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# EMERGING TRENDS IN BASIC AND APPLIED SCIENCES AND SOCIAL SCIENCES

**Editors**

**Dr. Sharadrao A. Vanalakar**

**Mr. Vishal A. Aher**



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## ***CONTENTS***

### **IMPACT OF FERTILIZERS ON EMISSION OF GASES IN GREEN HOUSE FARMING AND ITS SIGNIFICANCE ON GLOBAL WARMING**

S. V. Pore

### **WET STEAM AND LEMON CONTAINING ACIDS- STAIN REMOVERS**

Rajaram G. Chougale

### **EFFECT OF GREEN HARVEST ON FERTILITY OF SOIL**

A. B. Mamlyyya

### **MINERALOGY AND GENESIS OF LATERITES AND BAUXITES OF SHAHUWADI TALUK OF KOLHAPUR DISTRICT, MAHARASHTRA STATE (INDIA): A REVIEW**

J. V. Khanapurkar and R. A. Suryawanshi

### **UMP – TEST FOR MODERATE DISTRIBUTION USING MONOTONE LIKELIHOOD RATIO**

Mayur V. Savasani and Jinal N. Shah

### **USE OF SPREAD SHEET IN .NET**

Abhijit V. Patil

### **WIRELESS SENSOR NETWORK FOR AGRICULTURAL ENVIRONMENT TO CONTROL THE DRIP IRRIGATION**

Dnyaneshwar Natha Wavhal and Sneha Avinash Ghumatkar

### **A CRITICAL STUDY OF ICT INCLUDING IN REVISED B. ED. SYLLABUS**

Ravasaheb Kerappa Shelake

### **ASSOCIATION RULE MINING IN LEARNING MANAGEMENT SYSTEM**

Radhika M. Patil and Nita N. Bargale

### **MOBILE COMPUTING IN E-COMMERCE: ISSUES AND CHALLENGES**

Amit S. Babar

**MODULAR ARITHMETIC AND C DATA TYPES: SIGNED INTEGRALS**

S. P. Patankar, S. P. Thorat, K. P. Gidde and M. A. Jadhav

**USER-FRIENDLY MICROGASIFIER: SOLUTION FOR REDUCING INDOOR AIR POLLUTION IN RURAL KITCHENS**

Sanjay K. Babar and Priyadarshini Karve

**A REVIEW ON DESIGN OF CHAIN CONVEYOR SYSTEM AND STUDY OF STRESS DISTRIBUTION OF THE CHAIN LINK BY MEANS OF FINITE ELEMENT METHODS**

Kumar D. Kolhe and Hriday Mishra

ज्ञानरचनावाद आणि शिक्षण

Vishal A. Aver

## PREFACE

*In recent years, the landscape of scientific inquiry and social analysis has undergone profound transformations. The confluence of technological advancements, interdisciplinary collaborations, and evolving societal needs has spurred new directions in both basic and applied sciences, as well as in social sciences. Emerging Trends in Basic and Applied Sciences and Social Sciences aims to capture the essence of these dynamic changes, providing a comprehensive overview of the latest developments and innovations that are shaping the future.*

*The chapters in this volume are contributed by a diverse group of scholars, practitioners, and researchers who are at the forefront of their respective fields. They explore a wide range of topics, including the latest breakthroughs in nanotechnology, renewable energy, biotechnology, artificial intelligence, and data science, alongside emerging perspectives in social theory, cultural studies, and behavioral sciences. Each chapter delves into the current state of knowledge, key theoretical frameworks, practical applications, and future directions, providing readers with a holistic view of the subject matter.*

*A central theme of this book is the recognition that scientific and social advancements are not merely academic pursuits but are intimately connected to the well-being of society. As we navigate the complexities of the 21st century, it is imperative that we foster a dialogue between the sciences and the humanities, between technology and ethics, and between innovation and equity. This dialogue is essential for ensuring that the benefits of progress are shared widely and that the potential risks are carefully managed. Emerging Trends in Basic and Applied Sciences and Social Sciences is designed to serve as a valuable resource for students, educators, researchers, and policymakers. It aims to provide a foundation for understanding the current trends and encourages readers to think critically about the implications of these developments.*

*We extend our deepest gratitude to the contributors whose expertise and passion have made this volume possible. We also thank the editorial team for their unwavering commitment and meticulous work in bringing this project to fruition. We hope that this book will spark curiosity, provoke thought, and serve as a catalyst for further exploration and innovation in the exciting and ever-evolving fields of basic and applied sciences and social sciences.*

*Editors*





## **IMPACT OF FERTILIZERS ON EMISSION OF GASES IN GREEN HOUSE FARMING AND ITS SIGNIFICANCE ON GLOBAL WARMING**

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### **ABSTRACT**

This research analyzed the effect of organic fertilizer on the greenhouse gas emission, including carbon dioxide, methane, and nitrous oxide emitted from green house farming. Sweet Corn variety of maize plant was planted in green house farms in study area. It was divided into four different sectors such as control plots without added fertilizer, plots with the addition of organic fertilizer (cow manure), plots with the addition of organic fertilizer pellets and plots with the addition of chemical fertilizers. The results showed that the carbon dioxide, methane and nitrous oxide emission rates in the chemical fertilizer plot were the highest at 497.11, 1.81 and 1.19 mg/m<sup>2</sup>/day, respectively. The second highest levels were with the addition of manure at 381.54, 1.44 and 0.79 mg/m<sup>2</sup>/day, respectively. To reduce greenhouse gas emissions from green house farming, it is recommended that organic fertilizer must be utilized instead of chemical fertilizer, which also has good benefit on the health of farmers.

**KEY WORDS:** Global warming, Chemical fertilizers, Greenhouse gas, Organic Fertilizer, Farming.

### **INTRODUCTION**

The literature survey reveals that, Green house farming were the highest producers of gases like carbon dioxide, methane, nitrous oxide, hydro fluorocarbon, per fluorocarbon and sulfur hexafluoride. The India, as an agricultural country, average amount of total gases emitted per year causing Global warming is 57.7%<sup>12</sup>. The study showed that the amount of carbon dioxide emitted by the transportation sector was 229.08 million tons<sup>8</sup>, constituting 69.9% of the total amount of greenhouse gases, whereas the agricultural sector ranked second for greenhouse gas production, contributing 22.6%. In general comparatively methane gas more easily absorbs infrared rays than carbon dioxide per volume which is the most prevalent greenhouse gas emission in the Green house farming, as it evolves under anaerobic conditions and through organic decomposition. Nitrous oxide results from the general use of nitrogeous fertilizers, which decompose into nitrous oxide through the denitrification process caused by over irrigation or in rainy

season<sup>6</sup>. Thus, this study focused on the use of organic fertilizers instead of chemical fertilizers in Green house farming to reduce global warming by reducing greenhouse gas emission.

## **MATERIAL AND METHODS**

**Plot Preparations:** Organic farming fields belonging to Sweet corn (maize variety), from Kadegaon Tehsil of Sangli District were used for the experimental work. Each plot of 20x20 meters was prepared which involved plowing to a depth not exceeding 30 centimeters and constructing a ridge in each plot to prevent the contamination or overflow of water from adjacent plots. The seeding preparation is done as usual procedure adopted by the farmers and harvested and transplanted to the experimental plots under study.

**Fertilizer Preparation:** The fertilizers used included organic fertilizer which was obtained from non contaminated Sources, pellet organic fertilizer, and chemical fertilizer (formulas 16-20-0 and 46- 0-0). A random sampling of all of the fertilizers was performed to analyze for acid-forming or nonacid-forming properties, pH, moisture content, total nitrogen, the C/N ratio and total organic carbon.

**Planting and Maintenance:** The planting was divided into two stages:

1. The first stage was to plant seeds in small plots by sowing the seeds and allowing them to sprout for 30 days
2. The second stage was to harvest and replant into experimental plots. A water level of 5-10 centimeters was maintained throughout the experiment.

**Application of Fertilizers:** The conditions for each experimental plot were as follows:

1. Plot without fertilizer
2. Plot with added cow manure as a Organic Fertilizer during the plot preparation at a rate of 3.13 ton/ha, at 60 days after transplantation at a rate of 1.88 ton/ and the addition of 1.25 ton/ha at the maturation and final stages
3. Initially adding pellet organic fertilizer during the farming field preparation at a rate of 0.13 ton/ha, adding pellet organic fertilizer at the vegetative stage at a rate of 0.13 ton/ha or after 60 days of transplanting the seedlings and adding pellet organic fertilizer at a rate of 0.06 ton/ha at the maturation stage
4. Adding chemical fertilizer, formula 16-20-0, during the initial stage at a rate of 0.19 ton/ha and adding chemical fertilizer formula 46- 0-0 at a rate of 0.05 ton/ha at the vegetative stage and 0.05 ton/ha at the maturation stage.

**Sample Collection and Analysis:** The air was sampled during the following <sup>9</sup> stages: before planting, initial stage, vegetative stage, panicle-formation stage and maturation stage. Air samples were collected in a canister using the following sampling method. The chamber used was 0.6 meters wide, 0.6 meters long and 0.8 meters high, with an area of 0.29 cubic meters. Prior to the sampling period, the chamber was placed in

the plots and an air pump was used to draw an air sample, which was stored in a sample bag. The air samples were analyzed for CO<sub>2</sub> and CH<sub>4</sub> using Gas chromatography and N<sub>2</sub>O was analyzed using Fourier transform infrared spectroscopy (FTIR). The concentration of greenhouse gas was analyzed for flux using the following equation<sup>4</sup>

$$[F] = \frac{BV_{std} \times dC \times MW \times 1000 \times 60}{104 \times 22400 \times A \times dt} \dots\dots\dots (1)$$

$$[BV_{std}] = \frac{BV \times B.P. \times 273}{(273 + T) \times 760} \dots\dots\dots (2)$$

Where, F = Flux value for each gas (mg/m<sup>2</sup>/hr)

BV = Volume inside the plastic box at a point located above the flooding level (cm<sup>3</sup>)

B.P = Ambient Pressure at that time (mm Hg)

MW = Molecular weight for each gas

T = Temperature of the air in the box (°C)

A = Cross Section of the box (m<sup>2</sup>)

dC = Differential concentration of each gas at time zero and t (minute)

dt = Contact time (minute)

**Statistical Analysis:** The Variation in emission of CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emission data from the experiment was analyzed using ANOVA, and the differences of the data were compared using Duncan's new multiple range Test (DMRT). The statistical analysis was implemented.

## RESULTS AND DISCUSSION

**Quantity of Greenhouse Gas Emission:** Different fertilizers were used for the experiment: organic fertilizer (cow manure), pellet organic fertilizer and chemical fertilizer (formulas 16-20-0 and 46-0-0). Both the organic fertilizer (cow manure) and pellet organic fertilizer, composed of N, P and K, were expected to affect the greenhouse gas emissions due to agricultural activity. The overall analysis concluded that the CO<sub>2</sub>, CH<sub>4</sub> & N<sub>2</sub>O were emitted at statistically significant differences (P < 0.05). Detail of the greenhouse gas emission is shown in Table 1.

**Emission of CO<sub>2</sub>:** Plots with the added chemical fertilizer emitted the most CO<sub>2</sub> gas, averaging 497.11 mg/m<sup>2</sup>/day. The lowest was found in the fields that contained cow manure as added organic fertilizer. The organic fertilizer pellet plot and control plot emitted CO<sub>2</sub> gas at rates 381.54, 268.65 and 258.69 mg/m<sup>2</sup>/day, respectively. The CO<sub>2</sub> emission rates were not statistically significant different; however, the results of this study indicate that the addition of fertilizer in the plots under study increases the CO<sub>2</sub> emission rates. The CO<sub>2</sub> emission is generated by organic decomposition in the soil under aerobic conditions. Hence, a high quantity of organic matter is an important factor in increasing CO<sub>2</sub> emissions, which corresponds to the total density of fertilizer<sup>9</sup> by varying the ratio for organic farming: The N: P<sub>2</sub>O<sub>5</sub> ratio was varied at a level of

9.6:9.6 and 28.8:28.8, and the results indicated that the soil density increases from 1.15 gram per cubic meter to 1.39 gram per cubic meter when the ratio is increased. When adding fertilizer to the soil, both the nitrogen and soil density will increase. In the present study, the quantity of CO<sub>2</sub> in each plot experiment found that CO<sub>2</sub> emitted through Sweet corn plant as a maize variety. The panicle-formation stage displayed the highest CO<sub>2</sub> level, after the plot with added chemical fertilizer, which had the highest CO<sub>2</sub> emission during the harvest period. This finding corresponds to Redeker's<sup>4</sup> research, which indicated that plants of the Chainat variety had the highest emission rate (539.6 mg/m<sup>2</sup>/day) during the panicle formation stage.

**Methane Emissions:** The methane emission quantity shows that, adding fertilizer in each plot affected the methane emissions. The highest rate of CH<sub>4</sub> emission occurred in the plot with the added chemical fertilizer and measured an average rate of 1.81 mg/m<sup>2</sup>/day. The plot with the added cow manure as a organic fertilizer and organic fertilizer pellets emitted at the average rate of 1.44 and 1.38 mg/m<sup>2</sup>/day, respectively. In addition, the control plot emitted the lowest CH<sub>4</sub> gas level, at the rate of 1.23 mg/m<sup>2</sup>/day. Most of the CH<sub>4</sub> gas emitted by the field was generated by the microbiological decomposition in the soil. It was also found that the plants in each growth stage has a statistically significant difference in the emission rate (P<0.05). When compared with the CH<sub>4</sub> gas emission rate of each plot during the maize growth stages, we found that the maize as a sweet corn variety in the vegetative stages had the highest emission rate. In addition, the plot with the added chemical fertilizer had the highest CH<sub>4</sub> gas emission rate, at 3.03 mg/m<sup>2</sup>/day. The ranking order for the CH<sub>4</sub> gas emission rate is the plot with added organic fertilizer pellets, the cow manure as a organic fertilizer and the control plot, at 2.88, 1.68 and 1.03 mg/m<sup>2</sup>/day, respectively. A similar study by Ying and Tai<sup>14</sup> evaluated the CH<sub>4</sub> gas emission from pre-germinated direct-seeded lowland maize of different seed varieties combined with water management and chemical fertilizer addition during out-of-season maize growth. The results of the present study showed that the highest CH<sub>4</sub> gas emission rate was generated during the plant growth between 16-40 days or by the plant in the vegetative stage.

**Emission of N<sub>2</sub>O:** The control plot, added cow manure as a organic fertilizer plot and organic fertilizer pellet plot emitted N<sub>2</sub>O at averages of 0.25, 0.79 and 0.47 mg/m<sup>2</sup>/day, respectively. The plot with added chemical fertilizer emitted the most N<sub>2</sub>O gas during the maize season, at a rate of 1.19 mg/m<sup>2</sup>/day. In addition, adding fertilizer increased the N<sub>2</sub>O gas emissions. A finding that was especially noted in the plot with the chemical fertilizer. The N<sub>2</sub>O gas emission was directly affected by the chemical fertilizer component, the N:P:K ratio of 16:20:0 and 46:0:0, which corresponds to Stevenson and Cole<sup>5</sup> who studied the use of fertilizer with a high nitrogen component in agriculture, reporting higher amounts of N<sub>2</sub>O gas emissions. Moreover, the comparison of the N<sub>2</sub>O gas emission rate during each maize growth stage found that the plants in the vegetative stage emitted the highest amount of N<sub>2</sub>O gas. In addition, newly germinated maize seedlings depend on large quantities of nutrients for strong and complete<sup>2</sup> growth. Hence, fertilizer formula 46-0-0 was added to the paddy field, and the results showed that the nitrous oxide emission was the highest during the vegetative stage because the high quantity of nitrogen in the fertilizer increased the nitrous oxide emission

rate. The application of fertilizer increased the greenhouse gas emission during maize cultivation. The plot with the added chemical fertilizer formulas, 16-20-0 and 46-0-0, which are considered appropriate for maize growth<sup>10</sup>, increased some of the greenhouse gas emissions. The highest levels of CO<sub>2</sub> gas emission (37.64%), CH<sub>4</sub> gas emission (32.65%) and N<sub>2</sub>O gas (44.83%) of the total greenhouse gas emissions during the growth are illustrated in Table 2.

The application of chemical fertilizer caused higher greenhouse gas emissions than the organic fertilizer because chemical fertilizers indirectly affect soil reactions, resulting in microbial changes that slow the decomposition of organic substances and increase the accumulation of organic substances in the soil. Moreover, the increase in organic substances contained in the soil raises the amount of CH<sub>4</sub> gas that will be emitted<sup>10</sup>. In addition, the denitrification process will be initiated, whereby nitrate is converted to nitrogen gas under anaerobic conditions by micro-organisms in the soil<sup>12</sup>. Therefore, to reduce greenhouse gas emissions due to organic farming, agriculturists should add organic fertilizer instead of chemical fertilizer, which would also afford benefits to the health of the agriculturists. However, it may be difficult for agriculturists to switch to organic fertilizer because chemical fertilizer results in good production and many individuals neglect to consider the negative effects on the environment. Based on this research, the highest maize production occurred under the treatment of added organic fertilizer (cow manure), and the remaining ranking order was paddy fields with added chemical fertilizer, pellet organic fertilizer and the control plots, respectively; the production for each field was 3.59, 3.34, 2.71 and 2.00 ton/ha, respectively. To promote the use of organic fertilizer, relevant agencies should provide information that is relevant to environmental effects and health impacts on both the producer and consumer. Moreover, such guidance for the reduction of greenhouse gases due to agriculture should be provided for acceptance by the agriculturist in addition to the consideration of sweet corn as a maize production. Furthermore, agriculturists should be encouraged to utilize organic fertilizer, as it results in the reduction of greenhouse gas emissions from agriculture and is considered as part of the Clean Development Mechanism (CDM) for India to reduce greenhouse gas emission. Additionally, organic fertilizer is more efficient in enriching the soil, promotes soil aeration and looseness and contains more and varied nutrients than chemical fertilizer<sup>13</sup>. Furthermore, modifications of water management by adding a small amount of water and draining when the rice plants reach the vegetative stage and then allowing evaporation as a natural process complies with the study of Tsuruta and Hirose<sup>7</sup> and results in the reduction of CH<sub>4</sub> gas and N<sub>2</sub>O gas production.

**Table 1: Quantity of Greenhouse Gas Emission after Fertilizer Application in Plots**

Plot	Emission of greenhouse gas (mg/m <sup>2</sup> /day)		
	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub>
C control plots without added fertilizer	1.23±0.06	0.25±0.06a	258.69±39.50a
A plots with the addition of organic fertilizer (cow manure)	1.44±0.13	0.79±0.02ab	381.54±27.77a
B plots with the added organic fertilizer pellets	1.38±0.08	0.47±0.05ab	268.65±33.9a
R plots with the addition of chemical fertilizer	1.81±0.20	1.19±0.05b	497.11±109.01b

**Table 2: Percentage of greenhouse gas emission**  
**Plots Emission of greenhouse gas (%) Carbon dioxide Methane Nitrous oxide**

Plot	Emission of greenhouse gas (mg/m <sup>2</sup> /day)		
	CH <sub>4</sub>	N <sub>2</sub> O	CO <sub>2</sub>
C control plots without added fertilizer	20.79	8.99	35.97
A plots with the addition of organic fertilizer (cow manure)	24.56	29.91	26.89
B plots with the added organic fertilizer pellets	23.50	18.29	19.48
R plots with the addition of chemical fertilizer	31.15	42.81	17.66
Total	100	100	100

## CONCLUSION

**Effect of Fertilizer on the Quantity of Greenhouse Gas Emission:** The quantity of greenhouse gas emitted from the experimental plots indicated that plot with added chemical fertilizer had the highest emission rates when compared to all of the plots. The greenhouse gases in this study were CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O, and the emission rates were 497.11, 1.81 and 1.19 mg/m<sup>2</sup>/day respectively. The plot with the added organic fertilizer pellets had the lowest emission rates of 268.65, 1.38 and 0.47 mg/m<sup>2</sup>/day, respectively. The greenhouse gas emission rates for each gas type and plot were statistically significant (P<0.05).

**Effect of Greenhouse Gas Emission during Growth:** The study of the greenhouse gas emission from the plots also compared each growth stage, with all of the fields emitting CO<sub>2</sub> gas mostly during the panicle-formation stage. Furthermore, during the vegetative stage, CH<sub>4</sub> and N<sub>2</sub>O were mostly emitted by all of the plots; the drainage of water from the plots after the vegetative stage resulted in decreased greenhouse gas emission in all of the plots. The lowest greenhouse gas emission rate for all stage was found prior to the harvest stage. The difference in each maize growth stage was statistically significant.

**Guidance for the Reduction of Greenhouse Gas Emission from Organic Farming:** To reduce emission of CO<sub>2</sub> gas, agriculturists should be encouraged to discard organic waste instead of burning, decrease plowing and provide mostly CO<sub>2</sub> in the carbon cycle in an organic form to slow organic decomposition and increase photosynthesis. For CH<sub>4</sub> gas reduction, agriculturists should avoid adding large amounts of organic fertilizer, improve soil quality by increasing aeration and drain water from the plots prior to the panicle-formation stage. For N<sub>2</sub>O gas reduction, farmers can add organic fertilizer instead of chemical fertilizer; however, organic fertilizer must also contain a low quantity of nitrate. Finally, the application of organic fertilizer in agriculture, especially organic farming, would protect and conserve the environment.

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## REFERENCES

1. Department of Agricultural Extension. The Increasing of rice yield per hectare. In the Meeting documents for registration of rice farmers, Bangkok, Thailand, 2010.
2. Ministry of Agriculture and Cooperatives (2008) Integrated rice. [http://www. brrd.in.th/rkb](http://www.brrd.in.th/rkb). 21 May, 014.
3. Nimrat S. Soil microbiology. Odeon Store, Bangkok, Thailand, 2006.
13. Wannai S. Organic Fertilizer. Technology Promotion Association (Thailand-Japan), Bangkok, Thailand, 1978.
4. Redeker KR, Wang NY, Low JC, McMillan A, Tyler SC, Cicerone RJ. Emissions of Methyl Halides and Methane from Rice Paddies. *Science* 2000; 3:966-969.
5. Stevenson FJ, Cole MA. Cycles of Soil. Canada
6. Shioiri M. Denitrification in Paddy Soils. *Journal Sci Soil Manu* 1942; 16:104-116.
7. Singh JS, Raghubanshi AS, Reddy VS, Singh S, Kashyap AK. Methane flux from irrigated paddy and dryland rice fields, and from seasonally dry tropical forest and savanna soils of India. *Soil BiolBiochem* 1998; 30(2):135-139.
8. Thailand Greenhouse Gas Management Organization (2000) Greenhouse Gas in Thailand. <http://www.ieat.go.th>. 21 May, 2014.
9. Tattao DA. Influence of Long-Term N-P Fertilizers, Cropping Systems and Rainfall on Corn Yields and Soil Properties. Doctor's Thesis, Kasetsart University, Bangkok, Thailand, 1987.
10. Thanyadee P, Maneewan M, Wananukool P. Knowledge of organic matter in the soil. Manual of the Improve soil with organic matter. Land Development Department, Bangkok, Thailand, 1997.
11. Tsuruta H, Kanda K, Hirose T. Nitrous oxide emission from a rice paddy field in japan. *NutrienCycling in Agroecosystems* 1997; 49:51-58.
12. United Nations Framework Convention on Climate Change (2011) Kyoto protocol. <http://unfccc.int>. 21 May, 2014.
13. Wannai S. Organic Fertilizer. Technology Promotion Association (Thailand-Japan), Bangkok,
14. Ying YS, Tai XB. Effects of rice plants on methane emission from paddy fields. *Institute of Soil Science* 2003; 11:2049-2053.

## **WET STEAM AND LEMON CONTAINING ACIDS- STAIN REMOVERS**

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### **ABSTRACT**

The cleaning chemicals i.e. solvents were used to remove oil based stain, water soluble and insoluble stains. The non aqueous solvents and alcohols used to remove stain containing fats, waxes, grease cosmetics, paints and plastics etc. The water insoluble stains i.e. chili-oil spots of curry on clothes were removed by use of wet steam. For this purpose lemon containing acids with water and its vapours under steam pressure (15 P.S.I.G) and at temperature 285°F in steam cooker / autoclave machine 121.6 °C and 15 lbs per square inch / Kg cm<sup>-2</sup> were used. Universal solvent, water were used as dry cleaning solvent.

**KEYWORDS:** Dry Cleaning, Dry Vapour Steam, Wet Steam, Surfactants.

### **INTRODUCTION**

The steam refers to the visible mist or aerosol of water droplets, as water vapour condenses. The water vapour includes water droplet is described as wet steam. As wet steam is heated further the water droplets evaporates and the system is in vapour-liquid equilibrium. The steam produced at temperature higher than boiling point of water for the pressure, where all liquid water evaporated called super heated steam.<sup>8</sup> The machine produces steam (gaseous phase of water) for cleaning at high temperature (200°C - 500°C) and high pressure (32 to 110Kg cm<sup>-2</sup>) known as dry vapour steam.<sup>9</sup> The dry vapour steam contains 5% moisture, dry steam vapour which becomes tremendous cleaning tool. It does so without any chemical and very little moisture which allows the surface to dry almost immediately, removing dirt, degreasing and killing bacteria and other micro-organisms instantly. Dry steam vapour kill bed bugs, dust mites, fleas and any insect eggs and larvae a great relief for any skin or asthmatic allergy suffers. Steam is used in the process of wood bending; killing insects<sup>5</sup> and increasing plasticity and also transfers heat in cooking vegetables.<sup>7</sup> Dry cleaners dissolve rubber, waxes and resins. Dry cleaning solvents remove oily stains and so detergents are not needed. Soaps increase the cleaning power of dry cleaning solvents. Detergents help remove all other soils that may be present.<sup>16</sup>

The absorbents and green solvents used in dry cleaning. The absorbents are useful for cleaning grease marks on light coloured fabrics. Absorbents: common absorbents are starch, MgCO<sub>3</sub>, French chalk, bran moog powder (green gram powder) and bread crumbs etc. Green solvents: Inflammable – aviation petrol, benzine, Noninflammable: CCl<sub>4</sub>, benzene, trichloroethylene, tetrachloroethane, turpentine spirit soaps



etc<sup>1</sup>. Solvents to be acceptable when dry cleaning solvents must be an effective solvents for fats and oils, non-corrosive to metals commonly used in the machinery and be non-inflammable, clear and water white.

## **MATERIAL AND METHODS**

Treatment with sodium hypochlorite solution was used for removal of food stains.<sup>1</sup> For removal of curry stain marks, soap were applied to curry (Turmeric and Oil) stain on clothes and bleach in sunlight when dry, if the stain has not disappeared ,wet it and put it back in sunlight again. This method is time consuming. Hence preferred wet steam cleaning method and it is suitable to stain removal<sup>2</sup>.

The method applied for iron rust removal, spread mild acid e.g. Milk, Lemon, Vinegar or Salts of lemon. Pour boiling water through and also for ink stain removal, soak the stain in lime juice, curds or sour milk overnight. Then wash out.<sup>1</sup> This indicates that lemon juice was used for stain removal. Hence Wet Steam and Lemon containing acids was used for chili-oil mark on cloth fibre removal purpose, under steam pressure (15 P.S.I.G) and at temperature 121.6<sup>0</sup>C in steam pressure cooker / autoclave.<sup>4</sup>

The chemical cleaning is costly. The smell of inflammable solvent remains in clothing for a long time. (especially in woolens). Therefore for fragrance finish<sup>24</sup> wet steam cleaning method suitable in Laundry. The carboxylic group in acid (lemon) imparts antimicrobial and fragrance finish.

## **RESULT AND DISCUSSION**

The dry cleaning solvents Petroleum ether, Solvent naphtha, Kerosene, Turpentine (Petroleum based) ,Paraffin, Spirit (methylated), Ethyl alcohol, Amyl alcohol, Amyl acetate ,Acetone,Glycerine,Benzene or Petrol,Toulene,Chlorobenzene, Methyl Chloride, Carbon Tetrachloride, Perchloroethylene, trichloroethylene, tetrachloroethylene, 1,1,1trichloroethane, 1,1,2 trichlorofluoroethane , chlorofluorocarbons, glycol ethers ( propylene, dipropylene), hydrofluoroethers, n-propyl bromide and liquid CO<sub>2</sub> etc. used are stain removers. Petroleum naphtha is used as stain repellents. Most of the solvents are toxic to human being. Viz Theperchloroethylene(Perc)is neurotoxic and damages liver, Carbon tetrachloride damages liver, central nervous system and kidney. Trichoroethylene reduces eyesight, causes irregular heart beat.

Alkaline Stain removers are Ammonia (10% ammonium hydroxide), Sodium carbonate, 1% Sodium bicarbonate, Sodium hydroxide and Potassium hydroxide etc. used as cleaning agent.<sup>1,2</sup> Apply ice to the chewing gum stain. Allow to soak in ice cold water for a few minutes then launder. But Dry steam cleaning technology is ideal for localized chewing gum stain and spot removal from carpets and upholstery. Sanitizes cleaning surfaces and kill bacteria.<sup>1,2</sup>

The High dry temperature about 280-300<sup>0</sup>C and chemicals used in the dry cleaning process can directly damage garments or slowly decrease their life span. Steam explosions have been responsible for many laundry accidents<sup>8</sup>. Therefore without used high temperature and toxic chemicals e.g. CCl<sub>4</sub>, dry cleaning process could be modified and investigated that water insoluble stains e.g. curry(Chili- oil) based stain on clothes/garments not easily removed by any chemical method of dry cleaning e.g. 1%Acetic acid , 30%Formic

acid, 1% Oxalic acid, dilute HCl etc. But by using lemon juice containing acids (Citric acid, Ascorbic acid etc.) worked as like surfactants with water & its steam. The water applies for wet stains (Stain that had water in it.) Acid catch the stain reduces surface tension of boiled water around stain and stain 'Send Out' on the clothes and stain/ spot of curry were easily removed. Along with boiled water with steam vapour, under steam pressure (15 P.S.I.G) and at temperature 140 -141° C were required to remove oily type stains. Here water is used as solvent it is harmless reduces air pollution. Steam is non-toxic antimicrobial agent. The detergents used for washing and cleaning of garments releases phosphorus from phosphate ( ethoxylated phosphate esters) can cause eutrophication. By use of wet steam in dry cleaning, eutrophication process could be avoided.

The acidity found in order of Lemon > Tamrind > Kokam > Imblica > Young Unripe Mango > Papanus > Orange > Jagm, > Grapes > Tomato etc.<sup>3,27</sup> and Sour milk or Curds, Apples, Mint and spinach leaves extract etc. containing organic acids were used as acidic agent called bio-chemical stain removers.

Natural ecofriendly materials i.e. various herbal species such as extract of neem, tulsi leaves, *Quercus infectoria*,<sup>23</sup> pomegranate rind<sup>18</sup> etc. were screened for their antimicrobial activities against the stains of *Staphylococcus aureus* and *E. Coli*. Natural medicinal products clove oil and neem oils show good antibacterial property on cotton fabric<sup>13</sup> (becomes bioactive textiles) Antimicrobial agents (e.g. polyaniline<sup>19</sup>) for use in hospital textiles (gram positive and gram negative bacteria<sup>19</sup>) and effective anti odour agents for use in sports and household textiles.<sup>23,15</sup> Along with steam this natural herbal species material useful for antibacterial and antifungal action.<sup>18,20</sup> Instead of these the wet steam is useful for sterilization and antimicrobial action on fibre cloth.

The treated fibre cloth is lustrous and does not undergo any change due to the wetting in water<sup>14</sup>, retention of colour depth after the steam washing is observed. Only washing wrinkles in fabric formed during steam wash, rinse actions. Thermal stability, brightness and breaking strength of fibre maintained due to hemicelluloses.<sup>11</sup>

## **EXPERIMENTAL**

The lemon fruit were taken for experiment because lemon juice is highly acidic and have pH value 2.3. Oil stain removal process in which oil stain was first treated with lemon juice and sodium chloride then wash with soap and water were carried for cleaning. Other experiment carried in which curry (chili and oil) stain on cloth/garment were kept in steam cooker or autoclave machine containing water with about 30 cm<sup>3</sup> lemon juice (fresh), the cloth /garment soak in water and water boiled then produce steam, removes stain marks /spot.

## **CONCLUSION**

Most of the cleaning chemicals are toxic in nature. By this method these chemicals are not released in environment. Therefore wet steam cleaning technology is enviro-friendly. Saves costs of cleaning chemicals,

water used for laundry purpose is also saved results in air, soil & water pollution prevented. It is possible to create steam with solar energy and generated steam is used for soil sterilization to avoid the use of harmful chemical agents and increase soil health.

### **ACKNOWLEDGEMENT**

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### **REFERENCES**

1. Susheela Dantyagi, *Fundamental of textiles and their care*, Orient -Longman, fourth edition.
2. Noemia D'souza, *Fabric Care*, NEW AGE INTERNATIONAL (P) LIMITED, New Delhi 1998.
3. K. Raghuram, D.V. Prabhu, P. A. Sathe, S.H.S. Bohra, Sugandha Shetye, *Basic Principles in physical chemistry*, Sheth Publisher Pvt.Ltd.
4. Kumar V.M. *Practical's in Botany*, Sheth Publisher Pvt.Ltd.
5. Song Liyan; Wu, Jianfeng Xi, Chuanwu (2012): "Biofilms on environmental surface: Evaluation of the disinfection efficacy of a novel steam vapours system.
6. Bevelhimer, Carl (2003): *Steam*, Grotham Gazette. Steam Balloon JBFA Article.
7. Singh, R Paul (2001): *Introduction to food engineering* Academic Press ISBN 978-0-12- 6463842.
8. Wiser, Wendell H (2000): "Energy source Contribution to electric Power Generation. Energy resources: occurrence, production, conversion, use. Birkhauser P 190 ISBN 978-0-387-98744-6.
9. Md. Ibrahim H Mondal (2002): Effect of H<sub>2</sub> O<sub>2</sub> bleaching on Sulphonated Jute Cotton. *Indian Journal of fibre and Textile Research* Vol. 27, PP 280-283.
10. Mona Suri, D Rastogi, K. Khanna and M Chakraborty (2002): Development of protective clothing for pesticide industry, *Indian Journal of fibre and Textile Research* Vol. 27 PP 85-90.
11. R. K. Sarkar, Purushottam De and P. D. Chuhan (2003): The Bacteria resist finish on cotton fabrics using natural herbal extracts. *Indian Journal of fibre and Textile Research* Vol.28 PP 322-333.
12. GFS Hussain and KR Krishna Iyer (2003): Effect of swelling and stretching in water on the proportion of cotton fibres and yarns. *Indian Journal of fibre and Textile Research* Vol. 28 PP 134-146.
13. AlySayedAly, Ali Hashem and Samaha Hussein (2004): Utilization of Chitosan Citrate as crease resistant and antimicrobial finishing agent for cotton fabric. *Indian Journal of fibre and Textile Research* Vol. 29, PP 218-222.
14. Samanta, A. K. SunandaMitra, DeepaliSinghee and Smita Parekh (2004): Efficiency of selective Surfactants / detergents as washing agents on soiled white and dyed cotton fabrics. *Indian Journal of fibre and Textile Research* Vol. 29 PP 223-232.
15. S. K. Malik and Sushil Kumar (2005): Simultaneous dyeing and finishing of cotton fabric using reactive dyes & citric acid. *Indian Journal of fibre and Textile Research* Vol. 30 PP 444-450.

16. G Thilagavathi, K Rajendrakumar and R Rajendran (2005) : Development of ecofriendly antimicrobial textile finishes using herbs. *Indian Journal of fibre and Textile Research* Vol. 30 PP 431-436.
17. Devender T, Seshadri and Narendra V Bhat (2005): use of polyaniline as an antimicrobial agent in textiles. *Indian Journal of fibre and Textile Research* Vol. 30, PP 204-206.
18. G Thilagavathi, S Krishna Bala& T Kannaian (2007) :Microencapsulation of herbal extracts for microbial resistance for textiles. *Indian Journal of fibre and Textile Research* Vol. 32 PP 351-354.
19. Deepti Gupta and SomesBhaumik (2007): Antimicrobial treatments for textiles *Indian Journal of fibre and Textile Research* Vol. 32 PP 254-263.
20. T Kavitha, R Padmashwini, ASwarna, V R GiriDev, R Neelakandan and M Senthil Kumar, (2007): Effect of Chitosan treatment on the properties of turmeric dyed cotton yarn *Indian Journal of fibre and Textile Research* Vol. 32, PP 53-56.
21. Deepti Gupta and AnkurLaha (2007): Antimicrobial activity of cotton fabric treated withQuercusinfectoria extract. *Indian Journal of fibre and Textile Research* Vol. 32, PP 88-92
22. Anjali Karolia and SnehalMendapara (2007): Importing antimicrobial and fragrance finish on cotton using Chitosan with silicon softener. *Indian Journal of fibre and Textile Research* Vol. 32, PP 99-107.
23. T Sharbaty, F Biguenet, D. Dupuis and P Viallier (2008): Investigation on moisture transport through polyester / cotton fabric, *Indian Journal of fibre and Textile Research* Vol. 33 PP 419-425.
24. G Thilagavathi and T Kannaian (2008): Dual antimicrobial and blood repellent finishes for cotton hospital fabrics. *Indian Journal of fibre and Textile Research* Vol. 33, PP 23-29.
25. R.G.Chougale, A.B.Parab : Estimation of ascorbic acid in some fruits and vegetables by titrimetric methods, *international journal of basic and applied research* , special vol. 03 (88-90)

## **EFFECT OF GREEN HARVEST ON FERTILITY OF SOIL**

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### **ABSTRACT**

The study of effect of Green Harvest as aorganic fertilizers on fertility of soil health and its physico-chemical and Microbiological parameters are done.Day wise analysis of soil samples before and after treatment and green harvest available in pellet and powder form was carried out .The study have shown that, the applicationof green harvest reduces the chemical fertilizers up to Green Harvest 5%,increases organic carbon percentage in soil ,it maintains the pH of soil, the activity of soil microorganism was found to be increased and the soil became healthy and porous. The additional benefit of Green Harvest improves size, quality, luster and aroma of fruits.The use ofGreen Harvest gave maximum output in Minimum input. Green Harvest can be used for all types of crop. The uses of Green Harvest enhance the bacterial activity in the soil resulting in increase in soil fertility.

**KEY WORDS:** Green Harvest, organic carbon, microorganism, pellet, organic fertilizers.

### **INTRODUCTION**

The fertility of soil is "its ability to provide nutrients for the growth of plants, when other important growth factors are favorable."For optimum crop production, a soil that enables deep rooting provides aeration, has a good water holding capacity and consists of a productive and fertile soil.Fertilizers are materials used to provide plant nutrients which are deficient in soils.Fertilizers replace the chemical components that are taken from the soil by growing plants. However, they are also designed to improve the growing potential of soil, and fertilizers can create a better growing environment than natural soil. They can also be tailored to suit the type of crop that is being grown. Typically, fertilizers are composed of nitrogen, phosphorus, and potassium compounds. They also contain trace elements that improve the growth of plants.Organic fertilizers are fertilizers derived from animal or vegetable matter. The green harvest as an *organic fertilizer* refers to a soil amendment derived from natural sources that guarantees, at least, the minimum percentages of nitrogen, phosphate, and potash.

Soil health is defined as the continued capacity of soil to function as a vital living system, by recognizing that it contains biological elements that are key to ecosystem function within land-use boundaries<sup>1</sup>.These functions are able to sustain biological productivity of soil, maintain the quality of surrounding air and water environments, as well as promote plant, animal, and human health<sup>3</sup>.In many cases the composts have been supplemented with fertilizers not approved for use in organic farming, for

example<sup>6,7</sup> Supplementing composts with rock phosphate is however of interest in organic farming. Manures from organic farming systems usually have lower average nutrient contents than manures from conventional systems<sup>2,8</sup> reported that compost applied at rates varying from 18 to 146 t ha<sup>5</sup> produced a 6 to 163% increase in soil organic matter. Soil quality was been defined as “the capacity of a reference soil to function, within natural or managed ecosystem boundaries to sustain plant and animal productivity, maintain or enhance water and air quality, and support human health and habitation.” Subsequently the two terms are used interchangeably<sup>5</sup> A more recent study by <sup>10</sup> over a three-year period showed increases in soil organic matter from <sup>2</sup> different organic sources including biosolids, food waste and composted pig manure. The effect of different organic materials on soil pH was investigated by Wong et al. <sup>9</sup>. Electrical conductivity has been shown to increase with increased manure or compost application rates<sup>1,4</sup>

## **MATERIAL AND METHODS**

**Collection of soil sample:** The soil used in the experiment was black soil and it was collected from cultivated land near At/p. Bhikawadi khurd (Tal- Kadegaon, Dist- Sangli). Soil was collected from the top 5-20 cm layers and sieved through 0.5mm screen and then placed in cotton bags and stored at room temperature. The soil was then analyzed for some selected physio-chemical and Microbial parameter.

**Collection of Green Harvest as a organic fertilizer:** Sample was collected from Nature Care Fertilizers Pvt. Ltd. Vita. (Dist – Sangli). All fertilizers were collected and placed in cotton bags and stored at room temperature. The fertilizers were then analyzed for some selected physio-chemical and biological parameter. Green Harvest” is an organic fertilizer of different organic ingredients derived from plants origin. This product is result of Vedic Wisdom with modern scientific studies in agriculture. Green Harvest” is an organic fertilizer prepared from cold pressed oil seed cake which contains Neem, Pongamia, Mustard, Mahuwa, Castor, Palm, Shea, Sal, Cashew, Mangium, Marigold, Thyme .Turmeric, Ginger as a Antibacterial ingredient. Silica, Lobster shells ,Chicken Manure, City Compost as a Minerals. Magnesium powder, Rock phosphate as a Filler and Acetobacter, Azotobacter, BD 500, Potash Mobiliser, PSB, Silica Solubliser as a Bacterial Cultures.

Colonies were counted and expressed as cfu/gm of sample.

The analyzed soil was then treated with different organic fertilizers as follows,

1. Control – Untreated soil
2. Sample A – 1 kg soil + Green Harvest (2.5%)

The above samples were stored and their physical, chemical and biological characters were studied after every 5 days.

### **BIOLOGICAL ANALYSIS-**

cfu/gm of treated soil sample was calculated and recorded using serial dilution method after every 5 days.

<b>Physio-chemical analysis</b>			
<b>Sr.</b>	<b>Parameter</b>	<b>Reagent</b>	<b>Apparatus</b>
1	pH	7 buffer	Digital pH meter
2	Electric conductivity	KCl	Digital conductivity meter
3	Bulk density		Weighing machine
4	Nitrogen	NaCl, Phenolphthalein, Mixed Indicator, 2% Boric acid, 0.01N H <sub>2</sub> SO <sub>4</sub>	Kjeldahl's assembly
5	Phosphorus	Sodium carbonate, Charcoal, Ammonium molybdate, Stannous chloride, 100 ppm	Colorimeter
6	Organic Carbon and Organic matter	Conc. H <sub>2</sub> SO <sub>4</sub> , 1N K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> , Orthophosphoric acid, 0.5N FeSO <sub>4</sub> , Diphenylamine	Hot air oven
7	Calcium	Ammonium acetate, NaOH, Murexide, EDTA	Weighing machine
8	Magnesium	Ammonium buffer, Ammonium acetate, Erichrome black T, EDTA	Weighing machine
9	C: N ratio	Calculated using total carbon and total nitrogen.	
<b>Biological analysis-</b> cfu/gm of soil sample was calculated using serial dilution method			
	<b>Media</b>	<b>Common Procedure</b>	
10	<b>Soil extract agar</b> Glucose – 1 gm, K <sub>2</sub> HPO <sub>4</sub> – 0.5 gm, Soil extract –100 ml, Agar –15 gm, P <sup>H</sup> – 7.2 Distilled water – 100 ml	1) 10 gram of the soil sample was added in 90 ml sterile saline. 2) And the solution was shaken for 5 minutes on rotary shaker. 3) After thorough mixing 1 ml of the suspension was to be transferred 9 ml sterile saline aseptically.	
11	<b>Sabourad's agar</b> Glucose – 4 gm, Peptone – 1 gm, Agar – 2.5 gm, P <sup>H</sup> – 5.4 Distilled water 100 ml	4) The tube was shaken for a minute and 1 ml was transferred to another 9 ml sterile saline. This dilution was made until million dilutions. 5) A loopful of suspension was then transferred on sterile soil extract agar, sabourad's agar, ken knight's medium plates and was streaked.	

		6) Plates were then incubated at 37°C for 24hrs, 48hrs, and 72hrs respectively.
12	<b>Ken Knights medium</b> Glucose - 0.1 gm KHPO <sub>4</sub> - 0.01 gm KNO <sub>3</sub> - 0.01 KCL- 0.01, P <sup>H</sup> - 7 to 7.2 MgSO <sub>4</sub> - 0.01gm, Agar-agar - 1.5 gm Distilled water 100 ml	

## RESULTS AND DISCUSSION

**Table 1. Physiochemical analysis - Untreated soil and fertilizers**

Sr.No	Parameter	Units	Untreated soil	Units	Green Harvest
1	pH	-	8.17	-	7.23
2	EcV	-	0.63	-	5.07
3	Nitrogen	Kg/h	18.95	%	1.70
4	O.C	%	0.30	%	23.69
5	O.M	%	0.52	%	40.85
6	Phosphorus	Kg/h	93.33	%	1.71
7	Potash	Kg/h	840.80	%	1.33
8	Calcium	%	0.60	%	3.40
9	Magnesium	%	0.21	%	2.81
10	Bulkdensity	g/cm <sup>3</sup>	1.00	g/cm <sup>3</sup>	0.61
11	Ash	%	18.70	%	60.30
12	Moisture	%	9.23	%	24.70
13	C:N ratio	-	0.001	-	13.93



**Table 2. Microbial analysis - Untreated soil and Fertilizers**

Sr.No	Microbial count	cfu/gm	Untreated Soil							Fertilizers
			0 day	5th day	10th day	15th day	20th day	25th day	30th day	Green Harvest
1	Bacteria	107	22	25	29	18	23	12	20	8
2	Fungal	107	5	5	4	4	8	5	8	20
3	Actinomycetes	107	10	10	12	13	17	15	10	5

**Table 3. Day wise Physiochemical analysis - Untreated soil and sample A (Soil + Green Harvest)**

Para Meters	Units	Control (Untreated Soil)							Sample A (Soil + Green Harvest)						
		0	5	10	15	20	25	30	0	5	10	15	20	25	30
pH	-	8.17	8.15	8.1	8.12	8.15	8.07	8.12	8.0	7.4	7.3	7.24	7.37	7.32	7.30
EcV	-	0.63	0.62	0.6	0.61	0.63	0.57	0.6	0.5	0.5	0.6	0.79	0.69	0.75	0.81
N	KG/h	18.95	18.3	18.0	17.82	17.9	18.1	19.2	11	11	13	12.9	17.6	17.6	17.2
O.C	%	0.3	0.30	0.30	0.34	0.30	0.36	0.37	0.33	0.4	0.5	0.98	1.55	1.92	2.02
O.M	%	0.52	0.52	0.50	0.58	0.52	0.62	0.63	0.58	0.7	0.8	1.68	2.67	3.31	3.45
P2O5	KG/h	93.33	95.3	75.0	99.12	102.	98.06	101	94	99	106	104	112.	134	136
K2O	KG/h	840	739	851	840	840	851	784	735	752	784	784	821	812	830
Ca	%	0.60	0.61	0.60	0.61	0.60	0.61	0.60	0.36	0.41	0.40	0.63	0.85	0.85	0.89
Mg	%	0.21	0.21	0.20	0.21	0.21	0.20	0.23	0.10	0.12	0.15	0.18	0.23	0.24	0.24
Bulk density	g/cm <sup>3</sup>	1.00	1.01	1.00	0.97	0.97	0.98	0.97	0.98	0.98	1.00	1.01	1.02	1.03	1.02
Moisture	%	9.23	9.11	11.0	10.95	12.9	10.75	10.3	20.1	19.3	18.0	19.4	21.2	21.3	21.8

## DISCUSSION

In the present study various parameters were checked, such as pH, Electric conductivity, Nitrogen, Organic Carbon, Organic matter, Phosphorus, Potash, Calcium, Magnesium, Bulk Density, Moisture content of untreated soil and treated soils (Green Harvest). We observed that, pH of untreated soil was 8.1 and in sample A (Soil + Green Harvest) pH was found to be 8.0 on 0 day and on 30<sup>th</sup> day pH of untreated soil was observed to be 8.12 and in sample A (soil + Green Harvest) pH was found to be 7.30. Thus pH was found to decrease after addition of Green Harvest. Electric conductivity (EcV) of untreated soil was 0.63 on the 0 day and In sample

A( Soil + Green Harvest) EcV was found 0.50. On 30<sup>th</sup> day EcV of untreated soil was 0.60 and sample A( Soil + Green Harvest) EcV was observed that, 0.81. EcV of untreated soil was 0.63 on the 0 day In untreated soil nitrogen was 18.95 KG/h and sample A (Soil+ Green Harvest) nitrogen 11.00 KG/h and on 30<sup>th</sup> day nitrogen of untreated soil increased to 19.24 KG/h and in sample A (Soil + Green Harvest) 17.2 KG/h. Organic carbon of untreated soil was 0.30% which showed increase up to 0.37% on 30<sup>th</sup> day while in sample A (Soil + Green Harvest) OC increased from 0.33% to 1.70% on 30<sup>th</sup> day. Organic matter is dependent on Organic Carbon. Organic matter of untreated soil was 0.52% on 0 day and in Sample A (soil + Green Harvest) 0.58%. On 30<sup>th</sup> day Organic matter of untreated soil was 0.63% and in sample A (Soil + Green Harvest) organic matter was 3.45%. The comparison between untreated soil and soil + Green Harvest, organic carbon increased. Organic matter of untreated soil was 0.52% on 0 day. On 0 day Phosphorus of untreated soil was 93.33KG/h and in sample A (soil + Green Harvest) phosphorus was 94.0 KG/h. And on 30<sup>th</sup> day. Phosphorus of untreated soil was 101.0KG/h and in sample A (soil + Green Harvest) phosphorus was 136.0 KG/h. The comparison between untreated soil and soil + Green Harvest, percentage of phosphorus increased. In untreated soil the potassium was observed, 840 KG/h on 0 day and in sample A(soil + Green Harvest) potassium was 735 KG/h. On 30<sup>th</sup> day untreated soil potassium was 784 KG/h and in sample A (soil + Green Harvest) potassium was 830 KG/h. The comparison between untreated soil and soil + Green Harvest potassium increased. Calcium of untreated soil was 0.60% on 0 day and in sample A (soil + Green Harvest) calcium was 0.36%. On 30<sup>th</sup> day Calcium of untreated soil was 0.60% and in sample A (soil + Green Harvest) calcium was 0.89% The comparison between untreated soil and soil + Green Harvest percentage of calcium increased. Magnesium of untreated soil was 0.21% and in sample A (soil + Green Harvest) magnesium was 0.10% on 0 day. On 30<sup>th</sup> day magnesium of untreated soil was 0.23% and in sample A (soil + Green Harvest) magnesium was 0.24% The comparison between untreated soil and soil + Green Harvest magnesium increased. Bulk density of untreated soil was 1.00 gm/cm<sup>3</sup> and in sample A (soil+ Green Harvest) bulk density was 0.98 gm/cm<sup>3</sup> on 0 day and bulk density of untreated soil was 0.97 gm/cm<sup>3</sup> and in sample A (soil+ Green Harvest) bulk density was 1.02 gm/cm<sup>3</sup> on 30<sup>th</sup> day. Moisture content of untreated soil was 9.23% on 0 day and in sample A (soil + Green Harvest) moisture 20.1% and on 30<sup>th</sup> day moisture content of untreated soil was 10.3% and in sample A (soil + Green Harvest) moisture 21.8%. The comparison between untreated soil and soil + Green Harvest percentage of Moisture content increased. Moisture content of untreated soil was 9.23% on 0 day and in sample B (soil + Press mud) moisture 19.6% and on 30<sup>th</sup> day moisture content of untreated soil was 10.3% and in sample B (soil + Press mud) moisture 20.9%. Overall pH and EcV of all samples showed decreasing trend. While Nitrogen Organic carbon, Organic matter showed an increasing trend. Phosphorus, Potassium, Calcium, and Magnesium was also increased. Bulk density in all samples decreased while Moisture content increased.

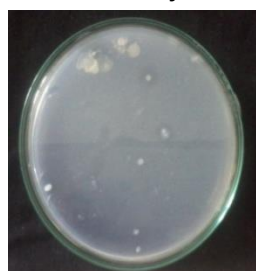
Sample A (Soil + Green Harvest) fungal count was found to be  $7 \times 10^7$  cfu/gm. On 30<sup>th</sup> day fungal count of untreated soil was  $8 \times 10^7$  cfu/gm and in sample A (Soil + Green Harvest) fungal count was found to be  $13 \times 10^7$  cfu/gm. The comparison between untreated soil and soil + Green Harvest fungal count increased.. On 0 day actinomycetes count of untreated soil was  $10 \times 10^7$  cfu/gm and in sample A (Soil + Green Harvest)

actinomycetes count was found to be  $12 \times 10^7$  cfu/gm. On 30<sup>th</sup> day actinomycetes count of untreated soil was  $10 \times 10^7$  cfu/gm and in sample A (Soil + Green Harvest) actinomycetes count was found to be  $17 \times 10^7$  cfu/gm.

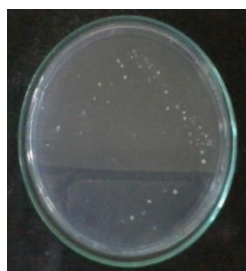
**Table 4. Day wise microbial analysis of untreated soil and sample A (Soil + Green Harvest):**

Microbial count	cfu/gm	Control(Untreated soil)							Sample A (Soil + Green Harvest)						
		0 day	5th day	10th day	15th day	20th day	25th day	30th day	0 day	5th day	10th day	15th day	20th day	25th day	30th day
Bacterial	107	22	25	29	18	23	12	20	39	39	41	48	48	51	54
Fungal	107	5	5	4	4	8	5	8	7	8	10	11	12	9	13
Actinomycetes	107	10	10	12	13	17	15	10	12	10	10	13	16	12	17

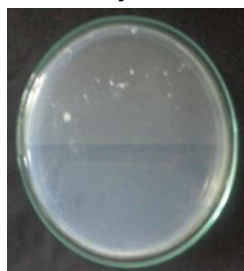
**0 Day Bacterial Count – Soil extract agar    30<sup>th</sup> Day Bacterial Count – Soil extract agar**



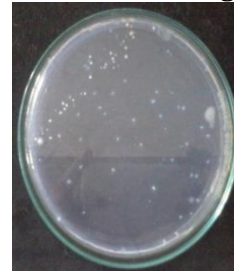
Control  
 Untreated soil  
 $22 \times 10^7$  cfu /gm



Sample A  
 Soil + Green Harvest  
 $39 \times 10^7$  cfu /gm

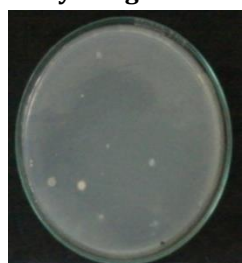


Control  
 Untreated soil  
 $20 \times 10^7$  cfu /gm



Sample A  
 Soil + Green Harvest  
 $54 \times 10^7$  cfu /gm

**0 Day Fungal Count –Sabourad’s agar**

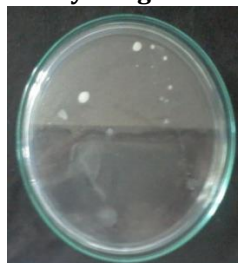


Control –  
 Untreated soil  
 $5 \times 10^7$  cfu /gm



Sample A  
 Soil + Green Harvest  
 $7 \times 10^7$  cfu /gm

**30<sup>th</sup> Day Fungal Count – Sabourad’s agar**

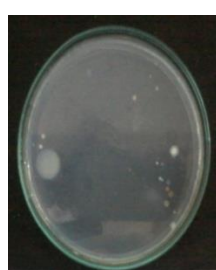


Control  
 Untreated soil  
 $8 \times 10^7$  cfu /gm

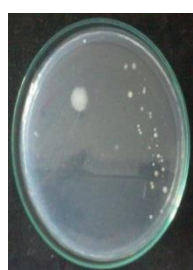


Sample A  
 Soil + Green Harvest  
 $13 \times 10^7$  cfu /gm

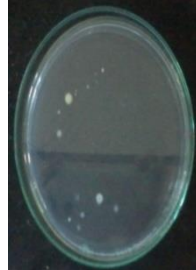
**0 Day Actinomycetes Count –30<sup>th</sup> Day Actinomycetes Count –Ken Knight’s mediaKen Knight’s media**



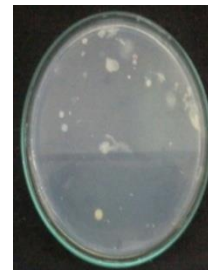
Control  
 Untreated soil  
 $10 \times 10^7$  cfu /gm



Sample A  
 Soil + Green Harvest  
 $12 \times 10^7$  cfu /gm



Control  
 Untreated soil  
 $10 \times 10^7$  cfu /gm



Sample A  
 Soil + Green Harvest  
 $17 \times 10^7$  cfu /gm

## CONCLUSION

The main purpose of application of organic fertilizers in the soil is to increase percentage of organic carbon which provides food for bacteria. It is essential for many soil reactions. These bacteria can convert total nutrient present in the soil to available form, which fulfills nutritional requirements of plants.

In our study we observed that, count of essential bacteria increased by increase in organic carbon by application of various organic fertilizers.

**Future prospect** – Isolation, identification and characterization of bacteria present in the soil. (Azotobacter, Acetobacter, PSB, Rhizobium, Potash mobilizing bacteria).

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## REFERENCES

1. Chang, C., Sommerfeldt, T.G. and Entz, T. (1991) Soil chemistry after eleven annual applications of cattle feedlot manure. *Journal of Environmental Quality* 20, 475-480.
2. Dewes, T. and Hünsche, E. (1998) Composition and microbial degradability in the soil of farmyard manure from ecologically-managed farms. *Biological Agriculture and Horticulture* 16, 261-268.
3. Doran, J.W., Sarrantonio, M., Liebig, M., 1996b. Soil health and sustainability. In: Sparks, D.L. (Ed.), *Advances in Agronomy*, Vol. 56. Academic Press, San Diego, pp. 1-54.
4. Eghball, B. (2002) Soil properties as influenced by phosphorus- and nitrogen-based manure and compost applications. *Agronomy Journal* 94, 128-135.
5. Karlen, D. L., Andrews, S. S. and Doran, J. W. 2001. Soil quality: Current concepts and applications. *Advances in Agronomy* 74: 1-40.
6. Manna, M.C., Ghosh, P.K., Ghosh, B.N. and Singh, K.N. (2001) Comparative effect of phosphate-enriched compost and single superphosphate on yield, uptake of nutrients and soil quality under soybean-wheat rotation. *Journal of Agricultural Science, Cambridge* 137, 45-54.
7. Marchesini, A., Allievi, L., Comotti, E. and Ferrari, A. (1988) Long-term effects of quality-compost treatment on soil. *Plant and Soil* 106, 253-261.
8. Shepherd, M.A., Bhogal, A., Lennartsson, M., Rayns, F., Jackson, L., Philipps, L. and Pain, B. (1999) The environmental impact of manure use in organic farming. Final Report to MAFF
9. Wong, M. T. F., Gibbs, P., Nortcliff, S., and Swift, R. S. (2000). Measurement of the acid neutralizing capacity of agroforestry tree prunings added to tropical soils. *Journal of Agricultural Science, Cambridge* 134, 269-276.
10. Zebarth, B.J., Neilsen, G.H., Hogue, E, and Neilsen, D. (1999) Influence of organic waste amendments on selected soil physical and chemical properties. *Canadian Journal of Soil Science* 79, 501-504.

**MINERALOGY AND GENESIS OF LATERITES AND BAUXITES OF  
SHAHUWADI TALUK OF KOLHAPUR DISTRICT, MAHARASHTRA STATE  
(INDIA): A REVIEW**

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**ABSTRACT**

The tropical location of Western Maharashtra exposes it to excessive rainfall, high humidity and high temperature. In these conditions, the Deccan Trap basalts in this area progressively weather insitu to laterites and bauxites. The blanket-type bauxite deposit and laterites of the Shahuwadi area has been studied with reference to its geological setting, mineralogy and genesis. Field relations indicate the following successive stages developed during in-situ weathering: basalt (parent rock) → altered basalt → clay → aluminous laterites → bauxite. Residual laterites overlying the saprolitic/lithomargic clays exhibit vesicular, spongy and pisolitic macrot textures and are composed mainly of hematite and goethite with minor proportions of gibbsite, kaolinite and anatase. Bauxites, which occur as pockets and lenses within the laterites, display pisolitic, massive and nodular micro textures, and are predominantly composed of gibbsite with minor amounts of anatase, kaolinite, hematite and goethite.

**KEYWORDS:** Deccan Trap, Laterite, Bauxite, blanket-type, goethite.

**INTRODUCTION**

Weathering and sedimentation are the two geochemical processes of greatest importance to man, since they provide us with our basic economic resource; the soil. Soils result from weathering of rocks and as such their physical and chemical constitution is primarily a function of the parent material and the environment. The same parent rock may give rise to very different soils under different environmental conditions. The environmental factors which affect soil formation include climate, biological activity and topography. The most important of these is climate. Tropical weathering is a prolonged process of chemical weathering which produces a wide variety in thickness, grade and ore mineralogy of the resulting soil through lateritization. Lateritization is the process whereby rocks are converted to laterite by the enrichment of oxides and hydroxides of iron and aluminum and depletion of silica. It is favoured by low topographic relief, a warm climate with alternating wet and dry seasons, and a fluctuating water table near the surface,

which enables insoluble oxides of iron and aluminum to be precipitated in the zone of aeration. Laterite is a reddish residual soil formed by the weathering of parent rocks under strong oxidizing and leaching conditions (F. A. Ushie and C.N. Ehirim, 2012).

The term 'laterite' was first proposed by Francis Buchanan in 1800 (Fox, 1923) to describe the red building stone material excavated from the hills around Angadipuram, a village in Kerala, India. The sediments rich in alumina near Les Baux, France were named as 'bauxite' by Berthier in 1821. The term 'bauxite' was extended to cover the gibbsite-rich weathering products of basalts in Germany by Liebrich in 1892 (Valeton, 1972).

Laterite is a generic term for the rock products of lateritization. The latter is a form of superficial weathering resulting in an increase of aluminum and titanium, also frequently but not invariably of iron, and in a decrease of alkaline earths and silica. Bauxite is a residual or sedimentary rock in which the aggregate content of the oxide and/or hydroxide minerals of aluminum, iron and titanium is greater than 50%, and aluminum minerals are more abundant than the minerals of the two other elements together. Bauxite genesis covers all those processes of alteration and sedimentation which lead to the formation of rocks enriched in aluminum, including processes of weathering, transportation and deposition. Bauxitization is that phase of bauxite genesis in which the material of some rock is converted into bauxite or in which the conversion into bauxite of a rock already partially bauxitized is continued. Bauxitization is a special case of lateritization, characterized by a prevalence of aluminum enrichment (D.V. Chitale, 1986).

## **OCCURRENCE OF LATERITES AND BAUXITES**

Deccan Trap basalts at Western Maharashtra, India progressively weather in situ to laterites and bauxites via an intermediate stage of saprolitic clays. The unweathered basalts are predominantly composed of a calcic plagioclase and a ferrous pyroxene, with minor proportions of magnetite, ilmenite, volcanic glass, iddingsite and palagonite. Dissolution etch pits form due to weathering on the surfaces of minerals in basalts. Weathered basalts are composed of various combinations of smectites, kaolinites, goethite, hematite and anatase. Kaolinite is the principal mineral in the saprolitic clays overlying the basalts in the residual bauxite deposits. It commonly forms a framework of submicron sized, irregular shaped platelets, and occasionally occurs as booklets of hexagonal platelets that rarely form spheroidal aggregates. Residual laterites overlying the saprolitic clays exhibit vesicular, spongy and pisolitic macrottextures and are composed mainly of hematite and goethite with minor proportions of gibbsite, kaolinite and anatase. Bauxites, which occur as pockets and lenses within the laterites, display pisolitic, massive and nodular microtextures, and are predominantly composed of gibbsite with minor amounts of anatase, kaolinite, hematite and goethite. Laterites and bauxites are characterized by framework microtexture formed by three-dimensional packing of crystallites (D.V. Chitale, 1986). The study area considered here i.e. Shahuwadi Taluk of Kolhapur District (Shown in the **Fig-1**), represents the Western Maharashtra, India only.

## REVIEW OF THE PREVIOUS STUDIES

### Geology of Western Maharashtra-

The following summary of the geology of western Maharashtra including Shahuwadi Taluk is based on Sahasrabuddhe (1978) and Chitale (1980):

The oldest rocks in western Maharashtra *are* represented by Precambrian granites, gneisses and metasediments. These are overlain by the Early Paleozoic sandstones and quartzites. All the older rock units are unconformably overlain by the Deccan Trap Basalt lava flows of Late Cretaceous to Tertiary age. The rocks older than basalt crop out only extremely rarely. In most parts of western Maharashtra the Deccan Basalts are overlain by clays and/or laterites. The bauxites are included within laterites. The laterites are occasionally overlain by Quaternary sediments that are commonly represented by beach sediments and loess. **Table-1** displays the summary of the regional geology of western Maharashtra. Deccan Trap basalts are the oldest rocks exposed in the study area in western Maharashtra, and are capped by laterites and bauxites.

### Mineralogy and Genesis-

The earliest reference to laterites and bauxites in western India are by Wynne (1872), Foote (1876) and Fox (1923). They described the general geology of the region and the physical features of the laterites and bauxites. The bauxite deposits in western India were extensively studied later by Sahasrabuddhe (1961, 1962, 1978). He provided excellent summaries of field descriptions, chemical analyses and petrography of laterites and bauxites from several profiles in Maharashtra and Gujarat states. He recognized laterites and bauxites cappings over Deccan basalts in most parts of western India, and bauxite cappings over pyroclastics in Gujarat state.

Valeton (1967) studied the geologic history of bauxites over the Deccan Trap basalts and suggested that the bauxites at high elevation represent polygenetic soils formed on uplifted trap basalt areas. Valeton explained the occurrence of bauxite deposits at different elevations on the Deccan Plateau by envisaging step faulting of a peneplain. Raja Rao (1976), on the contrary, attributed such occurrence of bauxite to the weathering process and mass removal of the weathering products up to different layers in the basalt flow areas. Laterites and bauxites formed in Maharashtra on peneplained surfaces that were gently sloping southerly or southwesterly (Sahasrabuddhe and Deshmukh, 1981). The effect of a fluctuating water table during the weathering of basalts was also stressed by Sahasrabuddhe and Deshmukh. Bauxites formed above the water table under conditions of good drainage, while the saprolitic clays formed below the water table. Balasubramaniam and Paropkari (1975), and Balasubramaniam and Sable (1976), respectively, studied the mineralogy of high-level bauxite at Nangrataswadi in Maharashtra and that of low-lying bauxites from the Kutch mainland in Gujarat state. Gibbsite is the main mineral in bauxites, with minor amounts of boehmite, allophane, and clachite. Successive stages of weathering from basalt to weathered basalt through lithomargic clay to bauxites were recognised in the above bauxite profiles. Chitale (1980), and Dessai and Chitale (1980)

studied in detail the mineralogic and megascopic textural features of the bauxites at Srivardhan, in Maharashtra state on the west coast of India.



**Fig-1. Maps showing location of Kolhapur and Shahuwadi Taluk in Maharashtra. (Not to the scale)**

The mineral composition of bauxites and laterites was determined by infra-red (IR) spectroscopy and differential thermal analysis (DTA). Gibbsite is the main mineral of bauxites, while hematite and goethite predominate in laterites. Small amounts of kaolinite, anatase, bayerite, boehmite and nordstrandite are also present in these laterites and bauxites. Chemical analyses of the rocks in the laterite profiles indicate that silica, bases from the Deccan Trap basalts were selectively removed during the weathering, resulting in the concentration of Al, Fe and Ti that are the major elements of bauxites and laterites. Reviews on the general stratigraphy and physiography (**Table-1**) of the bauxite bearing regions in India, and on the occurrence and economic reserves of bauxites are available from Rao (1975), Sastry (1981) and Das Gupta (1984).

### **Bauxitization Process-**

There is a voluminous literature available on the weathering of rocks, neoformation of clay minerals, and mineralogy, geochemistry and genesis of laterites, bauxites and associated clays from various parts of the world. Some of the important publications relevant to the study of bauxitization are reviewed below.

An excellent review of the surficial weathering of basic igneous rocks was done by Cawsey and Mellon (1983). Water is the most important agent of chemical weathering, acting through the process of dissolution and hydrolysis. Oxidation, pH and drainage are the principal factors that influence the progress of weathering in a given rock.  $Fe^{2+}$  converts to  $Fe^{3+}$  under oxidizing conditions affecting Fe within silicate minerals and aiding the disruption of the crystal structure. Insoluble  $Fe^{3+}$  hydroxides form and are residually concentrated in a weathering profile.



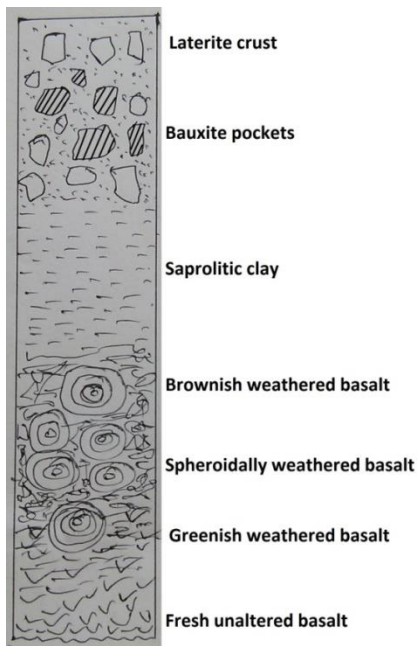


Fig-3. A schematic (Not to the scale) representation of the laterite profile over Deccan Trap basalts.

Table-1. Stratigraphy of Western Maharashtra, India.

Age	Lithology
Quaternary	Beachsands, loess, lignite
Tertiary to Recent	Laterites and Bauxites
Upper Cretaceous to Miocene	Deccan Trap Basalts
-----UNCONFORMITY-----	
Early Palaeozoic	Sandstones, quartzites
-----UNCONFORMITY-----	
Precambrian	Granites, Metamorphic rocks

Under reducing conditions,  $Fe^{3+}$  is mobilized as  $Fe^{2+}$  and leached away from the weathering profile. Low pH promotes hydrolysis of silicate minerals by protonation of the silicate structure. Silica solubility rapidly increases at pH of near or above 9 and Al and Fe hydroxides are soluble at pH below 4. The quantity of water passing through the zone of weathering influences the nature of secondary minerals which form during weathering. Under conditions of large amounts of water percolating through the rocks and with good drainage even slightly soluble elements are leached out, leaving an insoluble residue of  $Fe^{3+}$  and Al hydroxides. When the drainage is impeded or where there is insufficient water to leach out the weathering products, clay minerals form.

Formation conditions of clay minerals under lateritic conditions are summarized by Harder (1977). Smectite minerals form under alkaline or neutral pH conditions from basic igneous rocks. Smectite minerals can form from acidic magmatic rocks only under alkaline pH conditions which are produced by K or Na of the freshly weathered feldspar. Under tropical climates of lateritization, clay minerals form below the water table during the dry seasons. Silica contents are very low during the wet seasons and clay minerals cannot form. Smectites form in inorganic basic solutions, while kaolinite minerals crystallize in weakly acid solution aided by the presence of organic compounds.

## REFERENCES

1. Allen, V. T. (1948): Formation of bauxite from basaltic rocks of Oregon. *Econ. Geol.* 43, 619-626.
2. Balasubramaniam, K. S. (1970): A study of the formation of bauxites of Tungar Hill. *Basseion, Bombay. Geol. Bull. Indian Inst. Technol., Bombay* 1, 27-34.

3. Balasubramaniam, K. S., paropkari, A. L. (1975): Canadian mineralogist, vol. 13; 222-226.
4. Bates, T. F.-(1962): Halloysite and gibbsite formations in hawaii. Proc. Nat. Conf, clays clay minerals 9, 307-314.
5. Directorate of geology and mining, govt. Of maharashtra (1968): Bauxites, geology and mineral resources of maharashtra, 56-71.
6. D. V. Chitale (1986): Laterites, bauxites and associated clays from western, Ph. D. Thesis submitted to texas tech university.
7. Fox, C. S. (1923): The bauxite and aluminous lateritic occurrences in india. Mem. Geol. surv. India, pt. I, 49.
8. Goldschmidt, V. M. (1954): Geochemistry. Oxford univ. Press.
9. Gordon, M., jr. & Tracey, J. I. (1952): Origin of arkansas bauxite deposits. In problems of clay and laterite genesis. Aime. 12-34.
10. Loughnan, F. C. (1969): chemical weathering of silicate minerals, american elsevier, new york.
11. Libbey, F. W., Lowry, W. D. & Mason. R. S. (1946): Ferruginous bauxite deposits. econ. Geol. 41, 246-265.
12. Lyon, J. P. (1964): Infrared analysis of soil minerals. In soil clay mineralogy. Rich, c.i. & kunze, g. W., eds. Univ. N. Carolina press. Chapel hill, 170-200.
13. Mason, B. (1960): Principles of geochemistry. John wiley & sons, new york. 145-182.
14. Mcfarlane, M. J. (1971): Lateritization and landscape development in kyagwe uganda. Quart. J. Geol. Soc. London, 126, part 4, 507-537.
15. Oldham, R. D. (1893): Laterite. A manual of the geology of india. (2nd ed.), 369-390.
16. Sahasrabudhe, Y. S. (1964): The origin of the bauxite deposits of gujarat, india. In Advancing frontiers of geology and geophysics, m. S. Krishnan vol., hyderabad, 461- 480.
17. Valeton, Ida, (1972): bauxites. Development in soil science 1. Elsevier. Wealth of india series (1946): b-series, raw materials. C.s.i.r. publication, new delhi,1. 161-165.
18. Zalesskii, B. V. (1967): Physical and mechanical properties of rocks. Acad. Sci. Ussr, Moscow.

## UMP – TEST FOR MODERATE DISTRIBUTION USING MONOTONE LIKELIHOOD RATIO

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### ABSTRACT

In this paper, we have derived the estimate of monotone likelihood ratio technique. This technique will be used to obtain Uniformly Most Powerful (UMP) test for testing the mean of moderate distribution under the composite hypothesis. We have also obtained its power of the test. This finding is supported by example to test the mean and mean deviation under composite hypothesis. The derivation technique is fast, direct and less burdensome when compared to some existing methods.

**KEYWORDS:** Moderate Distribution, Monotone Likelihood Ratio, UMP – Test, Neyman – Pearson Lemma.

### INTRODUCTION

#### 1.1 MODERATE DISTRIBUTION

We know that when a probability distribution is dependent on a parameter, it is important to know the estimator of such parameter and properties of such estimator so that it is feasible to draw inference about this parameter when only sample information is available for the given population following that distribution.

The moderate distribution is nothing but modified normal distribution in which location parameter is mean but the scale parameter is replaced by the mean deviation. The estimation of mean deviation under normal distribution is concerned, Naik and Desai (2009) have suggested some estimators. In this chapter an attempt is made to study of drawing inference about mean deviation under moderate distribution. Estimators of mean deviation are proposed and their properties are studied under moderate distribution.

The p.d.f. of a distribution of a random variable X is defined as,

$$f(x) = \frac{1}{\pi\delta} e^{-\frac{1}{\pi}\left(\frac{x-\mu}{\delta}\right)^2}, -\infty < x < \infty, -\infty < \mu < \infty, \delta > 0 \quad (1.1.1)$$

Then, the random variable X may be said to be following **moderate distribution** with parameters  $\mu$  and  $\delta$  and may be denoted as  $X \sim M(\mu, \delta)$ .

It has been prove that,

$$(i) \quad \int_{-\infty}^{\infty} f(x) dx = 1 \quad (1.1.2)$$

$$(ii) \quad \text{Mean} = E(X) = \mu \quad (1.1.3)$$

$$(iii) \quad \text{Mean Deviation} = E[|X - \mu|] = \delta \quad (1.2.4)$$

$$(iv) \quad \text{Standard Deviation} = \sigma = \sqrt{\frac{\pi}{2}} \delta \quad (1.2.5)$$

$$(v) \quad \text{M.G.F.} = M_x(t) = e^{\mu t + \frac{\pi}{4} \delta^2 t^2} \quad (1.2.6)$$

$$(vi) \quad f(\mu - x) = f(\mu + x) \quad (1.2.7)$$

**NOTE:-** It may be noted that the relationship between  $\sigma$  and  $\delta$  is same as that in the normal distribution.

Thus, the distribution of a random variable  $X$  having p.d.f. as defined in (1.1.1) has location parameter as mean  $\mu$  and scale parameter as mean deviation  $\delta$ . Naik and Desai (2010) have introduced concept of  $r^{\text{th}}$  degree (order or level) dispersion and identify mean deviation and variance defined measures of first degree dispersion (FDD) and second degree dispersion respectively (SDD).

Suppose the FDD is fixed at constant 'K'. Then for mean  $\mu$  and FDD = K, the normal distribution is  $N(\mu, \sigma = K)$  and the moderate distribution is  $M(\mu, \delta = K)$ .

Further, for **normal distribution**

$$\delta = \sqrt{\frac{2}{\pi}} \sigma = \sqrt{\frac{2}{\pi}} K.$$

And for **moderate distribution**

$$\sigma = \sqrt{\frac{\pi}{2}} \delta = \sqrt{\frac{\pi}{2}} K.$$

Hence, corresponding to the values of  $\sigma$  and  $\delta$  in  $N(\mu, \sigma = K)$ , viz.

$$\sigma = K \text{ and } \delta = \sqrt{\frac{2}{\pi}} K,$$

in  $M(\mu, \delta = K)$  we get the values of  $\sigma$  and  $\delta$  as

$$\sigma = \sqrt{\frac{\pi}{2}} K \text{ and } \delta = K.$$

Therefore, for given value of first degree dispersion, the value of  $\delta$  and  $\sigma$  in moderate distribution are larger than their respective values in normal distribution ( $\sigma$  has increased from  $K$  to  $\sqrt{\frac{\pi}{2}} K$  and  $\delta$  has increased from  $\sqrt{\frac{2}{\pi}} K$  to  $K$ ).

Further, to explain the above fact more precisely, let us compare the standard normal distribution with standard moderate distribution.

Clearly, for taking  $\mu = 0$  and  $K = 1$ ,

$$\text{in } N(0, \sigma = 1) \text{ we get } \quad \sigma = 1 \text{ and } \delta = \sqrt{\frac{2}{\pi}}$$

and  $M(0, \delta = 1)$  we get  $\sigma = \sqrt{\frac{\pi}{2}}$  and  $\delta = 1$ .

Therefore, for standard moderate distribution, the values of  $\delta$  and  $\sigma$  are larger than their respective values in standard normal distribution ( $\sigma$  has increased from 1 to  $\sqrt{\frac{\pi}{2}}$  and  $\delta$  has increased from  $\sqrt{\frac{2}{\pi}}$  to 1), which means the FDD in  $M(0,1)$  is always relatively higher than in  $N(0,1)$ .

## 1.2 UNIFORMLY MOST POWERFUL (UMP) TEST

Fisher, R.A. (1922) explained “on the mathematical foundations of theoretical statistics”, in this pioneered modern frequentist statistics as a model-based approach to statistical implement anchored on the notion of a statistical model as

$$G \{g_v(z), z \in Z, \theta \in \Theta \subseteq R^d, \dim \Theta < Z\}$$

Fisher proposed to begin with pre-specified  $G$  as a hypothetical infinite population. He estimated the specification of  $G$  as a response to the question: what population is this a random sample? A mis-specified  $G$  would reduced any procedure relying on  $g_v(z)$  or the likelihood function. In 1955, Fisher, R.A. argued for inductive inference spearheaded by his significant testing, and in 1956, Neyman, J. argued for inductive behavior based on Neyman- Pearson testing. However, neither account gave a satisfactory answer to the canonical question.

Over the last three decades, Fisher’s specification problem has been recast in the form of model selection problems. The essential question, how could n infinite set of all possible a single statistical model? We consider a parametric family of densities and two hypotheses as  $H_0$  and  $H_1$ . When the domain of density is dependent on parameter, the theories for hypothesis testing and model selection have not developed. For the testing problem of type

$$H_0 : \theta \leq \theta_1 \text{ or } \theta \geq \theta_2 \text{ (} \theta_1 < \theta_2 \text{) against } H_1 : \theta_1 \leq \theta \leq \theta_2$$

We write the power function as  $\text{Pow}(\theta, d)$  to make its dependence on the decision function explicit.

**Definition:** A decision function  $d^*$  is a uniformly most powerful (UMP) decision function (or test) at significance level  $\alpha_0$  if

(1)  $\text{Pow}(\theta, d^*) \leq \alpha_0, \forall \theta \in \Omega_0$

(2) For every decision function  $d$  which satisfies (1), we have

$$\text{Pow}(\theta, d) \leq \text{Pow}(\theta, d^*), \forall \theta \in \Omega_1$$

If the alternative hypothesis is one-sided then they do for certain distributions and statistics. We proceed by defining the needed property on the population distribution and the statistic.

## 1.3 MONOTONE LIKELIHOOD RATIO

**Definition:** Let  $T = t(X_1, X_2, \dots, X_n)$  be a statistic. Let  $f(x_1, x_2, \dots, x_n | \theta)$  be the joint density of the random sample. We say that  $f(x_1, x_2, \dots, x_n | \theta)$  has a monotone likelihood ratio in the statistic  $T$  if for all  $\theta_1 = \theta_2$  the ratio

$$\frac{f(x_1, x_2, \dots, x_n | \theta_1)}{f(x_1, x_2, \dots, x_n | \theta_2)}$$

depends on  $x_1, x_2, \dots, x_n$  only through  $t(x_1, x_2, \dots, x_n)$  and the ratio is an increasing function of  $f(x_1, x_2, \dots, x_n)$ .

### 1. UMP-test for Mean of Moderate Distribution

A random sample of size  $n$  is taken from a moderate random variable  $X$  with unknown parameter  $\mu$  and  $\delta$ . Formulate  $H_0$  and  $H_1$  as follows.

$$H_0 : \mu = \mu_0$$

$$H_1 : \mu > \mu_0.$$

We would like to devise a UMP test for the above set of hypothesis. To do this, let us first devise a test for the following set of simple hypothesis where  $\mu_1 > \mu_0$ .

$$H_0 : \mu = \mu_0$$

$$H_1 : \mu = \mu_1 (> \mu_0)$$

Use of Neyman-Pearson Lemma to this set of simple hypothesis. Recall that the likelihood function evaluated at  $\mu$  is,

$$f(x_1, x_2, \dots, x_n | \mu) = \left(\frac{1}{\pi\delta}\right)^n \exp\left(-\frac{1}{\pi} \sum_{i=1}^n \left(\frac{x_i - \mu}{\delta}\right)^2\right)$$

Therefore, we will reject  $H_0$  if

$$\frac{f(x_1, x_2, \dots, x_n | \theta_1)}{f(x_1, x_2, \dots, x_n | \theta_2)} = \frac{\left(\frac{1}{\pi\delta}\right)^n \exp\left(-\frac{1}{\pi} \sum_{i=1}^n \left(\frac{x_i - \mu_0}{\delta}\right)^2\right)}{\left(\frac{1}{\pi\delta}\right)^n \exp\left(-\frac{1}{\pi} \sum_{i=1}^n \left(\frac{x_i - \mu_1}{\delta}\right)^2\right)} < \frac{1}{K}$$

Therefore, simplifying we reject  $H_0$  if

$$\exp\left(-\frac{1}{\pi\delta^2} (\sum_{i=1}^n (x_i - \mu_0)^2 - \sum_{i=1}^n (x_i - \mu_1)^2)\right) < \frac{1}{K_1}$$

Taking natural logarithms of both side,

$$\begin{aligned} -\frac{1}{\pi\delta^2} \left( \sum_{i=1}^n (x_i - \mu_0)^2 - \sum_{i=1}^n (x_i - \mu_1)^2 \right) &< \ln\left(\frac{1}{K_1}\right) \\ \left( \sum_{i=1}^n (x_i - \mu_0)^2 - \sum_{i=1}^n (x_i - \mu_1)^2 \right) &> -\pi\delta^2 \ln\left(\frac{1}{K_1}\right) \end{aligned}$$

Expanding the sums, we have that

$$\begin{aligned} \left( \sum_{i=1}^n x_i^2 \right) - 2n\bar{x}_n\mu_0 + n\mu_0^2 - \left( \sum_{i=1}^n x_i^2 \right) + 2n\bar{x}_n\mu_1 - n\mu_1^2 &> -\pi\delta^2 \ln\left(\frac{1}{K_1}\right) \\ 2n\bar{x}_n(\mu_1 - \mu_0) &> -\pi\delta^2 \ln\left(\frac{1}{K_1}\right) - n\mu_0^2 + n\mu_1^2 \end{aligned}$$

Therefore,  $\bar{x}_n > \frac{-\pi\delta^2 \ln\left(\frac{1}{K_1}\right) - n\mu_0^2 + n\mu_1^2}{2n(\mu_1 - \mu_0)} = K^*$ .

Thus, critical region has the form  $\bar{x}_n > K^*$ . If we choose that  $\alpha(\psi^*) = \alpha_0$ ,

$$\alpha_0 = \pi(\psi^*, \mu_0) = P(\bar{x}_n > K^* | \mu = \mu_0) = P\left(\frac{\bar{x}_n - \mu}{\delta/\sqrt{n}} > \frac{K^* - \mu}{\delta/\sqrt{n}}\right) = P\left(Z > \frac{K^* - \mu}{\delta/\sqrt{n}}\right)$$

Therefore,  $\frac{K^* - \mu}{\delta/\sqrt{n}} = Z\alpha_0$  or equivalently,  $K^* = \mu_0 + Z\alpha_0 \left(\frac{\delta}{\sqrt{n}}\right)$

Therefore, I have derived the form of the decision rule.

**2.1 Decision Rule:**

$$\text{Reject } H_0 \text{ if } \bar{x}_n > \mu_0 + Z\alpha_0 \left(\frac{\delta}{\sqrt{n}}\right) \quad (\text{or equivalently, } Z > Z\alpha_0)$$

Note that the decision rule does not depend on  $\mu_1$ . Therefore, any  $\mu_1 > \mu_0$  would result in the exactly the same critical region. Therefore, above decision rule constitutes an UMP test for the mean.

**2.2 Power of the Test:**

It can be easily calculated at  $\mu = \mu_1 (> \mu_0)$ , the power is calculated by,

$$\begin{aligned} \pi(\psi^*, \mu_1) &= P\left(\bar{x}_n > \mu_0 + Z\alpha_0 \left(\frac{\delta}{\sqrt{n}}\right) \mid \mu = \mu_1\right) \\ &= P\left(\frac{\bar{x}_n - \mu_1}{\left(\frac{\delta}{\sqrt{n}}\right)} > \frac{\mu_0 - \mu_1}{\left(\frac{\delta}{\sqrt{n}}\right)} + Z\alpha_0\right) \\ &= P\left(Z > \frac{\mu_0 - \mu_1}{\left(\frac{\delta}{\sqrt{n}}\right)} + Z\alpha_0\right) \\ &= 1 - \phi\left(\frac{\mu_0 - \mu_1}{\left(\frac{\delta}{\sqrt{n}}\right)} + Z\alpha_0\right) \end{aligned}$$

Therefore,  $\beta(\psi^*) = \phi\left(\frac{\mu_0 - \mu_1}{\left(\frac{\delta}{\sqrt{n}}\right)} + Z\alpha_0\right)$ .

Notice that when  $\mu_1 = \mu_0$ , the power is

$$1 - \phi\left(\frac{\mu_0 - \mu_1}{\left(\frac{\delta}{\sqrt{n}}\right)} + Z\alpha_0\right) = 1 - \phi(Z\alpha_0) = 1 - (1 - \alpha_0) = \alpha_0 = \alpha(\psi^*)$$

As expected of result for critical region.

**Example:-1** Let  $X_1, X_2, \dots, X_n$ , be a random sample of from  $M(\theta,1)$ , then find the UMP test for testing  $H_0: \theta = 0$  against  $H_1: \theta > 0$ .

Solution :

$H_0: \theta = 0$  against  $H_1: \theta > 0$ , we want to find a UMP test. Here  $H_0$  is simple and  $H_1$  is composite.

Consider a specific alternative hypothesis  $H_1: \theta = \theta_0 > 0$ . Then an application of Neyman – Pearson lemma to test  $H_0: \theta = 0$  against  $H_1: \theta = \theta_0$  gives

$$\begin{aligned} L(\theta | \underline{x}) &= \frac{1}{\pi\delta} e^{-\frac{1}{\pi\delta^2}(x_1 - \mu)^2} \times \frac{1}{\pi\delta} e^{-\frac{1}{\pi\delta^2}(x_2 - \mu)^2} \times \frac{1}{\pi\delta} e^{-\frac{1}{\pi\delta^2}(x_3 - \mu)^2} \times \dots \times \frac{1}{\pi\delta} e^{-\frac{1}{\pi\delta^2}(x_n - \mu)^2} \\ L(\theta | \underline{x}) &= \left(\frac{1}{\pi\delta}\right)^n e^{-\frac{1}{\pi\delta^2}\sum (x_i - \mu)^2} \end{aligned}$$

$$\frac{L(\theta = 0 | \underline{x})}{L(\theta = \theta_0 | \underline{x})} = \frac{\left(\frac{1}{\pi\delta}\right)^n e^{-\frac{1}{\pi\delta^2}\sum (x_i - 0)^2}}{\left(\frac{1}{\pi\delta_0}\right)^n e^{-\frac{1}{\pi\delta_0^2}\sum (x_i - \theta_0)^2}} \leq K$$

$$\frac{L(\theta = 0 | \underline{x})}{L(\theta = \theta_0 | \underline{x})} = \frac{e^{-\frac{1}{\pi\delta^2}\sum (x_i)^2}}{e^{-\frac{1}{\pi\delta_0^2}\sum (x_i - \theta_0)^2}} \leq K$$

$$\frac{L(\theta = 0 | \underline{x})}{L(\theta = \theta_0 | \underline{x})} = e^{-\frac{1}{\pi\delta^2}\sum (x_i)^2 + \frac{1}{\pi\delta_0^2}\sum (x_i - \theta_0)^2} \leq K$$

$$\frac{L(\theta = 0 | \underline{x})}{L(\theta = \theta_0 | \underline{x})} = \frac{1}{e^{\pi\delta^2\sum (\theta^2 - 2x_i\theta_0)}} \leq K$$

$$\ln \left\{ \frac{L(\theta=0 | \underline{x})}{L(\theta=\theta_0 | \underline{x})} \right\} = \ln \left\{ e^{\frac{1}{\pi\delta^2}\sum (\theta^2 - 2x_i\theta_0)} \right\} \leq \ln K$$

$$\frac{1}{\pi\delta^2}\sum (\theta^2 - 2x_i\theta_0) \ln e \leq \ln K$$

$$\sum (\theta^2 - 2x_i\theta_0) \ln e \leq \pi\delta^2 \ln K$$

$$-2\theta_0 \sum (x_i) \leq \pi\delta^2 \ln K - n\theta_0^2 = K^*$$

$$\sum (x_i) \geq \frac{K^*}{-2\theta_0} = C_1$$

$$\frac{1}{n}\sum (x_i) \geq \frac{C_1}{n} \Rightarrow \bar{x} \geq C \text{ Where } C = \frac{C_1}{n}$$

Where C is determined such that  $P(\bar{x} \geq C | \theta = 0)$  and not by  $\theta_0$  in  $H_1$  (hence independent of  $\theta_0$ ) and the critical region will be the same if we had selected another value of  $\theta = \theta_1 > 0$ . Therefore the test given by  $\bar{x} \geq C$  is a UMP - test .

**Example:-2** Let  $X_1, X_2, \dots, X_n$ , be a random sample of from  $M(0, \delta)$ , then find the UMP test for testing  $H_0: \delta = 1$  against  $H_1: \delta > 1$ .

Solution:

Consider a particular simple alternative hypothesis  $H_1: \delta = \delta_0 > 1$ . Then the Most Powerful Test (MPT) for testing  $H_0$  against is given by,

$$L(\theta | \underline{x}) = \frac{1}{\pi\delta} e^{-\frac{1}{\pi\delta^2}(x_1 - \mu)^2} \times \frac{1}{\pi\delta} e^{-\frac{1}{\pi\delta^2}(x_2 - \mu)^2} \times \frac{1}{\pi\delta} e^{-\frac{1}{\pi\delta^2}(x_3 - \mu)^2} \times \dots \times \frac{1}{\pi\delta} e^{-\frac{1}{\pi\delta^2}(x_n - \mu)^2}$$

$$L(\theta | \underline{x}) = \left(\frac{1}{\pi\delta}\right)^n e^{-\frac{1}{\pi\delta^2}\sum (x_i - \mu)^2}$$

$$\frac{L(\delta = 1 | \underline{x})}{L(\delta = \delta_0 | \underline{x})} = \frac{\left(\frac{1}{\pi}\right)^n e^{-\frac{1}{\pi}\sum (x_i - 0)^2}}{\left(\frac{1}{\pi\delta_0}\right)^n e^{-\frac{1}{\pi\delta_0^2}\sum (x_i - 0)^2}} \leq K$$

$$\frac{L(\delta = 1 | \underline{x})}{L(\delta = \delta_0 | \underline{x})} = \delta_0^n e^{-\frac{1}{\pi}\sum (x_i)^2 + \frac{1}{\pi\delta_0^2}\sum (x_i)^2} \leq K$$

Taking natural log on both side



$$\begin{aligned} \ln \left\{ \frac{L(\delta = 1 | \underline{x})}{L(\delta = \delta_0 | \underline{x})} \right\} &= \ln \left\{ \delta_0^n e^{-\frac{1}{\pi} \sum (x_i)^2 + \frac{1}{\pi \delta_0^2} \sum (x_i)^2} \right\} \leq \ln K \\ \ln \left\{ \frac{L(\delta = 1 | \underline{x})}{L(\delta = \delta_0 | \underline{x})} \right\} &= \ln \delta_0^n + \ln \left\{ e^{-\frac{1}{\pi} \sum (x_i)^2 + \frac{1}{\pi \delta_0^2} \sum (x_i)^2} \right\} \leq \ln K \\ \ln \left\{ \frac{L(\delta = 1 | \underline{x})}{L(\delta = \delta_0 | \underline{x})} \right\} &= \ln \delta_0^n - \frac{1}{\pi} \sum (x_i)^2 + \frac{1}{\pi \delta_0^2} \sum (x_i)^2 \leq \ln K \\ \ln \left\{ \frac{L(\delta = 1 | \underline{x})}{L(\delta = \delta_0 | \underline{x})} \right\} &= -\frac{1}{\pi} \sum (x_i)^2 + \frac{1}{\pi \delta_0^2} \sum (x_i)^2 \leq \ln K - \ln \delta_0^n = \ln \left( \frac{K}{\delta_0^n} \right) \\ \ln \left\{ \frac{L(\delta = 1 | \underline{x})}{L(\delta = \delta_0 | \underline{x})} \right\} &= -\frac{1}{\pi} \sum (x_i)^2 + \frac{1}{\pi \delta_0^2} \sum (x_i)^2 \leq K_1 \quad \text{where } K_1 \ln \left( \frac{K}{\delta_0^n} \right) \\ \ln \left\{ \frac{L(\delta = 1 | \underline{x})}{L(\delta = \delta_0 | \underline{x})} \right\} &= -\sum (x_i)^2 + \frac{1}{\delta_0^2} \sum (x_i)^2 \leq \pi K_1 \\ \ln \left\{ \frac{L(\delta = 1 | \underline{x})}{L(\delta = \delta_0 | \underline{x})} \right\} &= -\delta_0^2 \sum (x_i)^2 + \sum (x_i)^2 \leq \pi \delta_0^2 K_1 \\ \ln \left\{ \frac{L(\delta = 1 | \underline{x})}{L(\delta = \delta_0 | \underline{x})} \right\} &= \sum (x_i)^2 (\delta_0^2 - 1) \geq -\pi \delta_0^2 K_1 \\ \ln \left\{ \frac{L(\delta = 1 | \underline{x})}{L(\delta = \delta_0 | \underline{x})} \right\} &= \sum (x_i)^2 \geq \frac{-\pi \delta_0^2 K_1}{(\delta_0^2 - 1)} = C \\ \therefore \sum (x_i)^2 &\geq C \\ \text{where } C &= \frac{-\pi \delta_0^2 K_1}{(\delta_0^2 - 1)} \end{aligned}$$

## RESULT

Observe that as long as  $\delta_0 > 1$  the MPT will remain the same for each simple alternative hypothesis  $H_1: \delta = \Sigma x_i^2 \geq C$  where  $C$  is determined once  $\alpha$ , the probability of type - 1 error, is specified, and independent of  $\delta_0$ . Thus,  $P(\Sigma x_i^2 \geq C | H_0 \text{ is true}) = \alpha$ . Since the critical region is independent of  $\delta_0$ , the test obtained here is UMP test. If we were testing

$H_0: \delta = 1$  against  $H_1: \delta > 1$ , it can be verified that the corresponding UMP - test is  $\Sigma x_i^2 \geq C$

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## REFERENCES

1. Fisher, R.A. (1922), " On the mathematical foundations of theoretical statistics", Philosophical Transactions of the Royal Society Vol. A, No.222. pp. 309-368.
2. Fisher, R.A. (1955), " Statistical Methods and Scientific Induction", Journal of the Royal Statistical Society, (1989), Vol B, No. 17, pp.69-78.
3. Lehman, E.L., (1986). " Testing Statistical Hypotheses" New York, John Wiley, II edition.

4. Neyman, J. (1956), " Note on an article by Sir Ronald Fisher", *Journal of the Royal Statistical Society*, Vol. B, No. 18, pp. 288-294.
5. Sayyareh, A., Barmalzan G., and Haidari, A, (2011)m " Two sided Uniformly Most Powerful Test for Pitman Family", *Applied Mathematical Sciences* Vol.5, No.74, pp. 3649-3660.
6. Vuong, Q.H. (1989), " Likelihood Ratio Tests for Model Selection and Non-Nested Hypotheses", *Econometrica*, Vol.57m No.2, pp. 307-333.
7. Casella, G.; Berger, R.L. (2008), *Statistical Inference*
8. Barnett, V. and Lewis, T. (1978), "Outlier in Statistical data", Chichester: John Wiley and Sons.
9. Biswas S. (1992), "Topics in Statistical Methodology", New Delhi: Wiley Eastern Limited.
10. Johnson, N.L. and Kotz, S.(1970), " Distribution in Statistics: Continuous Univariate Distribution", Vol.2 New York: John Wiley and Sons.
11. Naik, V.D. and Desai J.J.(2004), " Choosing a dispersion statistics for assessment of dispersion about known mean of normal population", *Journal of Veer Narmad South Gujarat University*, Vol.II B Science, 140-148.
12. Naik, V.D. and Desai J.M.(2009), " A Review of Debate on Mean Deviation Versus Standard Deviation and Comparative Study of Four Estimators (Including Two Proposed Unbiased Estimators) of Mean Deviation of Normal Population", *VNSGU Journal of Science Technology*, Vol. I, Issue-II, 220-229.
13. Naik, V.D. and Desai J.M.(2010), "Some more reasons for preferring Mean Deviation over Standard Deviation for drawing inference about first degree dispersion in numerical data", *VNSGU Journal of Science & Technology*,( Accepted for Publication in December 2010 Issue).
14. Patel, Kapadia and Owen (1976), " Handbook of Statistical Distribution, Statistics", Textbooks and Monographs Vol. 20, New York: Marcel Dekker Inc.
15. Patel, J.K. and Read, C.B. (1982), "Handbook of the Normal Distribution, Statistics", Textbooks and Monographs Vol.40, New York: Marcel Dekker Inc.

## **USE OF SPREAD SHEET IN .NET**

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### **ABSTRACT**

Far Point Spread from GrapeCity is a suite of Microsoft Excel-compatible spreadsheet components available for .NET, COM, and Microsoft BizTalk Server. Using Spread you can quickly create powerful database front-ends, easily manage the display and entry of up to two billion items, print flexible reports, perform complex calculations, read and write files, sort data, or simply take advantage of its unsurpassed cell-level formatting. It have more flexible and powerful features than data grid view.

**KEYWORDS:** .Net, Farpoint Spread

### **INTRODUCTION**

From Grape City is a suite of Microsoft Excel-compatible spreadsheet components available for .NET, COM, and Microsoft BizTalk Server.

Using Spread you can quickly create powerful database front-ends, easily manage the display and entry of up to two billion items, print flexible reports, perform complex calculations, read and write files, sort data, or simply take advantage of its unsurpassed cell-level formatting.

#### **System Requirements**

To run Spread, you need:

- An Intel® Pentium® system or later, or equivalent
- 32 MB of memory (minimum)
- a VGA card with support for 256 colors or better
- a CD-ROM or setup program for install and
- 22 MB of hard disk space (full install)

Depending on which control you use, you also need to use the following operating system and development environment.

<b>Control</b>	<b>Required Operating System and Development Environment</b>
32-bit ANSI DLL	Microsoft Windows NT® 4 SP3 or later, Windows 98, Windows 2000, Windows Millennium Edition, Windows Vista, or Windows XP; Microsoft Visual C++® 6 or later
32-bit Unicode DLL	Microsoft Windows NT® 4 SP3 or later, Windows 2000, Windows Vista, or Windows XP; Microsoft Visual C++® 6 or later
ADO Unicode ActiveX	Microsoft Windows NT® 4 SP3 or later, Windows 2000, Windows Vista, or Windows XP; Microsoft Visual Basic® 6 or later or Microsoft Visual C++ 6 or later
ADO ActiveX	Microsoft Windows NT® 4 SP3 or later, Windows 98, Windows 2000, Windows Millennium Edition, Windows Vista, or Windows XP; Microsoft Visual Basic 6 or later or Microsoft Visual C++ 6 or later

**Versions:**

- Spread for Windows Forms: 5.0
- Spread for Web Forms: 5.0
- Spread COM: 8.0
- Spread for BizTalk: 3.0

**1.1. Features of spread sheet:**

- **Predefined cell types, including:**
  - I. currency
  - II. date time
  - III. number
  - IV. percent
  - V. regular expression
  - VI. button
  - VII. check box
  - VIII. combo box
  - IX. hyperlink
  - X. image
- **Formula support, including:**
  - I. cross-sheet referencing
  - II. over 300 built-in functions
- **Import and export:**

- I. import to Microsoft Excel-compatible files
  - II. export to Microsoft Excel-compatible files
  - III. export to HTML files
  - IV. export to XML files
- **Design-time spreadsheet designer**
  - **Data-binding with customizable options**
  - **Hierarchical data views, with parent rows and child views**
  - **Grouping of rows or columns**
  - **Sorting by row or column on multiple keys**
  - **Cell spanning**

#### **Multiple row and column headers**

- **Bound and unbound modes**

### **1.2 When to use a Spreadsheet?**

Whenever NUMERICAL data requires like

#### **1. Calculation:**

Which may be complex, repetitive, or both.

#### **2. Presentation:**

In tabular and/or graphical format.

#### **3. Analysis:**

Of complex situations.

#### **4.Exploration**

Of probable outcomes.

### 1.3 A 'typical' Spread sheet:

The diagram shows a spreadsheet grid with the following data:

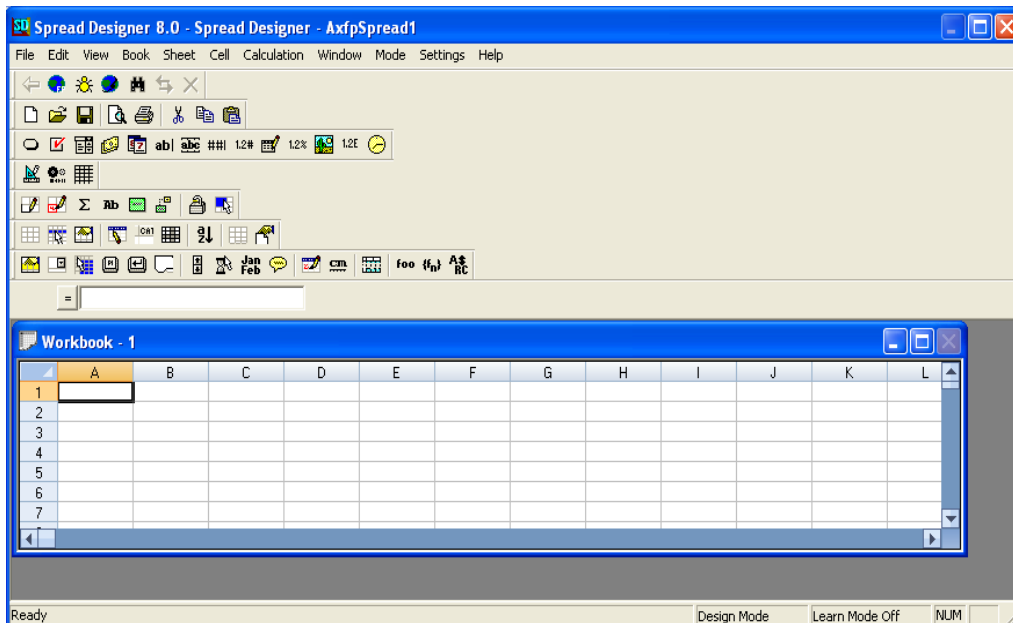
	A	B	C	D
1	R&D Cost	2003	2004	2005
2				
3	Rent	2360	2460	2560
4	Travel	800	900	
5	Personnel	5000	6800	
6	TOTAL	8160	10160	

Labels and arrows in the diagram point to: Cell Reference (B6), Formula (=SUM(B3:B5)), Range (B3:B5), Columns (A, B, C, D), Text (Rent, Travel), Rows (1, 2, 3, 4, 5, 6), Cell (8160), and Numbers (2360, 2460, 2560, 800, 900, 5000, 6800, 8160, 10160).

### 2.1 How To Apply In .Net ?

- i. Install FarPoint Setup.
- ii. Add tab in Toolbox.
- iii. Choose Toolbox Items.
- iv. Select Com Components and select FarPoint Spread.
- v. Drag and Drop FarPoint on form.
- vi. Right Click on spread and select ActiveX-spread designer.

### 2.2 Spread Designer:-



Using farpoint spread in .NET we can develop any kind of software. spread sheet is very powerful , easy and less code than use of DataGridView .It is Fast and efficient and Automatically recalculates.ItProvides multiple ways to implement state management in ASP. Net.

Example:

You can use any language in spreadsheet.

अ.न.	खता नं.	खतावधी नाव	रक्कम	रुचल तारीख	हापे
१५३	३०३	समासद म्हैस कर्ज	४०००.००	२६/०२/२०१५	५

वर्ग	जमा	जमा वर्ग	नावे	नावे वर्ग
समासद म्हैस कर्ज	२०००.००			
कर्जावरील प्राप्त व्याज	१०२.००			

तारीख	अ.तारीख	हाप्या रक्कम	व्याज	दिवस	व्याज रक्कम	रक्कम	द.व्याज	दंडाचे दिवस	दंडाची रक्कम	एकूण रक्कम	फरक	हापे प्रता
१	२६/०२/२०१५	२२/०२/२०१६	०.००	१५	५०							<input type="checkbox"/>
२	२२/०२/२०१६	२२/०२/२०१६	१०००.००	१५	५०	६	१०२.००			१०९०२.००		<input checked="" type="checkbox"/>
३	२२/०२/२०१६	२२/०२/२०१६	१०००.००	१५	५०							<input type="checkbox"/>
४	२२/०२/२०१६	२२/०२/२०१६	१०००.००	१५	५०							<input type="checkbox"/>
५	२२/०२/२०१६	२२/०२/२०१६	१०००.००	१५	५०							<input type="checkbox"/>

Sample Code of using spread sheet in .NET

`PrivateSub LoadSpreadSheet()`

`Dim i As Integer`

`Dim VarHeading_No, VarHeading_name, VarPatrakNo, varmember_name,`

`varJamaRs, varNaveRs, Bid`

`VarHeading_name = Nothing`

`varmember_name = Nothing`

`varJamaRs = Nothing`

`varNaveRs = Nothing`

`VarHeading_No = Nothing`

`Bid = Nothing`

`VarPatrakNo = Nothing`

`VarPatrakNo = Val(txtpatrakNo.Text)`

`VarHeading_No = Val(txtKhatNo.Text)`

`VarHeading_name = cmbpatrakname.Text`

```
varmember_name = txtSabhasadName.Text
varJamaRs = Val(txtTotalAmount.Text)
BIId = Val(lblBIId.Text)
i = AxfpSpread1.ActiveRow
AxfpSpread1.SetInteger(1, i, VarHeading_No)
AxfpSpread1.SetText(2, i, varmember_name)
If txtJamaNave.Text = 1 Then
    AxfpSpread1.SetText(3, i, VarHeading_name)
    AxfpSpread1.SetFloat(4, i, varJamaRs)
Else
    AxfpSpread1.SetInteger(7, 1, VarPatrakNo)
    AxfpSpread1.SetInteger(5, 1, VarHeading_No)
    AxfpSpread1.SetText(8, 1, VarHeading_name)
    AxfpSpread1.SetFloat(9, i, varJamaRs)
Dim Per, BankRs AsDouble
Per = (varJamaRs) * 5 / 100
lbltest.Text = Per
BankRs = varJamaRs - Per
lblBankRs.Text = BankRs
AxfpSpread1.SetFloat(5, 1, BankRs)
AxfpSpread1.SetText(4, 1, (lblBank.Text).ToString)
AxfpSpread1.SetInteger(3, 2, 1)
AxfpSpread1.SetInteger(3, 1, BIId)
AxfpSpread1.SetFloat(5, 2, Per)
AxfpSpread1.SetText(4, 2, (Label11.Text).ToString)
AxfpSpread1.SetInteger(6, 1, VarHeading_No)
EndIf
EndSub
```



## **WIRELESS SENSOR NETWORK FOR AGRICULTURAL ENVIRONMENT TO CONTROL THE DRIP IRRIGATION**

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### **ABSTRACT**

In the field of agriculture, use of proper method of irrigation is important and it is well known that irrigation by drip is very economical and efficient. In the conventional water management system, the farmer has to keep watch on the irrigation timetable, which is different for different crops. This project defines the implementation of an internet driven intelligent and completely automated water management system. The software and hardware combined together to provide a very advanced control over the currently implemented manual drip irrigation system. Microcontroller and PC based software is used to interface the board and control the valve ON/OFF timings. The software is capable to downloading the ON/OFF timings for drips from websites hosted by agricultural universities. Farmers can get instant assistance from universities to change the drip ON/OFF timings based on current climate, soil condition, fertilizers used, etc. The microcontroller based unit can operate in standalone mode since and only needs to be connected shortly to the PC in order to download the new values of valve ON/OFF timings. A software module will also be designed for agricultural universities to upload the drip ON/OFF timings for particular farm layout. The Wireless Sensor Network for Agriculture is an innovation of improving current water irrigation system. The scopes of this project consist of hardware and software. The basic idea is to provide user-controller of the hardware receiver board from the transmitter board that contains sensors that will send current condition of the plant to the receiver.

**KEYWORDS:** ATmega-32 Microcontroller, Drip Irrigation, Light Sensor (LDR), Wireless Sensor Nodes

### **INTRODUCTION**

It has been ten years since drip irrigation was introduced in California to be used on commercial agricultural crops. The initial work was started in an avocado orchard in San Diego County, and from this small five-acre experimental orchard the acreage has increased tremendously. Many crops are under test with drip irrigation. Equipment used in drip irrigation systems is very important. There are many pieces

of equipment required. They include plastic hose or pipe, spaghetti hose, emitters, pressure regulators, pressure gauges, valves, fertilizer tanks, filters — both sand and screen, time clocks, Tensiometer, evaporative pans, meters, and fertilizer injectors. One of the most important items in the hardware for drip irrigation systems is the filter. An automated management of greenhouse brings about precise control needed to provide the most proper condition of plant growth. The five most important parameters to consider when creating drip irrigation are humidity, temperature, ground water, carbon dioxide, light intensity [6].

this paper an advance microcontroller LM3S5T36 which is 32-bit ARM® Cortex™-M3 with features of 32kb single flash memory, 12kb RAM and three 32 bit timers and two 10 bit analog to digital converter is used. A timer for the automation of drip irrigation is set, which works accordingly to the sensors and combining all this features the flow of water in fields will be automatically controlled rather than manually. It also contains the temperature and moisture sensor.

Sensors are installed in the root zone at the undisturbed soil. The soil moisture sensor is a sensor connected to an irrigation system controller that measures soil moisture content in the active root zone. Soil moisture sensor can reduce irrigation application by 50%. Water saving have been measured between 5% to 88% over typical timer - base irrigation system. Sensors are placed at least 5 ft from the downspouts for avoiding the high moisture areas. Tensiometer can be used as the moisture sensor to detect moisture contents of soil. The sensor will not be damaged by temperatures as low as -40°C (-40°F); it is safe to leave the sensor in the ground year-round for permanent installation. These sensors are buried in the ground at required depth. Once the soil has reached desired moisture level the sensors send a signal to the micro controller to turn off the relays, which control the valves. RTD like PT 100 can be used as the temperature sensor. [7]

### **WHY TO USE DRIP IRRIGATION?**

- It's easy to install and simple to use
- Fertilize the plants directly through drip system
- Save 20 - 80% of water and fertilizer bills
- Control weed growth by watering only where it need
- Each plant can be watered individually
- Protect the property from erosion
- Reduce snail population
- Have healthier, faster-growing plants

### **OBJECTIVES**

- Resource Optimization in Water Management System for agricultural sector.
- To Provide the Decision Support System for Water Management System.
- To save the water, energy and man power in the agriculture sector.
- To design, build and test the system which will be economical, efficient and effort reducing of the farmer.

## LITERATURE SURVEY

### 4.1 Design of Micro controller Based Drip Irrigation System

The key elements that should be considered while designing a mechanical model:-

**a) Flow:-**You can measure the output of your water supply with a one or five gallon bucket and a stopwatch. Time how long it takes to fill the bucket and use that number to calculate how much water is available per hour. Gallons per minute x 60=number of gallons per hour.

**b) Pressure (The force pushing the flow):-**Most products operate best between 20 and 40 pounds of pressure. Normal household pressure is 40-50 pounds.

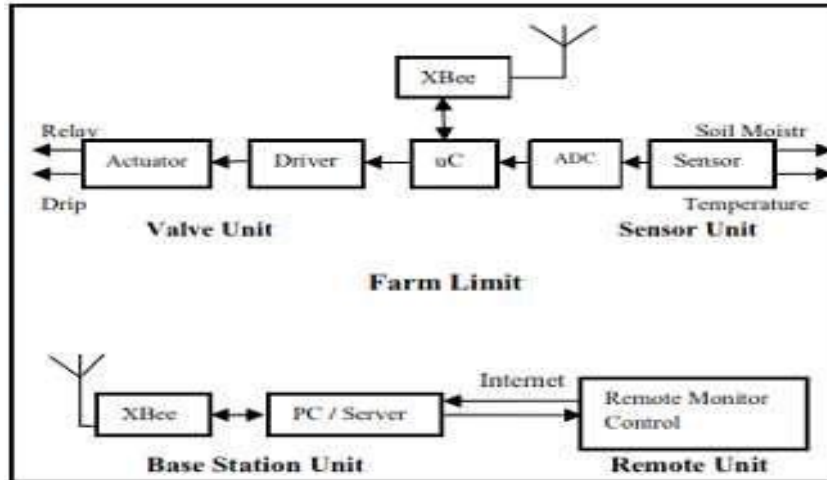
**c) Water Supply & Quality:** - City and well water are easy to filter for drip irrigation systems. Pond, ditch and some well water have special filtering needs. The quality and source of water will dictate the type of filter necessary for your system.

**d) Soil Type and Root Structure:** - The soil type will dictate how a regular drip of water on one spot will spread. Sandy soil requires closer emitter spacing as water percolates vertically at a fast rate and slower horizontally. With a clay soil water tends to spread horizontally, giving a wide distribution pattern. Emitters can be spaced further apart with clay type soil. A loamy type soil will produce a more even percolation dispersion of water. Deep -rooted plants can handle a wider spacing of emitters, while shallow rooted plants are most efficiently watered slowly (low gph emitters) with emitters spaced close together.

**e) Timing:** - Watering in a regular scheduled cycle is essential. On clay soil or hillsides, short cycles repeated frequently work best to prevent runoff, erosion and wasted water. In sandy soils, slow watering using low output emitters is recommended. Timers help prevent the too-dry/too-wet cycles that stress plants and retard their growth. They also allow for watering at optimum times such as early morning or late evening.

**f) Watering Needs:** - Plants with different water needs may require their own watering circuits. For example, orchards that get watered weekly need a different circuit than a garden that gets watered daily. Plants that are drought tolerant will need to be watered differently than plants requiring a lot of water.

The below is the system architecture for the automation of the drip irrigation. From Figure 1 it can see that the sensors send the signal to the microcontroller here in this there is an inbuilt timer and PC is used to display the readings. From microcontroller it sends to the water pump and from there it goes to the irrigation lines.



**Figure 1: Block Diagram**

#### **4.2 Concept of Modern Irrigation System**

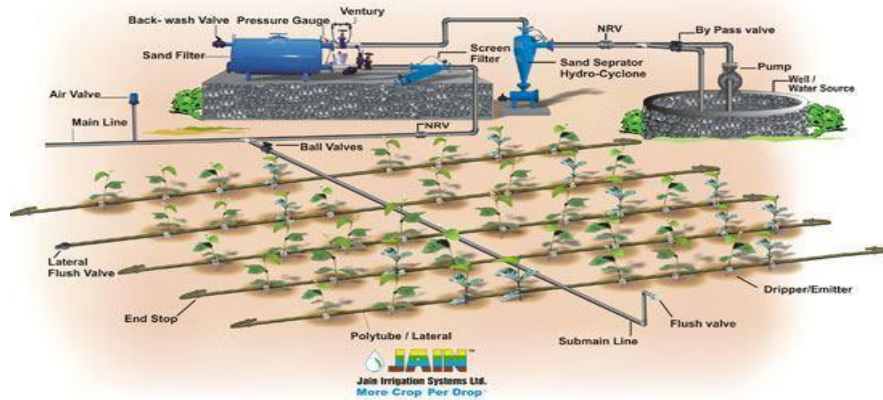
The conventional irrigation methods like overhead sprinklers, flood type feeding systems usually wet the lower leaves and stem of the plants. The entire soil surface is saturated and often stays wet long after irrigation is completed. Such condition promotes infections by leaf mold fungi. The flood type methods consume large amount of water and the area between crop rows remains dry and receives moisture only from incidental rainfall. Water is supplied frequently, often daily to maintain favorable soil moisture condition and prevent moisture stress in the plant with proper use of water resources.



**Figure 2: Drip Irrigation**

Drip irrigation requires about half of the water needed by sprinkler or surface irrigation. Lower operating pressures and flow rates result in reduced energy costs. A higher degree of water control is attainable. Plants can be supplied with more precise amounts of water. Disease and insect damage is reduced

because plant foliage stays dry. Operating cost is usually reduced. Federations may continue during the irrigation process because rows between plants remain dry. Fertilizers can be applied through this type of system. This can result in a reduction of fertilizer and fertilizer costs. When compared with overhead sprinkler systems, drip irrigation leads to less soil and wind erosion. Drip irrigation can be applied under a wide range of field conditions. A typical Drip irrigation assembly is shown in Figure (3) below. Drip irrigation is popular because it can increase yields and decrease both water requirements and labor.



**Figure 3: Typical Drip Irrigation**

#### **4.3 Components of Microcontroller Drip Irrigation**

The components of micro controller based drip irrigation system [1] are as follows:-

- I) Pump
- II) Water Filter
- III) Flow Meter
- IV) Control Valve
- V) Chemical Injection Unit
- VI) Drip lines with Emitters
- VII) Moisture and Temperature Sensors.
- VIII) Micro controller Unit (The Heart of the system).

## **METHODOLOGY**

### **5.1 Use of Linear Programming in System:**

Linear programming (LP or linear optimization) is a mathematical method for determining a way to achieve the best outcome (such as maximum profit or lowest cost) in a given mathematical model for some list of requirements represented as linear relationships. Linear programming is a specific case of mathematical programming (mathematical optimization).

- To evaluate control parameters like how much total water we have and what quantities of different crops must be used to give optimum throughput (production).
- E.g. How to divide drip water timings in order to attain best possible throughput.

### 5.2 Use of Interpolation in System:

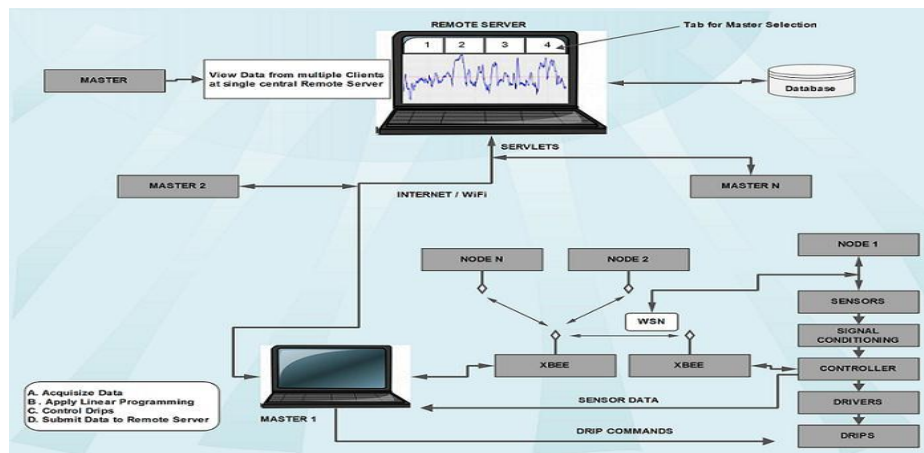
To map the physical parameter readings for areas in farm where taking manual readings is not possible. E.g. If we have a reading at 1 point and then directly at 2nd point 25 meters away. Then we shall interpolate the values for points at every meter between the two measured points

**Interpolation:** - Interpolation is a method of constructing new data points within the range of a discrete set of known data points.

**Extrapolation:** - The term extrapolation is used if we want to find data points outside the range of known data points

## SYSTEM ARCHITECTURE AND WORKING

The aim is to design Intelligent Irrigation System Using Linear Programming. This system must be able to control the Valve timings of drips automatically based on pre-programmed timings. The time intervals for all the Valves can be fed into PC for an entire week or month. Regional language based GUI must be developed so that novice users must be able to feed in the timings or program the hardware. An ADC connected to micro controller must gather the humidity values for soil at various points. These values must be visualized in software using 3D plots to assist the user in deciding valve timings



**Figure 5: True Drip Irrigation System**

In this system Computer Can read the ADC values also receives sensor data and on the basis of ADC values and Sensor data we can apply linear programming in order to generate optimum watering plan i.e. Minimum Water → Maximum Productivity → Maximum Profit. On the basis of values that we have read from ADC and Sensor we can easily apply linear programming in order to generate optimum watering plan through which we can generate drip control commands and later on we transmit that drip commands to the

Hardware Device. Hardware device is totally operated on wireless network. i.e. Computer can communicate with hardware device through WSN.

#### **ALGORITHMS INVOLVED IN WIRELESS SENSOR NETWORK FOR AGRICULTURAL ENVIRONMENT SENSING**

In this system there are three Main Algorithms

- 1) Master Side Algorithm
- 2) Node Side Algorithm
- 3) Remote Side Algorithm

The algorithms are as follows

##### **Master Side Algorithm**

- 1) Start
- 2) Initialize  $i=1$
- 3) Select Xbee Node  $i$
- 4) Send Address
- 5) Send ADC Read Command
- 6) Read Sensor Value at Node  $i$
- 7)  $i=i+1$
- 8) Repeat steps 3 to 7 for all Nodes.
- 9) Evaluate sensor values
- 10) Apply Linear Programming
- 11) Generate control data
- 12) Send Xbee Address
- 13) Send H/W relay/pump control command
- 14) Submit log to Remote Server.
- 15) Goto step 2

##### **Node Side Algorithm**

- 1) Initialize Micro-Controller
- 2) Read Self Address
- 3) Wait for XBee Command
- 4) Read Xbee Command
- 5) If ADC Command, read ADC value send back to Xbee  
Else if DEVICE Command Control Drips. End
- 6) Goto step 3

### **Remote Side Algorithm**

- 1) Start
- 2) Initialize Server (Tomcat Apache)
- 3) Wait for Client request
- 4) Read client request
- 5) Read latest submitted drip data
- 6) Send data to client as response
- 7) Goto step 3

These are the main algorithms on which my system runs.

## **RESULTS AND DISCUSSION**

The working of my project in real time environment is as shown in below.

Here in Figure 6 shown below that get control by using soil moisture sensor, temperature sensor and light sensor. That means drip it will be getting ON and OFF on the soil moistures sensors reading, if soil moisture is below pre-setted threshold value in that case Water pump it will get ON and also respective Drip or Valve is get ON and release particular amount of water to the soil. Once soil reaches to its presetted moisture level then the Valve as well as Water Pump will OF automatically. Apart from that have combine temperature sensor and light sensor. If temperature of the air t will get increases and it exceed the pre-setted limit of threshold values at that time automatically Fans will be get ON, it temperature remains below the threshold values at that time Fan Remains OFF. Also if light intensity is below the threshold values at that time bulb will ON automatically and if it equal or above the threshold value at that time bulb remains OFF. When this system is get used in control environment then we get all the results from this system. But when this system is get used in uncontrolled environment then it works as usual but by using linear programming though it will be get used in uncontrolled environment it water distribution will done properly.



**Figure 6:- Execution of the project in the Bajara field**



Thereafter have recorded temperature and light readings on ordinary day in the Farm, also I have tested my system for different crops like Bajara, groundnuts fields it works efficiently and effectively.

All the recorded readings are as shown in table below.

**Table 1: Live Readings (Recorded Reading on Ordinary Day)**

Time	Temperature		Soil Moisture		Light	
	Node 1	Node 2	Node 1	Node 2	Node 1	Node 2
09:30	25.1	24.3	64.1	65.4	114.8	115.1
10:00	25.8	24.9	64.3	64	117.8	118.1
10:30	33.5	32.9	63.5	62.7	120.5	120.4
11:30	31.6	30.9	62.9	62.8	123.3	123.7
12:30	28.3	28.1	61.3	61.6	128.0	127.5
01:00	32.3	32.1	60.5	60.8	128.0	128.0
01:30	34.8	34.6	59.2	59.1	128.0	128.0
02:30	30.9	30.5	58.6	58.3	128.0	128.0
03:30	32.6	32.1	57.2	57.9	127.3	127.6
04:00	31.4	31.0	56.6	56.2	126.1	126.3
04:30	29.2	30.0	55.1	55.5	115.3	114.7
05:54	28.5	28.1	54.3	54.2	110.4	111.1

**Table 2: Statistical Analysis of Result Values**

Time	Drip Irrigation Without Using L.P		Drip Irrigation Using L.P	
	Water(Liters)	Power(Watts)	Water(Liters)	Power(Watts)
09:00- 10:00	2000	4000	2000	4000
10:30- 11:30	2000	4000	1000	2000
12:00- 12:30	1000	2000	700	1400
12:45-01:50	2400	4800	1300	2600
02:00-03:00	2000	4000	1000	2000
03:10-04:10	2000	4000	800	1600
04:15-05:15	2000	4000	600	1200
05:20-06:20	2000	4000	500	1000
Total	15400 Liters	30800Watts	7900 Liters	9000 Watts
	15400-7900 =7500 Liters Water Saved = 48.7%		30800-15800= 15000 Watts Power Saved = 48.7%	

Thus by using this system one can save water and power/energy upto 50%.

## CONCLUSION

Thus The Wireless Sensor Networking for Agricultural Environment Sensing provides regularly updated soil moisture and ground water data at different spots and different depths in the field, along with

that it also provides to be a real time feedback control system which monitors and controls all the activities of drip irrigation system efficiently, and by using this system one can save up to 50% of water and power. The present system is model to modernize the agriculture industries at the mass scale with optimum expenditure. This is the first of its kind in using linear programming for drip irrigation systems. Using this system, one can save manpower, water, energy/power to improve production and ultimately profit. Also for future enhancement it is possible to registered farmer to download drip control timings from agricultural universities website and control own drip irrigation system according to university. Also in future enhancement it is possible to control all the activities of same drip irrigation system with the help of android platform supported mobile.

### REFERENCES

1. Dnyaneshwar Wavhal and Manish Giri Intelligent Drip Irrigation System Using Linear Programming and Interpolation Methodology International Journal of Computer (IJC), ISSN 2307-4531, pp.1-11
2. Microcontroller based drip irrigation, technical paper on Drip Irrigation [www.engineers.com](http://www.engineers.com) April 30, 2010
3. Stellar is LM3S5T36 Microcontroller Data Sheets, Texas Instruments Publication (January 15, 2011)
4. Wireless Sensor Network in Agriculture: for Potato Farming, Kshitij Shinghal et. al./ International Journal of Engineering Science and Technology Vol. 2(8), 2010, 3955-3963
5. Maximize drip irrigation benefits by automating By Inge Bisconer, Toro Micro-Irrigation (March 12, 2008)
6. Controlling water use efficiency with Irrigation Automation: cases from drip and center pivot Irrigation of Corn and Soybean Steven R. Evett, R. Troy Peters, and Terry A. Howell Southern Conservation Systems Conference, Amarillo TX, June 26-28, 2006 57
7. Irrigating basics published in American nurseryman, December 1, 2007
8. Design and simulation of an automated system for green house using lab view —, American Eurasian J. Agric. & Environ. Sci., 3(2): 279-284, 2008.
9. Intelligent Humidity Sensor for-Wireless Sensor Network Agricultural Application. International Journal of Wireless & Mobile Networks (Ijwmn) (Vol. 3, No. 1, February 2011) Doi: 10.5121/Ijwmn.2011.3111 118
10. Program for resource efficient communities, university of florida, 2008
11. Dnyaneshwar Wavhal and Manish Giri —Automated intelligent wireless drip irrigation using linear programming International Journal of Advanced Research in Computer Engineering & Technology (IJARCET) Volume 2, Issue 1, January 2013, ISSN: 2278 – 1323, pp.1-5
12. Dnyaneshwar Wavhal and Manish Giri —Automated Drip Irrigation Improvements Using Wireless Application, International Journal of Advance Research, IJOAR .org, Volume 1, Issue 3, March 2013, Online: ISSN 2320 -9194, pp.65-73

13. Dnyaneshwar Wavhal, Manish Giri and Sneha Ghumatkar –Decision Support System for Drip Irrigation, International Journal of Emerging Technology and Advanced Engineering, Website: www.ijetae.com (ISSN 2250-2459, ISO 9001:2008 Certified Journal, Volume 4, Issue 4, April 2014, pp.463-470
14. Mahir Dursun and Semih Ozden A wireless application of drip irrigation automation supported by soil moisture sensors, Scientific Research and Essays Vol.6(7), pp.1573-1582, 4April,2011. Available on- line at <http://www.academicjournals.org/SRE> ISSN 1992-2248 |2011 Academic Journals of Exclusive Management Science- June 2012-Vol 1 Issue 6 – ISSN 2277 - 5684.
15. Shiv Sutar, Swapnita-Jayesh, Komal-Priyanka MIT-COE, Pune, Maharashtra. Irrigation and Fertilizer control for Precision Agriculture using WSN: Energy Efficient Approach, International Journal of Advances in Computing and Information Researches, ISSN: 2277-4068, Volume 1 No.1, January 2012
16. Anurag D, Siuli Roy and Somprakash Bandyopadhyay, Indian Institute of Management Calcutta, Kolkata, India Agro-Sense Precision Agriculture using sensor based wireless mesh networks.
17. J.Panchard, P.R.S.Rao, M.S.Sheshshayee,P.Pa- padimitratos and J.-P. Hubaux, Wireless Sensor Networking for Rain-fed Farming Decision Support.
18. Ayman Sleman and Reinhard Moeller, Automation and Process Control Engineering, Integration of Wireless Sensor Network Services into other Home and Industrial networks using Device Profile for Web Services (DPWS).
19. P.Raghuram, and Veeramuthu Venkatesh, School Of Computing, SASTRA University, Thanjavur, Tamil Nadu, India, Enhancing Mine Safety with Wireless Sensor Networks using Zigbee Technology. Journal of Theoretical and Applied Information Technology 31st March 2012. Vol. 37 No.2, ISSN: 1992 -8645, www.jatit.org, E-ISSN: 1817-3195
20. Meijering, Erik (2002), A chronology of interpolation: from ancient astronomy to modern signal and image processing, Proceedings of the IEEE 90 (3):319-342, doi:10.1109/5.993400.

## **A CRITICAL STUDY OF ICT INCLUDING IN REVISED B. ED. SYLLABUS**

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### **ABSTRACT**

It is said by the ICT experts ICT means, it may be said to be that technology which is used for information management which involves acquisition, processing, storage, retrieval and dissemination of information. It can be defined as the use of hardware and software for efficient management of information i.e. storage, retrieval, processing, communicating, diffusing and sharing of information for social, economical and cultural upliftment. As per above experts ICT definitions we have come to notice the importance of ICT. Today there is no one field where ICT is not used, that's why the use of ICT is very important in B.Ed. Education. Shivaji University revised the B.Ed. syllabus as per guidelines of UGC, NCTE Curriculum Draft. This revised B.Ed. syllabus introduced academic year 2014-2015. The present research is consist in B.Ed. revised syllabus related to ICT concept where and how is used.

**KEYWORDS:** ICT, Teacher Education, B.Ed. Syllabus.

### **INTRODUCTION**

I remember one story about ICT in my childhood . I will tell you in short. The one girl & she has step mother. She always works with cattle and always eats bread of jawari. But she used to cry during the work with cattle at that time the airplane of God Shankar & Parwati just passing , Parwati listens the sound of the girls crying . The airplanes to minimize her sorrows (There is no airport). The lord Shankar listens her sorrows& tells one solution to her. That to clean the area of with the help of cows gobar and pin up the one needle and close the eyes .By closing the eyes and demand wish your will complete.

AS per the oral instruction of lord Shankar. The sorrow girl demand the wish of some food. But I come notice that what I listened in my childhood the short story , old story. It has came in real truth. The whole world is come near because of internet due to this the new concept emerged the 'up to second' by going to up to date. Now there is need to create up to second knowledge, to create various skills ,the competencies to learning and teaching in B.Ed. students who will gain the degree of B.Ed. through the teacher education training. For that in revised B.Ed. syllabus consist the study of How? And where ICT consist.

### **OBJECTIVE OF THE STUDY**

To study the critically study of ICT including in revised B.Ed. Syllabus.

### **SCOPE & LIMITATIONS OF THE STUDY**

1. The conclusions of the present research will be useful for B.Ed. trainee teachers.
2. The present research will be useful for teachers who teaching in B.Ed. college.
3. The conclusions of the present research will be useful for Board of Study (BOS) in Education.
4. The present research limited for Shivaji University revised B.Ed. syllabus 2014.
5. The present research limited for ICT Subject.

ASSUMPTION: In B.Ed. syllabus ICT consist.

### **RESEARCH METHOD**

The present research is related to present situation that's why survey method is used for present research.

### **CONCLUSION**

1. 54.55% objectives are related to ICT subject out of general objectives of revised B.Ed. syllabus.
2. 40.00% objectives out of objectives in paper EDU 504 Section I Learning Resources are related to ICT subject.
3. In the theory 8.33% weightage given to the ICT subject.
4. In the practical work there is compulsion to take ICT lesson for each method in of revised B.Ed. syllabus.
5. In the practical 3.67 % weightage given to the ICT subject practical.

### **RECOMMENDATIONS**

1. As per importance and need of ICT subject it is necessary to give weightage in theoretical and practical work.
2. In future relation of ICT among student technical use of ICT needs to increase weightage in B.Ed. syllabus. Example – Technique of developing Self Learning Material (SLM) include in B.Ed. syllabus. How does proper use of Whats App in educational work & services of ICT want to flexibility in use of that tools that is mostly want to include in B.Ed. syllabus.
3. There is completion to complete MS-CIT course in B.Ed. training for student teacher of B.Ed.

### **CLOSER**

So, computer is the soul of ICT, there is unlimited capacity in computer and thus student teacher needs to use of computer in B.Ed. course.

So, This information will be conduct in today's syllabus and wants to grow the scope of ICT.

### **REFERENCES**

Shivaji University Revised B.Ed. Syllabus introduction from June (2014).

## **ASSOCIATION RULE MINING IN LEARNING MANAGEMENT SYSTEM**

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### **ABSTRACT**

Learning Management Systems (LMSs) can offer a great variety of channels and workspaces to facilitate information sharing and communication among participants in a course. They let educators distribute information to students, produce content material, prepare assignments and tests, engage in discussions, manage distance classes and enable collaborative learning with forums, chats, file storage areas, news services, etc. These e-learning systems accumulate a vast amount of information which is very valuable for analyzing students behavior and could create a gold mine of educational data .They can record any student activities involved, such as reading, writing, taking tests, performing various tasks, and even communicating with peers. Association rule mining is one of the data mining techniques that discover the relationship among attributes in databases of web based education system and Learning Management System. The purpose of this paper is the knowledge discovery that can help educators to support their students by managing effectively educational units, redesigning student's activities and finally improving the learning outcome. In this paper we present the Knowledge Discovery in Databases (KDD) process which includes the application of Apriori algorithm for the association rule mining from the educational data.

**KEYWORDS:** Association rule, Learning Management System (LMS), Data mining, knowledge discovery.

### **INTRODUCTION**

Learning Management Systems (LMSs) can offer a great variety of channels and workspaces to facilitate information sharing and communication among participants in a course. They let educators distribute information to students, produce content material, prepare assignments and tests, engage in discussions, manage distance classes and enable collaborative learning with forums, chats, file storage areas, news services, etc. Some examples of commercial systems are Blackboard [1], WebCT [2] and Top-Class [3] while some examples of free systems are Moodle [4], Ilias [5] and Claroline [6]. One of the most commonly used is Moodle (modular object oriented developmental learning environment), a free learning management system enabling the creation of powerful, flexible and engaging online courses and experiences.

These e-learning systems accumulate a vast amount of information which is very valuable for analyzing student's behavior and could create a gold mine of educational data [7]. They can record any student activities involved, such as reading, writing, taking tests, performing various tasks, and even communicating with peers. They normally also provide a database that stores all the system's information: personal information about the users (profile), academic results and users' interaction data. However, due to

the vast quantities of data these systems can generate daily, it is very difficult to manage data analysis manually. Instructors and 2 course authors demand tools to assist them in this task, preferably on a continual basis. Although some platforms offer some reporting tools, it becomes hard for a tutor to extract useful information when there are a great number of students [8]. The current LMSs do not provide specific tools allowing educators to thoroughly track and assess all learners' activities while evaluating the structure and contents of the course and its effectiveness for the learning process [9]. A very promising area for attaining this objective is the use of data mining. Data mining or knowledge discovery in databases (KDD) is the automatic extraction of implicit and interesting patterns from large data collections. Next to statistics and data visualization, there are many data mining techniques for analyzing the data. Some of the most useful data mining tasks and methods are clustering, classification and association rule mining. These methods uncover new, interesting and useful knowledge based on users' usage data. In the last few years, researchers have begun to apply data mining methods to help instructors and administrators to improve e-learning systems [10].

Association rules mining is one of the most well studied data mining tasks. It discovers relationships among attributes in databases, producing if-then statements concerning attribute values [11]. Association rule mining has been applied to web-based education systems from two points of view: 1) help professors to obtain detailed feedback of the e-learning process: e.g. finding out how the students learn on the web, to evaluate the students based on their navigation patterns, to classify the students into groups, to restructure the contents of the web site to personalize the courses; and 2) help students in their interaction with the e-learning system: e.g., adaptation of the course according to the learner's progress, e.g., by recommending to them personalized learning paths based on the previous experiences of other similar students.

### **Association Rule Problem**

With the general example and introduction in last section, the formal statement of association rule mining problem was firstly stated by Agrawal et al. in 1993. Let  $I = \{I_1, I_2, \dots, I_m\}$  be a set of  $m$  distinct attributes,  $T$  be transaction that contains a set of items such that  $T \subseteq I$ ,  $D$  be a database with different transaction records  $T_s$ . An association rule is an implication in the form of  $X \Rightarrow Y$ , where  $X, Y \subseteq I$  are sets of items called itemsets, and

$X \cap Y = \emptyset$ .  $X$  is called antecedent while  $Y$  is called consequent; the rule means  $X$  implies  $Y$ . There are two important basic measures for association rules, support( $s$ ) and confidence( $c$ ). Since the database is large and users concern about only those frequently purchased items, usually thresholds of support and confidence are predefined by users to drop those rules that are not so interesting or useful. The two thresholds are called minimal support and minimal confidence respectively, additional constraints of interesting rules also can be specified by the users. The two basic parameters of Association Rule Mining (ARM) are: support and confidence.

**Support( $s$ )** of an association rule is defined as the percentage/fraction of records that contain  $X \cup Y$  to the total number of records in the database. The count for each item is increased by one every time the item is encountered in different transaction  $T$  in database  $D$  during the scanning process. It means the support count



does not take the quantity of the item into account. For example in a transaction a customer buys three bottles of beers but we only increase the support count number of {beer} by one, in another word if a transaction contains a item then the support count of this item is increased by one. Support(s) is calculated by the following formula:

$$\text{Support (XY)} = \frac{\text{Support count of XY}}{\text{Total number of transaction in D}}$$

From the definition we can see, support of an item is a statistical significance of an association rule. Suppose the support of an item is 0.1%, it means only 0.1 percent of the transaction contains purchasing of this item.

**Confidence** of an association rule is defined as the percentage/fraction of the number of transactions that contain X[Y to the total number of records that contain X, where if the percentage exceeds the threshold of confidence an interesting association rule X)Y can be generated.

$$\text{Confidence(X/Y)} = \frac{\text{Support (XY)}}{\text{Support(X)}}$$

Confidence is a measure of strength of the association rules, suppose the confidence of the association rule  $X \implies Y$  is 80%, it means that 80% of the transactions that contain X also contain Y together, similarly to ensure the interestingness of the rules specified minimum confidence is also pre-defined by users.

### **The association rule mining process in LMS**

The general KDD process [12] has the next steps: collecting data, preprocessing, applying the actual data mining tasks and post-processing. We particularize these steps for association rule mining in the LMS domain.

- **Collecting data.** Most of the current LMSs do not store logs as text files. Instead, they normally use a relational database that stores all the systems information: personal information of the users (profile), academic results, the user's interaction data, etc. Databases are more powerful, flexible and bug-prone than the typically textual log files for gathering detailed access and high level usage. Drawbacks and solutions of applying association rule mining [13] information from all the services available in the LMS. The LMSs keep detailed logs of all activities that students perform. Not only every click that students make for navigational purposes (low level information) is stored, but also test scores, elapsed time, etc. (high level information).
- **Data pre-processing.** Most of the traditional data pre-processing tasks, such as data cleaning, user identification, session identification, transaction identification, data transformation and enrichment, data

integration and data reduction are not necessary in LMS. Data pre-processing of LMS data is simpler due to the fact that most LMS store the data for analysis purposes, in contrast to the typically observational datasets in data mining, that were generated to support the operational setting and not for analysis in the first place. LMSs also employ a database and user authentication (password protection) which allows identifying the users in the logs. Some typical tasks of the data preparation phase are: data discretization (numerical values are transformed to categorical values), derivation of new attributes and selection of attributes (new attributes are created from the existed ones and only a subset of relevant attributes are chosen), creating summarization tables (these tables integrate all the desired information to be mined at an appropriate level, e.g. student), transforming the data format (to format required by the used data mining algorithms or frameworks).

- **Applying the mining algorithms.** In this step it is necessary: 1) to choose the specific association rule mining algorithm and implementation; 2) to configure the parameters of the algorithm, such as support and confidence threshold and others; 3) to identify which table or data file will be used for the mining; 4) and to specify some other restrictions, such as the maximum number of items and what specific attributes can be present in the antecedent or consequent of the discovered rules.
- **Data post-processing.** The obtained results or rules are interpreted, evaluated and used by the teacher for further actions. The final objective is to putting the results into use. Teachers use the discovered information (in form of if-then rules) for making decisions about the students and the LMS activities of the course in order to improve the students' learning. So, data mining algorithms have to express the output in a comprehensible format by e.g., using standardized e-learning metadata. It is important to notice that traditional educational data sets are normally small [12] if we compare them to databases used in other data mining fields such as ecommerce applications that involve thousands of clients. This is due to the fact that the typical size of one classroom is often only between 10-100 students, depending on the type of the course (elementary, primary, adult, higher, tertiary, academic and special education). In the distance learning setting, the class size is usually larger, and it is also possible to pool data from several years or from several similar courses. Furthermore, the total number of instances or transactions can be quite large depending on how much information the LMS stores about the interaction of each student with the system. In this way, the number of available instances is much higher than the number of students. And, as we have said previously, educational data has also one advantage compared to several other domains [12]: the data sets are usually very clean, i.e., the values are correct and do not contain any noise from measuring devices.

There are specific problems related to the application of association rule mining from e-learning data. When trying to solve these problems, one should consider the purpose of the association models and the data they come from. Nowadays, normally, data mining tools are designed more for power and flexibility than for simplicity. Most of the current data mining tools are too complex for educators to use and their features go well beyond the scope of what an educator might require. As a result, the courses administrator is more likely

to apply data mining techniques in order to produce reports for instructors who then use these reports to make decisions about how to improve the student's learning and the online courses. However, it is most desirable that teachers participate directly in the iterative mining process in order to obtain more valuable rules. But normally, teachers only use the feedback provided by the obtained rules to make decisions about modification to improve the course, detect activities or students with problems, etc.

### **Association rule mining algorithms**

Association rule mining algorithms need to be configured before to be executed. So, the user has to give appropriate values for the parameters in advance (often leading to too many or too few rules) in order to obtain a good number of rules. A comparative study between the main algorithms that are currently used to discover association rules can be found in [14]: Apriori [15], FP-Growth [16], MagnumOpus [17], Closet [18]. Most of these algorithms require the user to set two thresholds, the minimal support and the minimal confidence, and find all the rules that exceed the thresholds specified by the user. Therefore, the user must possess a certain amount of expertise in order to find the right settings for support and confidence to obtain the best rules. One possible solution to this problem can be to use a parameter-free algorithm or with less parameters. For example, the Weka [19] package implements an Apriori type algorithm that solves this problem partially. This algorithm reduces iteratively the minimum support, by a factor delta support ( $\Delta s$ ) introduced by the user, until a minimum support is reached or a required number of rules (NR) has been generated.

Another improved version of the Apriori algorithm is the Predictive Apriori algorithm [20], which automatically resolves the problem of balance between these two parameters, maximizing the probability of making an accurate prediction for the data set. In order to achieve this, a parameter called the exact expected predictive accuracy is defined and calculated using the Bayesian method, which provides information about the accuracy of the rule found. In this way the user only has to specify the maximal number or rules to discover. In [21] experimental tests were performed on a Moodle course by comparing the two previous algorithms. The final results demonstrated better performance for Predictive Apriori than Apriori-type algorithm using the  $\Delta s$  factor.

### **Apriori algorithm**

Apriori is a great improvement in the history of association rule mining, Apriori algorithm was first proposed by Agrawal. The AIS is just a straightforward approach that requires many passes over the database, generating many candidate itemsets and storing counters of each candidate while most of them turn out to be not frequent. Apriori is more efficient during the candidate generation process for two reasons; Apriori employs different candidates generation method and a new pruning technique.

Items	Count number
I1	7
I2	8
I3	6
I4	2
I5	3
I6	1

(a) C1

Large 1 Items
I1
I2
I3
I5

(b)L1

Items	Count number
I1,I2	5
I1,I3	4
I1,I5	3
I2,I3	4
I2,I5	3
I3,I5	1

(c) C2

Large 2 Items
I1,I2
I1,I5
I2,I5
I2,I3
I1,I3

(d)L2

Items	Count number
I1,I2,I5	3
I1,I2,I3	2

(e)C3

**Tables I. Apriori mining process**

There are two processes to find out all the large itemsets from the database in Apriori algorithm. First the candidate itemsets are generated, then the database is scanned to check the actual support count of the corresponding itemsets. During the first scanning of the database the support count of each item is calculated and the large 1-itemsets are generated by pruning those itemsets whose supports are below the pre-defined threshold as shown in Table I(a) and (b). In each pass only those candidate itemsets that include the same specified number of items are generated and checked. The candidate k-itemsets are generated after the (k-1)th passes over the database by joining the frequent k-1-itemsets. All the candidate k-itemsets are pruned by check their sub (k-1)-itemsets, if any of its sub (k-1)-itemsets is not in the list of frequent (k-1)-itemsets, this k-itemsets candidate is pruned out because it has no hope to be frequent according the Apriori property. The Apriori property says that every sub (k-1)-itemsets of the frequent k-itemsets must be frequent. Let us take the generation of candidate 3-itemsets as an example. First all the candidate itemsets are generated by joining frequent 2-itemsets, which include (I1, I2, I5), (I1, I2, I3), (I2, I3, I5), (I1, I3, I5). Those itemsets are then checked for their sub itemsets, since (I3, I5) is not frequent 2-itemsets, the last two 3-itemsets are eliminated from the list of candidate 3-itemsets as shown in Table I(e). All those processes are executed iteratively to find all frequent itemsets until the candidates itemsets or the frequent itemsets become empty.

In the process of finding frequent itemsets, Apriori avoids the effort wastage of counting the candidate itemsets that are known to be infrequent. The candidates are generated by joining among the frequent itemsets level-wise, also candidate are pruned according the Apriori property. As a result the

number of remaining candidate itemsets ready for further support checking becomes much smaller, which dramatically reduces the computation, I/O cost and memory requirement. Table I shows the process of Apriori algorithm.

### **The Apriori Algorithm**

- **Join Step:**  $C_k$  is generated by joining  $L_{k-1}$  with itself
- **Prune Step:** Any  $(k-1)$ -itemset that is not frequent cannot be a subset of a frequent  $k$ -itemset
- **Pseudo-code:**

$C_k$ : Candidate itemset of size  $k$

$L_k$ : frequent itemset of size  $k$

$L_1 = \{\text{frequent items}\};$

for  $(k = 1; L_k \neq \emptyset; k++)$  do begin

$C_{k+1}$  = candidates generated from  $L_k$ ;

for each transaction  $t$  in database do

    increment the count of all candidates in  $C_{k+1}$  that are contained in  $t$

$L_{k+1}$  = candidates in  $C_{k+1}$  with min\_support

end

return  $\cup_k L_k$ ;

## **CONCLUSION**

Helps the instructors to design courses more effectively, detect anomalies, inspire and direct further research, and help students use resources more efficiently. An advantage of this developing approach is its broad functionality in many data mining application domains. Specifically, it allows for contrast rule discovery with very low minimum support, therefore permitting the mining of possibly interesting rules that otherwise would go unnoticed. More measurements tend to permit discovery of higher coverage rules. A combination of measurements should be employed to find out whether this approach for finding more interesting rules can be improved.

## **REFERENCES**

1. BlackBoard, available at <http://www.blackboard.com/>, (accessed March 16), 2009.
2. WebCT, available at <http://www.webct.com/> (accessed March 16), 2009.
3. TopClass, available at <http://www.topclass.nl/> (accessed March 16), 2009.
4. Moodle, available at <http://moodle.org/>, (accessed March 16), 2009.
5. Ilias, available at <http://www.ilias.de/>, (accessed March 16), 2009.

6. Claroline, available at <http://www.claroline.net/>, (accessed March 16), 2009.
7. Mostow, J., and Beck, J., Some useful tactics to modify, map and mine data from intelligent tutors. *Natural Language Engineering*. 12(2), 195–208, 2006.
8. Dringus, L. and Ellis, T., Using data mining as a strategy for assessing asynchronous discussion forums. *Computer & Education Journal*. 45, 141–160, 2005.
9. Zorrilla, M. E., Menasalvas, E., Marin, D., Mora, E. and Segovia, J., Web usage mining project for improving web-based learning sites. In *Web mining workshop, Cataluña*, 1– 22, 2005.
10. Romero, C. and Ventura, S., *Data mining in e-learning*. Southampton, UK: Wit Press. 2006.
11. Agrawal, R., Imielinski, T. and Swami, A.N., Mining Association Rules between Sets of Items in Large Databases. In *Proceedings of SIGMOD*, 207-16, 1993. tutoring systems. In: *Proc. of Int. Conf. in Intelligent Tutoring Systems (2006)* 525– 534.
12. Wang, W., Weng, J., Su, J., Tseng, S.: Learning portfolio analysis and mining in scorm Zheng Z., Kohavi R., Mason L. Real world performance of association rules. In: *Proc. of the Sixth ACM-SIGKDD (2001)* 86-98.
13. Agrawal, R., Srikant, R.: Fast algorithms for mining association rules. In: *Proc. of Int. Conf. on Very Large Data Bases (1996)* 487-499.
14. Han, J., Pei, J., and Yin, Y.: Mining frequent patterns without candidate generation. In: *Proc. of ACM-SIGMOD Int. Conf. on Management of Data (1999)* 1-12.
15. Webb, G.I.: OPUS: An efficient admissible algorithm for unordered search. *Journal of Artificial Intelligence Research* 3 (1995) 431-465.
16. Pei, J., Han, J., Mao, R.: CLOSET: An efficient algorithm for mining frequent closed itemsets. In *Proc. of ACM\_SIGMOD Int. DMKD (2000)* 21-30.
17. Weka. (2007) Available at <http://www.cs.waikato.ac.nz/ml/weka/>.
18. Tobias S.: Finding Association Rules. In: *Proc. of the European Conf. of PKDD (2001)* 424-437.
19. García, E., Romero, C., Ventura, S. Castro, C.: Using Rules Discovery for the Continuous Improvement of e- Learning Courses. In *Proc. of the Int. Conf. on Intelligent Data Engineering and Automated Learning (2006)* 887-895.

## **MOBILE COMPUTING IN E-COMMERCE: ISSUES AND CHALLENGES**

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### **ABSTRACT**

With the advancement of world wide web, the internet E-Commerce has also been advancing for the last few years. Mobile Computing is effective delivery of E-Commerce into the consumer's hand, anywhere, using wireless technology. This advanced technology has the power to transform the mobile phone into a 'mobile wallet'. Mobile Computing facing many issues and challenges in their business like lack of resources, security problems, lower product cycle time and high implementation cost etc. But still, mobile computing is handy tool in the hands of consumers, it provides facilities like mobile banking, online trading, cloud computing, alert messaging system and data transfer etc. The present paper focuses on the benefits and applications that can be serve by mobile computing and their issues and challenges that e-commerce faced.

**KEY WORDS:** E-commerce, Mobile computing, Wireless Networks.

### **INTRODUCTION**

The phrase mobile commerce was originally coined in 1997 by Kevin Duffey at the launch of the Global Mobile Commerce Forum, to mean "the delivery of electronic commerce capabilities directly into the consumer's hand, anywhere, via wireless technology." Many choose to think of Mobile Commerce as meaning "a retail outlet in your customer's pocket."

While electronic commerce (e-commerce) continues to impact the global business environment profoundly, technologies and applications are beginning to focus more on mobile computing and the wireless Web. With this trend comes a new set of issues specifically related to mobile e-commerce. Mobile computing provides feasibility in e-commerce as the size, cost and power requirements of equipments goes down. It increases network accessibility and scope of communication so that the business environment may become clearer and interaction among people can be increased. The purpose of this paper is to examine some of these issues so that researchers, developers, and managers have a starting point for focusing their efforts in this new domain.

### **DEFINITIONS:**

**Mobile e-commerce** (also called mobile commerce or m-commerce) is defined as all activities related to a (potential) commercial transaction conducted through communications networks that interface with wireless (or mobile) devices.

Mobile Devices are those devices that are used to connect to the mobile services.

- Current wireless devices include
- Wireless phones,
- Wireless-enabled handheld computers (so-called pocket, palmtop, and tablet computers),
- Vehicle-mounted technologies, and
- Personal message pager devices.
- Mobile e-commerce can also be conducted using portable non-wireless mobile devices, such as
- Laptop computers

that can interface with other devices and networks through wired synchronization, often using wired cradles or infrared "beaming."

## **MOBILE COMPUTING**

Mobile computing as a generic term describing ability to use the technology to wirelessly connect to and use centrally located information and/or application software through the application of small, portable, and wireless computing and communication devices. Mobile computing also named as nomadic, ubiquitous, wireless and remote computing.

### **A. NETWORK TECHNOLOGIES**

In general all the mobile protocols are very similar to each other, being client-server based, enabling a continuously increasing amount of services to be provided to the users. Although the protocols are very similar to each other but still the variety of protocols is introducing some challenges to the adoption of wide spread M-Commerce. This is because it is more difficult to get a certain critical mass of subscribers to use a universal technology to enable frictionless service providing. The future will show which

of the following protocols is going to deliver the strongest commercial value at any point in time and will be supported by the largest number of attractive applications.

#### **1. GSM:**

GSM (Global System for Mobile communications) is an open, digital cellular technology used for transmitting mobile voice and data services.

GSM supports voice calls and data transfer speeds of up to 9.6 kbps, together with the transmission of SMS (Short Message Service).

GSM operates in the 900MHz and 1.8GHz bands in Europe and the 1.9GHz and 850MHz bands in the US. GSM services are also transmitted via 850MHz spectrum in Australia, Canada and many Latin American countries. The use of harmonised spectrum across most of the globe, combined with GSM's international



roaming capability, allows travellers to access the same mobile services at home and abroad. GSM enables individuals to be reached via the same mobile number in up to 219 countries.

Terrestrial GSM networks now cover more than 90% of the world's population. GSM satellite roaming has also extended service access to areas where terrestrial coverage is not available.

## **2. GPRS:**

General Packet Radio System is also known as GPRS is a third-generation step toward internet access. GPRS is also known as GSM-IP that is a Global-System Mobile Communications Internet Protocol as it keeps the users of this system online, allows to make voice calls, and access internet on-the-go. Even Time-Division Multiple Access (TDMA) users benefit from this system as it provides packet radio access.

GPRS also permits the network operators to execute an Internet Protocol (IP) based core architecture for integrated voice and data applications that will continue to be used and expanded for 3G services.

GPRS supersedes the wired connections, as this system has simplified access to the packet data networks like the internet. The packet radio principle is employed by GPRS to transport user data packets in a structure way between GSM mobile stations and external packet data networks. These packets can be directly routed to the packet switched networks from the GPRS mobile stations.

## **3. 4G/UMTS:**

Fourth-Generation universal mobile telecommunications system, often abbreviated 4GUMTS, is a wireless telecommunications data transfer standard. Though there are a number of devices that claim to use 4G UMTS, the original standards set by the International Telecommunication Network are not yet met by these devices. 4G UMTS uses many of the same devices and much of the same infrastructure as Third-Generation UMTS (3G UMTS).

UMTS, sometimes referred to as wideband code division multiple access (WCDMA), uses Internet protocol (IP) technology to connect wireless users with the Internet. First developed in the 1990s, UMTS is a reliable network that is frequently used to transmit data and voice. Mobile phones, laptop computers and other devices can connect to the Internet and make voice calls over a UMTS system.

Though not yet in wide use as of 2011, 4G UMTS calls for significant speed increases over the UMTS standard, which has been used since 2001. 3G UMTS requires that data be transferred at a peak rate of at least 200 kilobytes per second. In 4G UMTS, data must download at a rate of 100 megabytes per second in mobile devices and at 1 gigabyte per second for electronics connected to a local wireless access hub. Both 3G UMTS and 4G UMTS require the simultaneous transfer of voice and data, which was a requirement first established during the switch from second generation to third protocol. 3G UMTS and 4G UMTS can both transfer information using the same infrastructure.

## **B. Service technologies**

### **1. WAP:**

[WAP is] the de facto worldwide standard for providing Internet communications and advanced telephony services on digital mobile phones, pagers, personal digital assistants, and other wireless terminals - WAP Forum.

WAP stands for Wireless Application Protocol. Per the dictionary definition for each of these words we have:

Wireless: Lacking or not requiring a wire or wires pertaining to radio transmission.

Application: A computer program or piece of computer software that is designed to do a specific task.

Protocol: A set of technical rules about how information should be transmitted and received using computers.

WAP is the set of rules governing the transmission and reception of data by computer applications on or via wireless devices like mobile phones. WAP allows wireless devices to view specifically designed pages from the Internet using only plain text and very simple black-and-white pictures.

WAP is a standardized technology for cross-platform, distributed computing very similar to the Internet's combination of Hypertext Markup Language (HTML) and Hypertext Transfer Protocol (HTTP), except that it is optimized for:

Low-display capability, low-memory, low-bandwidth devices, such as personal digital assistants (PDAs), wireless phones, and pagers.

WAP is designed to scale across a broad range of wireless networks like GSM, IS-95, IS-136, and PDC.

### **2. J2ME:**

Java Platform, Micro Edition (Java ME) provides a robust, flexible environment for applications running on mobile and embedded devices: mobile phones, set-top boxes, Blu-ray Disc players, digital media devices, M2M modules, printers and more.

Java ME technology was originally created in order to deal with the constraints associated with building applications for small devices. For this purpose Oracle defined the basics for Java ME technology to fit such a limited environment and make it possible to create Java applications running on small devices with limited memory, display and power capacity.

### **3. I-MODE:**

The imode is the NTT DoCoMo's new Internet access system. It is an advanced intelligent messaging service for digital mobile phones and other mobile terminals that will allow you to see Internet content in special text format on special imode-enabled mobile phones. Enabling information access from handheld devices requires a deep understanding of both technical and market issues that are unique to the wireless

environment. The imode specification was developed by the industry's best minds to address these issues. Wireless devices represent the ultimate constrained computing device with limited CPU, memory and battery life and a simple user interface. Wireless networks are constrained by low bandwidth, high latency and unpredictable availability and stability. The imode specification addresses these issues by using the best of existing standards and developing new extensions when needed. The imode solution leverages the tremendous investment in web servers, web development tools, web programmers and web applications while solving the unique problems associated with the wireless domain. The specification ensures that this solution is fast, reliable and secure. The imode specification is developed and supported by the wireless telecommunication community so that the entire industry and its subscribers can benefit from a single, open specification.

#### **4. Light Efficient Access Protocol (LEAP):**

LEAP is a wireless access protocol developed by FreeProtocols.org as an open-source response to WAP. LEAP utilizes Efficient Short Remote Operations (ESRO) as the foundation transport layer for its messaging. In LEAP creation, LEAP developers attempted to minimize number of packets required for message delivery and the number of bytes per each packet. The rationale behind this effort is the fewer packets are transmitted, the longer is the wireless device battery life, the more is the network capacity, the cheaper the network usage, and less latency is experienced by users of the wireless devices.

## **ISSUES IN MOBILE COMMERCE**

### **INPUT AND OUTPUT:**

#### **Too many devices, too much choice:**

Smartphone adoption has gone stratospheric; led by the innovative iPhone and now being spearheaded by Android devices, it seems almost everyone has one. However, mass adoption leads to confusion, and for retailers this introduces problems. The classic dilemma is the app versus mobile site issue.

#### **Coping with small screen:**

The biggest limitation, but one that can be partially addressed, is screen size. The antidote to the limited real estate is to use a much smaller image, sharper messaging requiring less text, and more pages so that more information can be gleaned if the customer requires.

For example, Amazon has clearly done a lot of research with their mobile site. The core approach to its offering is centred around the core belief that browsers generally don't know what they want when landing on the site. This deep understanding of its customer base has driven its design.

### **Safety and Security**

The most important element when we are dealing with M-commerce is security issues and how we can make it safe for customers to feel comfortable when using mobile phones, so in order to attract as many customers we need to insure the quality of the security level provided. M-commerce is not possible without a secure environment, especially for those transactions involving monetary value. Therefore, there are three main areas related to security:

1. Security issues related to network technologies GSM provides a relatively secure connection through the PIN (Personal Identification Number) when turning on the handset. An authentication protocol between handset and the network through SSL encryption of voice and data is also there in GSM. But it is not enough to convince people. In order to get the confidence of critical mass of consumers, more is expected in the field of security. M-commerce applications, especially those involving payment need to be secured to assure customers. For example, in a payment scenario both sides will want to authenticate each other before committing to a payment. Also, the customer will want assurance about the delivery of goods or services. In addition to the authenticity, confidentiality and integrity of sent payment information, non-repudiation is important.

2. Security issues related to radio interface Access to a telecommunication network requires the protection of transmitted data in terms of confidentiality, integrity, and authenticity. In particular, the user's data should be protected from eavesdropping. Different security mechanisms for different mobile network technologies like 2G, 3G, 4G.

## **CHALLENGES IN MOBILE COMPUTING**

**Mobile computing presents the following challenges.**

### **Wireless communications:**

Wireless links are qualitatively different than wireline links - the bandwidth, latency, variability, and reliability of wireline links all pale in comparison to wireline links. Rapid changes in quality imply the need for highly adaptive applications that can possibly even support disconnected operation, implying a level of autonomy. Wireless links are less secure.

### **Mobility:**

Address migration (eg. mobile-IP) is required; common solutions include selective broadcast, centralized name services, forwarding pointers, and home-base. Because of mobility, location dependent information can exist - resource discovery, privacy, and the migration of locality become important issues.

### **Portability:**

Portable computers face physical challenges (volume, weight, power consumption, cost), pragmatic challenges (increased chance of data loss, small user-interface issues), and systems issues (network integration, resource imbalance such as lack of local storage, impoverished computational power)

**Power:**

Mobile platforms spend much of their time attached to AC power. At those times they are like other desktops. When a mobile platform is operating on batteries (DC power) or even when the platform is asleep on battery power, it is essential to minimize DC power use.

**Security in a Wireless Environment:**

Wireless traffic requires additional protection beyond that used on a standard wired LAN. Unauthorized platforms may attempt access to a wireless network, and wireless traffic is subject to interception by unauthorized platforms. To eliminate these problems:

- A wireless network access point must verify the identity of a device attempting to connect to it and validate that the device is authorized to connect to the network.
- The traffic must be protected from prying by unauthorized targets that can pick up the wireless transmission.

## **CONCLUSION**

Today's computing has rapidly grown from being confined to a single location. With mobile computing, people can work from the comfort of any location they wish to as long as the connection and the security concerns are properly factored. In the same light, the presence of high speed connections has also promoted the use of mobile computing.

Being an ever growing and emerging technology, mobile computing will continue to be a core service in computing and Information Communication and Technology.

## **REFERENCES**

1. e-Commerce by Ritendra Goel. New Age International Publishers
2. M-commerce ,<http://www.mcommercetimes.com>
3. GSM <http://www.gsma.com/aboutus/gsm-technology/gsm>
4. M-Commerce <http://www.hipc.org/hipc2003/HiPC03Posters/m-commerce>
5. Mobile Computing Issues, <http://www.internetnews.com/>

## MODULAR ARITHMETIC AND C DATA TYPES: SIGNED INTEGRALS

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### ABSTRACT

A partition of a positive integer or integer partition is a way of writing  $n$  as a sum of positive integers. A number may be represented in different permutation of its summands or parts with same order. We can observe these partition graphically with different diagrams like Young diagram (polyomino) containing Young tableaux, Ferrers diagram. Normal magic square of order  $n$  is also partition of  $\frac{n(n^2+1)}{2}$ ,  $n \geq 3$ . In this paper we are going to discuss concept, order of partition, partition matrix, square partition matrix and relation between determinant of square partition matrix.

**KEYWORDS:** Permutation, Young Diagram, polyomino, Young tableaux, Ferrers diagram, Magic matrix.

### INTRODUCTION

In number theory and combinatorics, a partition of a positive integer  $n$ , also called an integer partition, is a way of writing  $n$  as a sum of positive integers. Two sums that differ only in the order of their summands are considered the same partition. (If order matters, the sum becomes a composition.) Integer partitions may be encoded as either ascending or descending compositions for the purposes of systematic generation. Many algorithms exist to generate all ascending compositions, to generate all ascending compositions. The ascending composition generation algorithm is substantially more efficient than its descending composition counterpart.

Partitions of 5 are,  
$$5 = 1 + 1 + 1 + 1 + 1$$
$$= 1 + 1 + 1 + 2$$
$$= 1 + 1 + 3 = 1 + 2 + 2$$
$$= 1 + 4 = 2 + 3$$
$$= 5$$

which contains 1- unary, 2- binary, 2- ternary, 1-quinary, 1-quintal partition.

## PARTITION MATRIX

Representation of compositions in either  $1 \times 1, 2 \times 2, 3 \times 3, \dots, n \times n$  matrix is called as partition matrix of a given number.

Partition matrices of 5 are,

[5],

$$\begin{aligned} & \begin{bmatrix} 0 & 5 \\ 1 & 4 \end{bmatrix}, \begin{bmatrix} 0 & 5 \\ 2 & 3 \end{bmatrix}, \begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}, \\ & \begin{bmatrix} 0 & 0 & 5 \\ 0 & 1 & 4 \\ 1 & 1 & 3 \end{bmatrix}, \begin{bmatrix} 0 & 0 & 5 \\ 0 & 2 & 3 \\ 1 & 1 & 3 \end{bmatrix}, \begin{bmatrix} 0 & 1 & 4 \\ 0 & 2 & 3 \\ 1 & 1 & 3 \end{bmatrix}, \begin{bmatrix} 0 & 0 & 5 \\ 0 & 1 & 4 \\ 1 & 2 & 2 \end{bmatrix}, \begin{bmatrix} 0 & 0 & 5 \\ 0 & 2 & 3 \\ 1 & 2 & 2 \end{bmatrix}, \begin{bmatrix} 0 & 1 & 4 \\ 0 & 2 & 3 \\ 1 & 2 & 2 \end{bmatrix}, \begin{bmatrix} 0 & 0 & 5 \\ 1 & 1 & 3 \\ 1 & 2 & 2 \end{bmatrix}, \begin{bmatrix} 0 & 1 & 4 \\ 1 & 1 & 3 \\ 1 & 2 & 2 \end{bmatrix}, \begin{bmatrix} 0 & 2 & 3 \\ 1 & 1 & 3 \\ 1 & 2 & 2 \end{bmatrix}, \\ & \begin{bmatrix} 0 & 0 & 0 & 5 \\ 0 & 0 & 1 & 4 \\ 0 & 1 & 1 & 3 \\ 1 & 1 & 1 & 2 \end{bmatrix}, \begin{bmatrix} 0 & 0 & 0 & 5 \\ 0 & 0 & 2 & 3 \\ 0 & 1 & 1 & 3 \\ 1 & 1 & 1 & 2 \end{bmatrix}, \begin{bmatrix} 0 & 0 & 1 & 4 \\ 0 & 0 & 2 & 3 \\ 0 & 1 & 1 & 3 \\ 1 & 1 & 1 & 2 \end{bmatrix}, \\ & \begin{bmatrix} 0 & 0 & 0 & 5 \\ 0 & 0 & 1 & 4 \\ 0 & 1 & 2 & 2 \\ 1 & 1 & 1 & 2 \end{bmatrix}, \begin{bmatrix} 0 & 0 & 0 & 5 \\ 0 & 0 & 2 & 3 \\ 0 & 1 & 2 & 2 \\ 1 & 1 & 1 & 2 \end{bmatrix}, \begin{bmatrix} 0 & 0 & 1 & 4 \\ 0 & 0 & 2 & 3 \\ 0 & 1 & 2 & 2 \\ 1 & 1 & 1 & 2 \end{bmatrix}, \\ & \begin{bmatrix} 0 & 0 & 0 & 5 \\ 0 & 1 & 1 & 3 \\ 0 & 1 & 2 & 2 \\ 1 & 1 & 1 & 2 \end{bmatrix}, \begin{bmatrix} 0 & 0 & 1 & 4 \\ 0 & 1 & 1 & 3 \\ 0 & 1 & 2 & 2 \\ 1 & 1 & 1 & 2 \end{bmatrix}, \begin{bmatrix} 0 & 0 & 2 & 3 \\ 0 & 1 & 1 & 3 \\ 0 & 1 & 2 & 2 \\ 1 & 1 & 1 & 2 \end{bmatrix}, \begin{bmatrix} 0 & 0 & 0 & 0 & 5 \\ 0 & 0 & 0 & 1 & 4 \\ 0 & 0 & 1 & 2 & 2 \\ 0 & 1 & 1 & 1 & 2 \\ 1 & 1 & 1 & 1 & 1 \end{bmatrix}, \begin{bmatrix} 0 & 0 & 0 & 2 & 3 \\ 0 & 0 & 1 & 1 & 3 \\ 0 & 0 & 1 & 2 & 2 \\ 0 & 1 & 1 & 1 & 2 \\ 1 & 1 & 1 & 1 & 1 \end{bmatrix} \end{aligned}$$

If we observe all above matrices then we can observe that sum of elements of row is obviously 5, and hence we can say that determinant of above matrices is multiple of 5.

## RESULTS

- Result 1: If for any  $1 \leq m \leq n$ , determinant of partition matrix  $m \times m$  is integer and divisible by  $n$ .
- Result 2: If for any  $1 \leq m \leq n$ , for odd  $m$ , determinant of partition matrix  $m \times m$  is, starts from 0 and reaches to maximum as difference between sum of columns of partition matrix decreases.
- Result 3: If for any  $1 \leq m \leq n$ , for even  $m$ , determinant of partition matrix  $m \times m$  is, starts from maximum and reaches to 0 as difference between sum of columns of partition matrix decreases.

## REFERENCES

1. Ahlgren, Scott & One, Ken, Addition and Counting: The Arithmetic of Partitions, Notices of the AMS, Volume 48, Number 9, pp. 978-984, 2001,
2. Andrews, G. E., The Theory of Partitions. Cambridge, England: Cambridge University Press, 1998,
3. Apostol, T. M., Introduction to Analytic Number Theory. New York: Springer-Verlag, 1976,
4. Apostol, T. M., Rademacher's Series for the Partition Function. Ch. 5 in Modular Functions and Dirichlet Series in Number Theory, 2nd ed. New York: Springer-Verlag, pp. 94-112, 1997,
5. Ashrafi, A. R., An Exact Expression for the Partition Function  $P(n)$ , Far East J. Mathe. Sci. pp. , 2000,

6. Eisen, M., Elementary Combinatorial Analysis. New York, Gordon and Breach, Science Publishers , Inc.,1970, On the number of partitions of sets 1645
7. Beckenbach, E. F., Applied Combinatorial Mathematics. New York, John Wiley , Inc., 1964,
8. Bell, E. T., Exponential Numbers. Amer. Math. Monthly 41, 411-419, 1934,
9. Berndt, B. C., Ramanujan's Notebooks, Part IV. New York: Springer-Verlag, 1994,
10. Conway, J. H. and Guy, R. K., In The Book of Numbers. New York: Springer-Verlag, pp. 91-94, 1996,
11. David, F. N. and Barton, D. E., Combinatorial Chance. New York, Hafner Publishing Co. Inc., 1962,
12. Hardy, G. H., Ramanujan's Work on Partitions and Asymptotic Theory of Partitions. Chs. 6 and 8 in Ramanujan: 12 Lectures on Subjects, 3rd ed. New York: Chelsea, pp. 83-100 and 113-131, 1999,
13. Hirschhorn, M. D., Another Short Proof of Ramanujan's Mod 5 Partition Congruences, and More. Amer. Math. Monthly 106, 580-583, 1999,
14. Jackson, D. and Goulden, I., Combinatorial Enumeration. New York: Academic Press, 1983,
15. Gould, H. W., Bell & Catalan Numbers: Research Bibliography of Two Special Number Sequences, 6th ed. Morgantown, WV: Math Monongliae, 1985,
16. Grimaldi, Ralph P., Discrete and Combinatorial Mathematics: an Applied Introduction, 3rd ed., Addison-Wesley Publishing Company, 1994,
17. Lovasz, L., Combinatorial Problems and Exercises, 2nd ed. Amsterdam, Netherlands: North-Holland, 1993,
18. Lunnon, W. F., Pleasants, P. A. B. and Stephens, N. M., Arithmetic Properties of Bell Numbers to a Composite Modulus, I. Acta Arith. 35, 1-16, 1979,
19. Rota, G.-C., The Number of Partitions of a Set. Amer. Math. Monthly 71, 498-504, 1964,
20. Sixdeniers, J.-M., Penson, K. A., and Solomon, A. I., Extended Bell and Stirling Numbers from Hypergeometric Functions. J. Integer Sequences 4, No. 01.1.4, 2001,
21. 1646 H. Torabi, J. Behboodian and S. M. Mirhosseini
22. Stanley, R. P., Enumerative Combinatorics, Vol. 1. Cambridge University Press, pp. 33-34, 1999,
23. Stanley, R. P., Enumerative Combinatorics, Vol. 2. Cambridge University Press, p. 13, 1999,
24. Tucker, Alan, Combinatorics, 2nd ed. New York, John Wiley, 1985.



## **USER-FRIENDLY MICROGASIFIER: SOLUTION FOR REDUCING INDOOR AIR POLLUTION IN RURAL KITCHENS**

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### **ABSTRACT**

Indoor Air Pollution (IAP) produced by the traditional cook stoves is one of the greatest health threats to the rural women and children. The problem is more serious in the developing countries, since billions of peoples in rural areas of these countries rely on traditional fuels for cooking and room heating. The conventionally improved cook stoves (ICS) lead primarily to fuel saving but serve limited purpose in reducing IAP. During the last decade or so, with increasing awareness of the severity of IAP, efforts have been directed towards developing stoves with higher combustion efficiency so as to reduce emissions while improving thermal efficiency. One of the promising concept in this context is biomass gasification. Small scale gasifiers suitable for household cooking are called Microgasifiers. In microgasifier stoves the gasification and gas combustion occur in the same chamber but in distinct regions. This paper presents the development of microgasifier stove design. The focus was to achieve the maximum possible fuel use efficiency, and minimum possible harmful emissions, while also ensuring user friendliness to the best extent possible. The two design was: Household cooking stove (fuel use efficiency: 24.00 % and average CO emissions over the operation period of 50 min: 7.2 ppm), The emission tests indicates very low emissions from both the stove, which is very promising factor for addressing the problem of health impact of IAP on rural women.

**KEYWORDS:** improved cookstoves, microgasification, Indoor Air Pollution

### **INTRODUCTION**

Biomass is a sustainable and carbon-neutral source of energy. Its inefficient use in household cooking results in wastage, Indoor Air Pollution (IAP) and related respiratory and other health problems. However, over the last decade or so, with increasing awareness of the severity of the IAP problem, there has been a conscious effort to develop stoves with higher combustion efficiency so as to reduce emissions while improving thermal efficiency. This has attracted attention of the researchers towards biomass gasifiers, which have been developed independently primarily for generation of industrial heat. Biomass gasification appears to have a significant potential in Asia for domestic cooking applications. [1]

One of the gasification based processes with a great potential for household thermal application is what is termed as microgasification. In microgasifier stoves the gasification and gas burning are both occurring in the same chamber but in distinct regions. [2] The air flow control therefore becomes more challenging. The air supply should be such that just enough air is available to burn some of the solid fuel to create the high temperature required for the gasification of the rest of the fuel, while there is sufficient air (preferably preheated) available for mixing with the hot gas for combustion just under the cooking vessel.

This paper presents the results of the development of natural draft microgasifier stove design. The focus was to achieve the maximum possible fuel use efficiency, and minimum possible harmful emissions, while also ensuring user friendliness to the best extent possible.

## EXPERIMENTAL

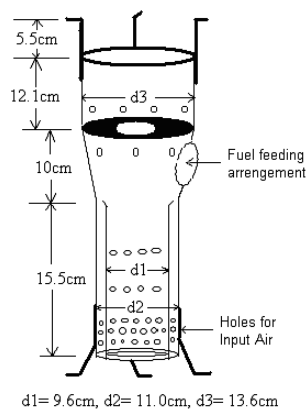
Initially Experimental model of a microgasifier was developed and its performance was studied in terms of fuel use efficiency and CO emission during the period of operation. The test protocols recommended by the School of Public Health, University of California, Berkeley, were used. [3,4].

The most promising experimental stove design was analyzed using CFD simulation, to understand the factors critical for good thermal efficiency and low emissions. The software 'STAR-CD' version 3.2 (Make CD-ADAPPO) was used for the CFD simulation. The analysis clearly indicated that the design features that led to better combustion (and therefore low emissions) also resulted in a reasonably good heat transfer from the stove to the cooking pot.

Based on the results of these preliminary studies, the working models for cooking and water heating stove were developed, and tested.

## MICRO-GASIFIER STOVE

The micro-gasifier having a fuel holding capacity of about 500 g was fabricated using an 18 gauge MS sheet, as shown in Figure 1. Photograph of the microgasifier is shown in Figure 2.



**Fig 1: Schematic of Micro-Gasifier**

**Fig 2: Photograph of Micro-Gasifier**

For ensuring clean combustion, input air was provided through the holes at the bottom of the outside cylinder. The holes at the bottom of the fuel holder were provided for primary air to enter the fuel stack. The

number, size and positions of the holes on the fuel holder were optimized using thermal efficiency and CO emission as the governing parameters.

The combustible gas received preheated secondary air. This was the part of the air that passed through the air gap between the outer cylinder and the fuel holder, and emerged on the top of the fuel holder. Additional secondary air was provided through the holes drilled on the middle part of the stove body. This air was preheated by allowing it to pass through the short metal pipes inserted into the stove and automatically heated by the waste heat dissipated to the stove body.

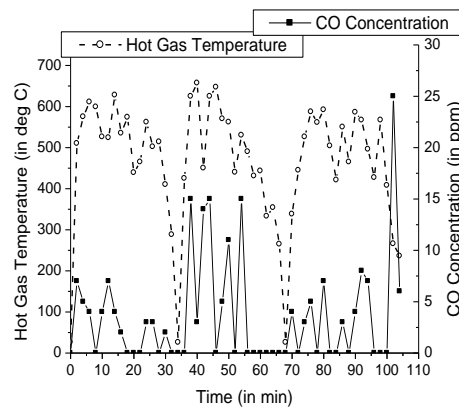
Proper mixing of the secondary air and the combustible gas was achieved by creating an obstacle in the form of a metal plate with a central circular opening. This served the dual purpose of creating turbulence in the flow of the gas-air mixture and also to direct the flames properly for better heat transfer to the cooking pot. Provision was made for addition of fuel into the fuel chamber, so as to be able to use the stove for longer periods without having to interrupt the cooking operation.

## EXPERIMENTAL RESULTS & DISCUSSION

The main observations were as follows.

1. The thermal Efficiency was 25.79%.
2. Time for boiling 2.5 liter of water was 16 minutes.

Figure 3 shows the variation of hot gas temperature and CO with time. During operation, when new fuel was added the hot gas temperature decreased and emissions increased.



**Fig.3 Variation of Flame Temperature and CO concentration with time**

Hot gas temperature is a critical parameter which decides the efficiency and emissions from the stove. Throughout the major part of the duration of stove operation, hot gas temperature remained above 500°C, while CO emission never exceeded 20 ppm. Both these factors have contributed to the high efficiency and fast boiling observed in this model.

When new fuel was added into the stove the hot gas temperature dropped and CO emissions increased. During the addition of fuel, cold air entered in the stove. Also when the cold wood chips dropped

into the fuel chamber, the temperature in the pyrolysis zone went down. When moisture from the newly added fuel went off, the hot gas temperature again increased and CO emission dropped off.

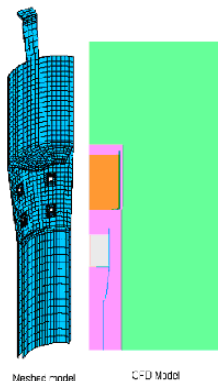
Measurements of the temperature of the stove body at various locations showed that the location of maximum temperature shifted downwards as the fuel level decreased and the gasification zone moved downwards. Initially highest temperature was observed at 30 cm from the bottom of the fuel chamber. Towards the end of the stove operation the highest temperature was at 20 cm from the bottom of the fuel chamber. The average temperature near the bottom of the stove was 225°C. It remained low as the cold air entered from the bottom.

## RESULTS OF THE CFD SIMULATION OF THE STOVE

For the simulation of the stove a quarter part of the model was used in symmetry. The meshed and CFD models are shown in Fig. 5.

The basic assumptions of the CFD model were as follows.

- Inlet temperature of Hot Gas: 480° C
- Outlet pressure: 0
- Compressible flow (density with respect to local temperature and pressure)
- Buoyancy driven flow
- Average gas temperature for 30 min run is 480 °C
- Overall combustion efficiency is assumed 80%
- Stove body material is Cast Iron
- Pot material is Aluminum
- Mass of the fuel used for 30 min run of the stove is 0.5 kg



**Fig 4: Meshed model and CFD Model**

Values of constants & other parameters used in the analysis were as follows.

Air to fuel ratio = 6:1; Combustion efficiency = 60%

Mass flow rate,  $\dot{m} = 0.00029175$  kg/s; Heat generation rate,  $H = \dot{m} C_p \Delta T = 135.01$  watt/s

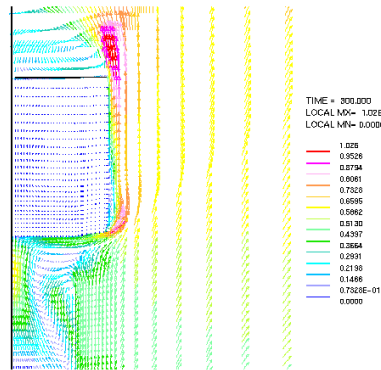
### VELOCITY OF HOT GAS

The velocity and type of flow of hot gas through the stove body and over the pot is a critical parameter in the design of the stove. The velocity plot is shown in Fig.6.

The velocity of gas below the circular plate was low but when the gas passed the hole of the circular plate the velocity of gas increased to 0.5862 m/s and the air flow became turbulent. This shows that the circular plate performed the function that it was intended for. By speeding up the pyrolysis gas and also creating turbulence, it allowed the hot gas to mix properly with the incoming secondary air. This helped in proper combustion of the gas, leading to lowering of the CO emission.

When the hot gas struck the bottom of the pot its velocity decreased. It was 0.2198 m/s, at the centre, but increased towards 0.8307 m/s at the periphery of the bottom of the pot. The direction of the flame was such that the hot gas moved along the surface of the cooking pot, with its velocity gradually increasing and becoming maximum at the upper edge of the pot. The nature of the flow of hot gases around the pot (always in contact with the pot surface) is well suited for efficient heat transfer to the pot. [4]

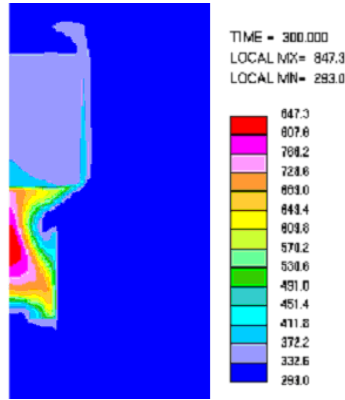
One issue of concern is the observed rapid movement of air around the stove body. This clearly indicates that the heat radiated by the stove body increases the temperature of the surrounding area.



**Fig 5: Velocity Plot**

### TEMPERATURE PLOT

The hot gas temperature is important parameter used in the analysis. The temperature plot is shown in Fig.7. Firstly, as the hot gas temperature is also experimentally measured, the theoretical value can be used as a test of reliability of the simulation model. The experimental value of the hot gas temperature (the average flame temperature is 475<sup>0</sup>C) measured under the cooking pot falls in the range deduced by the computational model.



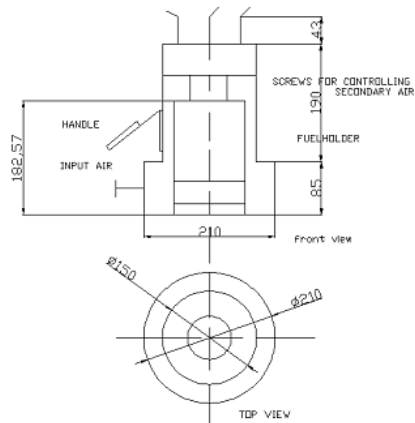
**Fig.6: Temperature Plot**

The hot gas temperature is also indicative of efficiency of the stove, as high flame temperature in the pyrolysis gas - air mixture ensures clean combustion and high flame temperature at the bottom of the cooking pot increases the heat transfer. In general, the variations in the temperature of the hot gas around the cooking pot followed the same trend as the velocity plot, as expected. Both the velocity plot and temperature plot also indicate that if a skirt is used around the cooking pot, heat loss to the surrounding from the surface of the cooking pot can be reduced, and heat transfer efficiency can be further improved.

The CFD simulation clearly indicates that the stove design that has been optimised for low emissions (and therefore good gasification and better combustion efficiency) also has reasonable heat transfer efficiency. The analysis also demonstrates that CFD can be a useful tool in stove design optimisation. It is noteworthy that we have not used a simulation specifically developed for stove analysis, but have used a standard program available commercially for general fluid flow analysis.

### **MICROGASIFIER FOR COOKING**

Based on the above study we have developed userfriendly model of a microgasifier stove for cooking purpose. The height of the stove is about 31.8 cm, which is suitable for Indian cooking practices. It is constructed in MS sheet and consists of two cylinders. The inner cylinder is the fuel holder and consists of small holes on its surface for providing the primary air. The outer cylinder provides support for the cooking pot. The gap between the two cylinders is useful for providing the preheated secondary air. The circular metal plate above the fuel holder is used for proper mixing of primary and secondary air. During the development of stove the dimensions of holes on the stove body and the air gap between the fuel holder and circular metal plate were decided based on the basis of actual analysis of the performance on the stove. The engineering drawing and photograph of the stove is shown in figure7 below.

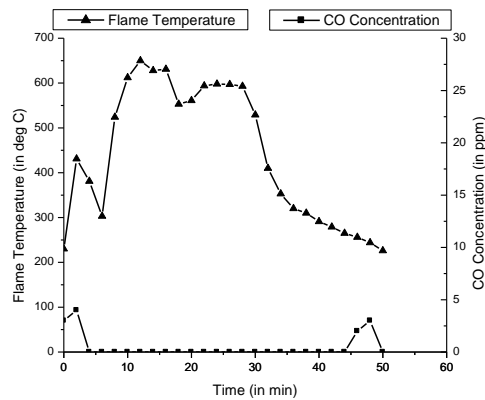


**Figure 7: Engineering drawing and photograph of the microgasifier stove for cooking**

The flame temperature and CO concentration data for this stove are shown in Fig. 2.

The microgasifier cook stove was developed on the basis of the laboratory performance. The performance is measured in terms of thermal efficiency and CO emissions. The main observations of the final model were as below.

1. Time for boiling 2.5 liter of water = 14 min
2. Thermal Efficiency = 24.00% (thermal efficiency of traditional cook stoves is around 10-15%).



**Fig. 8 Variation of Flame Temperature & CO with Time**

## CONCLUSIONS

We developed a clean burning and efficient gasifier stove, using basic principles of micro gasifiers. We also explored the possibility of using CFD as a tool for understanding the stove performance.

The stoves represent the contribution of physical sciences to combat a serious health threat faced by rural women in the developing world in general, and in India, in particular. More importantly, this can be achieved without shifting the rural households away from use of biomass fuels for the domestic cooking

energy need. This aspect is important because use of biomass as domestic fuel can be renewable and sustainable, whereas, the so-called cleaner fuels like kerosene and LPG, being fossil fuels, are unsustainable.

### **ACKNOWLEDGEMENTS**

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### **REFERENCES**

1. Bhattacharya, S. C. and M. A. Leon, 'Prospects for Biomass Gasifiers for Cooking Applications in Asia', [AIT-gasifierstove%20for%20cooking-final](#)
2. Paul S. Anderson, Thomas B. Reed and Paul W. Weaver ' Micro-Gasification: What it is and why it works'. 'Boiling Point No. 53, (2007)
3. [http://ehs.sph.berkeley.edu/hem/hem/protocols/wbt\\_draft\\_version\\_1.5\\_with\\_notes-appendices.doc](http://ehs.sph.berkeley.edu/hem/hem/protocols/wbt_draft_version_1.5_with_notes-appendices.doc)
4. Ahuja, D. R., V. Joshi, K. Smith, C. Venkatraman, 'Thermal Performance and Emission Characteristics of Unvented Biomass-Burning Cookstoves: a proposed Standard Method for Evaluation', Biomass 12 (1987).



## **A REVIEW ON DESIGN OF CHAIN CONVEYOR SYSTEM AND STUDY OF STRESS DISTRIBUTION OF THE CHAIN LINK BY MEANS OF FINITE ELEMENT METHODS**

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### **ABSTRACT**

Agricultural and industrial sector play important role in state as well as in country. Sugar cane is one of the good economical products of state. Sugar factories are most important in state economy. In these types of factories are used roller chain conveyers. Around 65% processes depends upon roller chain system. Actually problem in chain causes big loss of factories and relevant who depends upon sugar industry. It also affects growth of state. Failures are mostly happened by tension in chain and reason is mistake/ errors in design. Optimization of all parameters is necessary for obtaining best outcomes under given circumstances. Stress distribution of chain link studied by FEM (Finite element method). Overall design of chain conveyor system for best results.

**KEYWORDS:** Chain conveyor, stress distribution, FEM.

### **INTRODUCTION**

Economy of state is dominated by agricultural as well as industrial sector. Sugar factories play important role in economy of state. About 60 percent processes in these factories are based on roller chain conveyers. Apart from that, other industries also use these chains frequently for process atomization. However, failure of this chain is perennial problem in these industries which causes huge losses to these industries along with its dependants and in turn economical growth of the state. So, roller chain is the most important element of the industrial processes. Fig. 1.1 shows the typical roller chain link assembly.



**Fig. 1.1 Typical Roller Chain Link Assembly.**

Most of the time chain is under tension which causes failure of chain assembly which is the major problem for industrial sector. Causes of this failure are improper design. It is important to study the influence of these parameters. All these parameters can be considered simultaneously and chain link design optimally. Optimization is the process of obtaining the best result under given circumstances in design of system. In optimization process we can find the conditions that give the maximum and minimum value of function.

## OBJECTIVES

- Design of Chain conveyor for given application.
- Model of the Conveyor System in CATIA.
- Development of finite element model using ANSYS software
- Study of Stresses generated and redesign if required.

## LITERATURE SURVEY

**Tushar D. Bhoite** et. al.[1] studied into various application aspects and manufacturing aspects to formulate an idea of the system. Finally Finite Element Analysis (FEA) has been used to conduct shape optimization. Since lot of work has already been done in other components, in this work the focus has been narrowed down to specific component of outer link.

**M. Koray KESİKÇİ** et. al.[2] widely investigated in literature the theoretical differences and the superiorities of the techniques over each other. In the study, roller chains which are used as pulling and driving members of materials handling mechanisms are inspected. Stress analysis of a standard roller chain link is performed using both boundary and finite element methods. The mechanical behaviors of a standard roller chain which is loaded by the maximum allowed load are considered. Comparing the results of the both techniques with each other and the results of literature, the appropriate method for the roller chain problem is proposed.

**Shoji NOGUCHI** et. al. [3] suggest some approaches for reducing stresses and weight saving in the link plate of roller chain. Stresses are 3% higher in proposed design, but the weight reduced in 10%. Tensile tests are performed on link plates made of resin and the effectiveness of proposed model is confirmed.

**XU Lixin** et. al. [4] developed a mathematical model to calculate the dynamic response of a roller chain drive working at constant or variable speed condition. In the model, the complete chain transmission with two sprockets and the necessary tight and slack spans is used.

**V. Kerremans** et. al. [5] studied various wear related things for chain conveyor, reasons as they are sometimes used in severe environments, soiled with water, foreign particles, chemicals or other contaminants. Normal use will result in wear of the components of the chain which can lead to unexpected failure and costly production downtime.

## DESIGN OF CHAIN CONVEYOR SYSTEM

To enable the most suitable chain to be selected for a particular application it is necessary to know full application details such as the following:

- Type of conveyor.
- Conveyor centre distance and inclination from the horizontal.
- Type of chain attachment, spacing and method of fixing to the chain.
- Number of chains and chain speed.
- Details of conveying attachments, e.g. weight of slats, buckets, etc.
- Description of material carried, i.e. weight, size and quantity.
- Method of feed and rate of delivery.

As a general rule, for most applications a factor of safety of 8 is used,

Working Load = Breaking Load/8

**A suitable type of chain has to be selected for horizontal slat conveyor:**

Transported material: Anthracite coal

Conveyor length: 22.5 m

Flow: 28 T/h

Conveyor conduit width: 300 mm

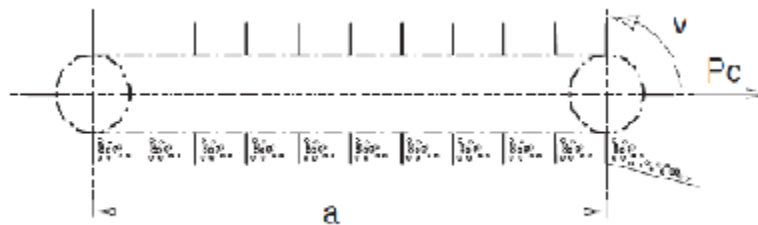
Conveyor conduit height: 280 mm

Roller Diameter: 250 mm

Number of chains: 1

Number of teeth of the sprocket: 11

Load distribution: even



**Fig. 4.1 Horizontal slat conveyor - Slide Guide way**

### 4.1. Material flow Q

$$Q = 28 \text{ T/h}$$

#### 4.2. Chain velocity v

We use the formula:  $Q = H \cdot B \cdot \beta \cdot \gamma \cdot v \cdot 3600$   
 (T/h)

$$v = \frac{Q}{H \cdot B \cdot \beta \cdot \gamma \cdot 3600}$$

$$v = \frac{28}{0.3 \times 0.28 \times 0.6 \times 0.7 \times 3600}$$

$$= 0.22 \text{ m/sec.}$$

Where,

H= Conduit Height (m)

B= Conduit width (m)

$\beta$  = conveyor repletion coefficient=0.5 to 0.6

$\gamma$  = specific weight of transported material  
 (T/m<sup>3</sup>) = 0.7 (Ref. Table 8)

#### 4.3. Weight of transported material P<sub>1</sub>

$$P_1 = a \cdot \frac{Q}{3.6 v}$$

$$P_1 = 22.5 \cdot \frac{28}{3.6 \times 0.22}$$

$$= 795.45 \text{ kg}$$

$$= 7805 \text{ N}$$

Where,

a = Conveyor length (m) = 22.5 m

#### 4.4. Selection of suitable chain

Selected chain must resist the wt of transported material multiplied with safety coefficient (k= 8).

Thus its break strength must be:

$$F_B = P_1 \cdot k = 7805 \times 8 = 62440 \text{ N}$$

Corresponding type of chain according to **DIN 8167 (ISO 1977) is MRC 80 x 125.**

#### Selection of a conveyor chain

#### 4.5. Chain weight P

The selected chain's weight per meter is  $q = 4$   
 kg/m; its pitch is  $p = 125$  mm and the assumed  
 number of teeth of the sprockets is  $Z = 11$

Total chain weight is:

$$d_t = \frac{p}{\sin \frac{180}{Z}}$$

$$= \frac{125}{\sin \frac{180}{11}}$$

$$= 443.68 \text{ mm}$$

$$= 0.444 \text{ m}$$

$$L = 2 \cdot a + \Pi \cdot d_t = 2 \times 22.5 + \Pi \times 0.444 = 46.39 \text{ m}$$

(Chain length)

$$P = L \cdot q = 46.39 \times 4 = 190 \text{ kg (Chain Weight)}$$

#### 4.6. Selection of friction coefficient f<sub>r</sub>

The chain slides on steel guide way.

The estimated reading of Table 2 is  $f_r = 0.3$ .

#### 4.7. Correction coefficient for type of operation F<sub>s</sub>

See Table 4:

Load balance - centered load  $F_s = 1.0$

Load characteristics - small fluctuations  $F_s = 1.2$

Frequency of start/stop under load  $F_s = 1.0$

Operating environment - medium dusty  $F_s = 1.2$

Work hours per day  $F_s = 1.2$

Total friction coefficient  $F_s = 1.728$

#### 4.8. Determination of velocity correction coefficient $F_v$

Chain velocity  $v = 0.22$  m/sec. see Table 5; for  $Z = 11$  the resulting value  $F_v = 0.9$

#### 4.9. Friction coefficient $f_m$

The friction coefficient " $f_m$ " describes the influence of friction of transported material vs. conveyor conduit.

See Table 8 - for given material,  $f_m = 0.4$

#### 4.10. Computation of traction force $T$

$$T = 9.81 \frac{(P.f_r + P1.f_m) .F_s .F_v}{\text{Number of chains}} \text{ N}$$

$$T = 5730\text{N (Number of chains 1)}$$

$$T = 9.81 \frac{(190 \times 0.3 + 796 \times 0.4) 1.728 \times 0.9}{1}$$

#### 4.11. Computation of necessary shaft power $N$

$$\begin{aligned} N &= \frac{T v}{1000} \\ &= \frac{5730 \times 0.22}{1000} \\ &= 1.26 \text{ kW} \end{aligned}$$

#### 4.12. Specific pressure on chain joints $p_t$

$$\begin{aligned} P_t &= \frac{T}{f} \\ &= \frac{5730}{468} \end{aligned}$$

$p_t = 12.24 \text{ MPa} < 25 \text{ MPa}$  (see Table 6)

$f = 468 \text{ mm}^2$  according to the chain catalogue.

Computed specific pressure is lower than maximum permissible pressure listed in Table 6.

***The selected chain fulfils requirements.***

### Selection of a conveyor chain

#### 4.13. Sprockets

The design and actual condition of the sprocket influences the chain operating life the most. Generally speaking, the following recommendations should be followed:

- a) Sprockets of the biggest possible diameter should be employed to lower the pressure on chain
- b) Driving wheels should be located at conveyor end, especially with complicated conveyor designs (e.g. conveyors that include fermentation or dry-up compartments).
- c) If the conveyor employs two or more interconnected chains, their driving sprockets must not be interlocked.

The following formula can be used to determine the pitch, outer and root diameters of a sprocket:

$$D_p = \frac{p}{\sin \frac{180}{z}} = \frac{125}{\sin \frac{180}{11}}$$

$$= 443.68 \text{ mm}$$

$$= 0.444 \text{ m}$$

$$D_e = D_p + (0.6875) D \text{ (mm)}$$

$$= 443.68 + 0.6875 \times 250$$

$$= 620 \text{ mm}$$

$$D_i = D_p - D \text{ (mm)}$$

$$= 443.68 - 250$$

$$= 195 \text{ mm}$$

Where:

$$D_p = \text{pitch diameter (mm)} \quad p = \text{chain pitch (mm)}$$

$$D_e = \text{outer diameter (mm)} \quad Z = \text{number of teeth}$$

$$D_i = \text{root diameter (mm)} \quad D = \text{diameter of chain roller (mm)}$$

## **V. SOFTWARE USED FOR MODELING AND ANALYSIS**

### **5.1 Catia V5 R20**

CATIA V5 provides three basic platforms: P1, P2 and P3. P1 is for small and medium sized process oriented companies that wish to grow toward the large scale digitized product Definition. P2 is for the advanced design engineering companies that require product, process and resource modeling. P3 is for the high-end design application and is basically for Aerospace Industry, where high quality surfacing or class-A surfacing is used for designing. A good feature is that any change made to the external data is notified to user and the model can be updated quickly. A workbench is defined as a specified environment consisting of a set of tool, which allows the user to specific design tasks in a particular area.

#### **5.1.1 Part design workbench**

The part design workbench is a parametric and feature-based environment, in which user can create solid models. The requirement for this is a sketch. The sketch for the feature is drawn in the sketcher button from the sketcher toolbar. User can draw the sketch using the tools in this worktable. While drawing a sketch, various applicable constraints manually.

#### **5.1.2 Wire frame and Surface Design workbench**

The wire frame and surface design workbench is also a parametric and feature based Environment, in which user can create wire frame or surface models .The only difference is that the tools in the environment are used to create basic and advanced surfaces. Users are also provided the required shape.

#### **5.1.3 Assembly design workbench**

The Assembly Design workbench is used to assemble the components using the assembly constraints available in this workbench.

#### **5.1.4 Drafting Workbench**

The drafting workbench is used for the documentation of the parts or assemblies created earlier in the form of drawing views and their detailing. There are two types of drafting techniques:

1. Generative drafting

## 2. Interactive drafting

The generative drafting technique is used to automatically generate the drawing views of the parts and assemblies, the parametric dimensions added to the component in the part of design workbench during its creation can also be generated and display automatically in the drawing views. The generative drafting is bi-directionally associative in nature. User can also generate the bill of material (BOM) and balloons in the drawing views in interactive drafting ,user needs to create the drawing views by sketching them using the normal sketching tools and then adding the dimensions.

### **5.2 Ansys 14.0**

Ansys is user friendly finite element analysis software which can also use for modeling and meshing varies kind of analysis can carried out in Ansys. ANYAS 14.0 include the following new enhancement that improves the solution procedure and features high performance computing due to shared memory parallel capability in Ansys distributed Ansys now run on windows 32- and 64-bit systems PCG Lanczos method provides a robust and efficient option for large modal analyses.

#### **5.2.1 Different Types of Element**

##### **Element**

As the geometry of the structure modal has been established the grid points are connected by finite element, each element has its own characteristics. The different element is described below:

#### **5.2.2 Line Element (1D Element)**

Line elements are also called one-dimensional elements, are used to represent rod and beam behavior. An one-dimensional element is one in which the properties of the element are defined alone a line or curve. Typical applications for the one-dimensional element include truss structure, beam, stiffeners and many others. A rod element support tension, compression and axial tension, but not bending. A beam element includes bending.

#### **5.2.3 Surface Element (2D Element)**

Surface elements, also called two-dimensional elements, are used to represent a structure whose thickness is small compared to its other dimensions. Surface elements can model plates, which are flat or shells, which have single curvature (Like a cylinder) or double curvature (Like a sphere). For grid points connected to plate elements, stiffness terms exist for five of the possible six degrees of freedom-the rotational DOF about the normal to the plate is “unconnected”.

#### **5.2.4 Solid Elements (3D Elements)**

Solid (Three-Dimensional) elements are used to represent the behavior of thick plates and solids. Solid elements connect only translational degrees of freedom, no rotational degrees of freedom are connected to solid elements.

#### **5.2.5 Scalar Elements**

Scalar elements are referred to as zero dimensional elements, consists of the springs, masses and viscous dampers. All scalar elements are defined between two degrees of freedom and ground. Stiffness for scalar elements has to be defined.

## CONCLUSION

The stress analysis was performed by FEM, and some methods were considered with the suppression of the increase in stress. The design proposal for the use of a centrally located hole in a link plate has a beneficial effect on weight saving and yields a negligible stress. The breaking load of the chain was used to determine the tensile force in chain. Based on the FEA results, it is observed that the optimal value of radius is between 49.5 to 50 mm. Though this optimization seems insignificant on its own, it must be noted that in a typical industrial application, thousands of such links will be needed.

## REFERENCES

1. Tushar D. Bhoite, Prashant M. Pawar & Bhaskar D. Gaikwad., "Fea Based Study of Effect of Radial Variation of Outer Link in A Typical Roller Chain Link Assembly", *International Journal of Mechanical and Industrial Engineering (IJMIE)*, 2012, Vol-1, Issue-4, ISSN No. 2231 –6477.
2. M. Koray KESİKÇİ, M. Cüneyt FETVACI, C. Erdem İMRAK "Stress Distribution of The Chain Link By Means Of Boundary Element and Finite Element Methods", *Journal of Engineering and Natural Sciences*, Received: 30.06.2004 Accepted: 04.11.2004.
3. Shoji NOGUCHI, Kohta NAGASAKI, Satoshi NAGAKAYAMA "Static Stress analysis of link plate of roller chain using Finite element method and some design proposals for weight saving" at *Journal of Advanced Mechanical Design, Systems and Manufacturing*, 2009.
4. XU Lixin, YANG Yuhu, CHANG Zongyu, LIU Jianping., *Dynamic Modeling of a Roller Chain Drive System Considering the Flexibility of Input Shaft*., *CHINESE JOURNAL OF MECHANICAL ENGINEERING*, 2010, Vol. 23, (3) .
5. Ch. V. Kerremans, T. Rolly1, P. De Baets, J. De Pauw, J. Sukumaran and Y. Perez Delgado., "Wear of Conveyor Chains With Polymer Rollers"., Ghent University, Laboratory 2011.
6. R. E. Melchers, T. Moan, and Z. Gao, "Corrosion of working chains continuously immersed in seawater," *Journal of Marine Science and Technology*, Jun 2007, vol. 12, pp. 102-110.
7. Cândida Pereira, Jorge Ambrósio, and Amilcar Ramalho, "Contact Mechanics in A Roller Chain Drive using A Multibody Approach," *American Congress of Applied Mechanics*, January 04-08, 2010.



## ज्ञानरचनावाद आणि शिक्षण

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### सारांश:

जीन पियाजे आणि लेव वायगोस्की द्वारा विकसित सिद्धांत म्हणजे रचनावाद होय. रचनावादाची अशी धारणा आहे की अध्ययन कर्ता आपले पर्यावरण आणि सामाजिक संदर्भ याबरोबर चर्चेच्या माध्यमातून सक्रिय रूपाने आपली समज विकसित करतो. प्रस्तुत वैचारिक शोधनिबंध रचनावादाचा उदय व त्याच्या सिद्धांतांचा शोध घेतो. त्याबरोबरच रचनावादाचा शिक्षणावर पडलेल्या प्रभावाची चर्चा करतो जसे पारंपारिक व शिक्षक केंद्रित पद्धतीच्या प्रभावापासून मुक्त होऊन शिक्षण परस्पर संवाद, चर्चा, सक्रिय अध्ययन याकडे वळत आहे. आधार पद्धती, चौकशी आधारित अनुदेशन, सहयोगी प्रकल्प अशा प्रकारच्या विद्यार्थी केंद्रित बाबींकडे झालेला शिक्षणाचा प्रवास अधोरेखित करतो. ज्ञान राचानावादाचे फायदे ही स्पष्ट करण्यात आले आहे. एकंदरीत रचनावाद अध्ययन अध्यापनाचे आधुनिक पद्धत असून विद्यार्थ्यांमध्ये सजजशीलता, तर्क, अनुमान, निरीक्षण क्षमता, निर्णय क्षमता, चिकित्सक वृत्ती यांचा विकास करण्यासाठी उपयुक्त ठरतो, त्याबरोबरच विद्यार्थ्यांस ज्ञान निर्मितीची संधी प्राप्त करून देतो

**संशोधन संज्ञा** – माहिती, ज्ञान, ज्ञानरचनावाद, विद्यार्थी केंद्रित अध्यापन पद्धती, ज्ञानाची रचना आणि पुनर्रचना

### प्रस्तावना:

एकविसाव्या शतकात कोणत्याही गोष्टीचे ज्ञान अत्यंत महत्त्वाचे मानले गेले आहे हे प्रत्येक क्षेत्राचा मोठ्या प्रमाणात विकास झाल्यामुळे त्या त्या क्षेत्रातील योग्य प्रकारचे ज्ञान मिळवणे अत्यंत गरजेचे झालेले आहे सुसंगठित माहिती म्हणजे ज्ञान होय, माहितीचा योग्य प्रकारे वापर करता येणे म्हणजे ज्ञान होय. आधुनिक काळात केवळ शिक्षकांद्वारे दिले जाणारे पुस्तकी ज्ञान म्हणजेच ज्ञान अशा प्रकारचा अर्थ अभिप्रेत नाही विद्यार्थ्यांनी स्वानुभवातून एखाद्या विषयावर चिंतन करावे, त्यासंदर्भातली माहिती जमवावी त्या माहितीवर प्रक्रिया करून योग्य-अयोग्य याची जाणीव करून घ्यावी वर्गांमध्ये शिक्षकाने अध्यापन करताना विद्यार्थ्यांना स्वतः अनुभव घेऊन एखाद्या बाबीविषयी ज्ञाननिर्मिती करता येईल यासाठी तयार करणे अपेक्षित आहे. विद्यार्थी स्वतः ज्ञानाची रचना करणारा बनला पाहिजे. अर्थातच ज्ञानरचनावाद यामध्ये अनुभवाद्वारे माहिती जमा करणे माहितीवर प्रक्रिया करणे, त्याद्वारे माहितीला अर्थ प्राप्त करून देणे व अर्थाने त्या अर्थाला धारण करणे इत्यादी प्रक्रिया समाविष्ट आहे. व्यक्ती पूर्वानुभव यांच्या आधारे ज्ञानाची रचना आणि पुनर्रचना करत असतो अशा ज्ञानरचना विद्यार्थ्यांच्या मनात योग्य रीतीने व्हावी यासाठी विद्यार्थी केंद्रित अध्यापन पद्धती वापरल्यात त्याचा समावेश ज्ञानरचनावादी अध्यापन पद्धती केला जातो.

विको हा पहिला ज्ञानरचनावादी तत्त्वज्ञ म्हणून ओळखला जातो त्यानंतर इमॅन्युएल कान्ट यांनी मानव हा निष्क्रिय ज्ञानप्राप्ती करणारा प्राणी नाही अशा शब्दात याला पुष्टी दिली आहे त्याच्यामध्ये चेतक प्रतिसाद या अनुषंगाने ज्ञान अपेक्षित नाही तर विद्यार्थ्यांनी स्वानुभव घेणे त्यातून माहिती प्राप्त करणे, त्या माहितीवर प्रक्रिया करणे व तिची पुनर्रचना करणे हा ज्ञानरचनावादाचा आत्मा

आहे. ज्ञानरचनावाद या विचारसरणीच्या विकासात जॉन डुई, जेरोम ब्रूनर, आसू बेल, ग्लॅसर कॅल्डयांचे योगदान महत्वपूर्ण मानले जाते.

### **ज्ञानरचनावाद म्हणजे काय?**

Constructivism हा शब्द construere या लॅटिन शब्दापासून तयार झाला आहे. त्याचा अर्थ मांडणी करणे किंवा रचना करण्यास होतो जॉन डुई याच्यामध्ये ज्ञान म्हणजे प्राप्त परिस्थितीतून विद्यार्थ्यांनी घेतलेले अर्थपूर्ण अनुभव होय. अनुभव निरीक्षण याद्वारे मिळत असलेली माहिती समजून घेऊन तिचे व्यवहारात उपयोग करणे म्हणजे ज्ञान निर्मिती करणे होय. जेव्हा एखादी व्यक्ती पूर्व ज्ञानाच्या आधारे नवीन ज्ञानाची रचना करते किंवा त्यातून अध्ययन घडते तेव्हा त्यास ज्ञानरचनावाद असे म्हणतात.

### **ज्ञानरचनावादी अध्ययनाची वैशिष्ट्ये**

1. ज्ञानरचनावाद विद्यार्थ्यांना सक्रिय अनुभव घेण्यावर भर देतो त्यामुळे वर्गात अध्यापनात अध्यापन पद्धती अध्ययन पद्धती शैक्षणिक साधने अध्ययन अनुभव ही सर्व विद्यार्थी केंद्रित असणे गरजेचे आहे विद्यार्थ्यांनी स्वतः ज्ञान निर्माण करणे गरजेचे आहे.
2. अध्ययन ही अर्थपूर्ण आणि त्या समस्या सोडविण्यासाठी व नवीन अर्थ निर्मितीची सक्रिय प्रक्रिया आहे.
3. नवीन ज्ञानाची निर्मिती हे विद्यार्थी पूर्व ज्ञानाशी पूर्वानुभव शी संबंधित असते काही वेळा पूर्वज्ञान अर्थ जाणून घेण्यात अडथळा निर्माण करते.
4. अध्ययन ही पूर्व ज्ञानाची नवीन पद्धतीने संकल्पना मांडणीची प्रक्रिया आहे.
5. वर्गातील वातावरण हे ज्ञान निर्मितीसाठी व विविध दृष्टिकोन व्यक्त करण्यासाठी आधार ठरते.
6. पूर्व नियोजनात निश्चित केलेल्या अध्ययन कृतीच्या चौकटीतच अर्थपूर्ण ज्ञान होते.
7. शिक्षकांनी वर्गात अध्यापनात मार्गदर्शक म्हणून भूमिका पार पाडाव्या कारण विद्यार्थी चिकित्सक व तर्कसंगत विचार व मांडणी करू शकतो.
8. ज्ञानरचनावादतील शिक्षकांची भूमिका ही लोकशाही मूल्यांच्या अनुकूल असावी.
9. ज्ञानरचनावादात तंत्रज्ञानाचा वापर करून ज्ञाननिर्मिती करण्यावर भर दिला जातो.
10. विद्यार्थ्यांच्या विचारप्रक्रियेला चालना देण्याचा प्रयत्न शिक्षकांमार्फत केला जातो.
11. वर्गात अध्यापनात विद्यार्थ्यांना बोलते करण्याचा प्रयत्न केला जातो त्यासाठी शिक्षकांद्वारे प्रश्न विचारणे जिज्ञासा जागृतीवर भर दिला जातो.
12. ज्ञानरचनावादातील शिक्षक व विद्यार्थी परस्परावलंबी असतात. ज्ञाननिर्मिती दोन्हींचाही सहभाग असतो.

### **ज्ञानरचनावादातील शिक्षकाची भूमिका**

1. ज्ञानरचनावादी विचारसरणीत शिक्षक हा विद्यार्थ्यांचा मार्गदर्शक म्हणून कार्य करतो विद्यार्थ्यांना ज्ञाननिर्मिती करताना येणाऱ्या समस्या सोडवण्याचा प्रयत्न तो करतो.
2. विद्यार्थ्यांच्या गुण, क्षमता व आवड लक्षात घेऊन त्याप्रमाणे विद्यार्थ्यांना ज्ञान रचना करण्यासाठी शिक्षक मदत करतो.
3. ज्ञानरचनावादी विचारसरणी शिक्षकांची भूमिका ही लोकशाही मूल्यांचा आदर करण्याची असते ज्ञानरचना या प्रक्रियेमध्ये सर्व विद्यार्थ्यांचा सहभाग करून घेणे अपेक्षित असते.

4. ज्ञानरचनावाद या विचारसरणीत शिक्षकांची भूमिका ही एक प्रकारे संशोधकाची असते त्यांनी संशोधन करून नवीन या निर्मिती करावी व विद्यार्थ्यांनाही त्यासाठी प्रोत्साहन द्यावे अशी अपेक्षा असते.
5. विद्यार्थ्यांना ज्ञाननिर्मिती सहाय्यक ठरतील अशा विविध प्रकारच्या सुविधा पुरवण्याचे कार्य शिक्षक करतो उदाहरणार्थ संदर्भ पुस्तके, साधने इत्यादी
6. ज्ञानरचनावादी विचारसरणीत शिक्षक हा विद्यार्थ्यांना अध्ययन प्रक्रियेत स्वातंत्र्य देणारा असतो विद्यार्थ्यांच्या कल्पनांना विचारांना वाव देण्याचे कार्य तो करतो.
7. ज्ञानरचनावादी विचारसरणीत शिक्षकांची भूमिकाही दिशादर्शकाची असते ज्ञानरचना करताना ज्या विद्यार्थ्यांला अडचणी येतात त्याला योग्य दिशा दाखवण्याचे कार्य शिक्षक करत असतो.
8. ज्ञानरचनावादी विचारसरणीत शिक्षक हा आजन्म विद्यार्थी असतो नवे ज्ञान घेणे, नवे ज्ञान निर्माण करणे हे त्याचं कार्य असते.
9. ज्ञानरचनावादी विचारसरणीत शिक्षक हा प्रयोगशील उपक्रमशील संवेदनशील असणे गरजेचे आहे कारण ज्ञानाची रचना करण्यामध्ये या गुणांचा अत्यंत महत्त्वाचा उपयोग होतो.
10. प्राप्त केलेल्या ज्ञानाचा प्रत्यक्ष व्यवहारात कसा उपयोग करावयाचा हे समजून घेण्याचे कार्य ज्ञानरचनावादात शिक्षक करत असतो.

#### **ज्ञानरचनावादातील विद्यार्थ्यांची भूमिका**

1. ज्ञानरचनावादी विचारसरणी विद्यार्थी हा ज्ञानाचा ग्राहक मानला गेला आहे विविध ज्ञान स्रोतांच्या आधारे तो ज्ञान ग्रहण करण्याचे कार्य करतो.
2. ज्ञानरचनावादी विचारसरणीत विद्यार्थी हा स्वतः अनुभव घेऊन ज्ञान निर्मिती करण्यावर भर देतो अर्थात तो ज्ञानाचा निर्माता असतो.
3. ज्ञानरचनावादी विचारसरणीत विद्यार्थी हा स्वतः ज्ञान मिळवण्यासाठी धडपड करणारा असणे गरजेचे आहे.
4. विद्यार्थी हा स्वतः ज्ञान मिळवून व त्या ज्ञानाचे इतरांमध्ये वाटप करणारा असणे गरजेचे आहे.
5. ज्ञानरचनावादी विचारसरणीत विद्यार्थी हा ज्ञानाचा प्रसारक असावा त्यासाठी तो विविध तंत्रज्ञानाचा वापर करणारा असला पाहिजे.
6. ज्ञानरचनावादी विचारसरणीत विद्यार्थ्यांनी मिळालेल्या ज्ञानाचा प्रत्यक्ष व्यवहारात उपयोग करणे गरजेचे आहे.
7. ज्ञानरचनावादी विचारसरणी विद्यार्थी हा जागतिक घडामोडींच्या द्वारे ज्ञान प्राप्त करणारा असला पाहिजे.
8. ज्ञानरचनावादी विचारसरणीच्या अनुषंगाने विद्यार्थी हा उच्च मानसिक क्षमतांची प्राप्त करणारा असला पाहिजे. सृजनशीलता, तर्क, अनुमान, निरीक्षण क्षमता, निर्णय क्षमता चिकित्सक वृत्ती इत्यादी

#### **ज्ञानरचनावादातील अध्ययन व अध्यापन पद्धती**

ज्ञानरचनावाद हा विद्यार्थी केंद्रित असल्यामुळे ज्ञानरचनावाद आतील अध्ययन व अध्यापन पद्धती हा विद्यार्थी केंद्रित सृजनशील कृती प्रधान व प्रत्यक्ष अनुभव देणारे असल्या पाहिजे. त्यासाठी विविध आधुनिक तंत्रज्ञानाचा उपयोग केला गेला पाहिजे विद्यार्थी कृतिशील राहून ज्ञान निर्मिती करतील याकडे लक्ष दिले पाहिजे. त्या अनुषंगाने अध्यापन पद्धती अशी आपली करावी लागते.

1. स्वयम् शोधन पद्धती

2. प्रायोगिक पद्धती
3. समस्या निराकरण पद्धती
4. संगणक साहित अनुदेशन
5. प्रकल्प पद्धती
6. बुद्धी मंथन
7. गटचर्चा
8. पर्यवेक्षीत अभ्यास
9. चर्चा पद्धती
10. सहकार्यातून अध्ययन
11. प्रश्न पद्धती
12. संकल्पना चित्र पद्धती

#### **ज्ञानरचनावादाचे फायदे**

1. विद्यार्थ्यांमध्ये उच्च मानसिक क्षमतांचा विकास होतो.
2. विद्यार्थ्यांना ज्ञाननिर्मिती करण्यासाठी चालना मिळते.
3. विद्यार्थी प्राप्त ज्ञानाचा व्यवहारात उपयोग करू शकतो.
4. विद्यार्थ्यांना विविध दृष्टिकोनातून विचार करण्याची सवय लागते.
5. विद्यार्थी ज्ञानाचा प्रसार व प्रसार करण्याची भूमिका स्वीकारतो.
6. विद्यार्थ्यांना तंत्रज्ञानाद्वारे ज्ञानप्राप्ती करण्याचा मार्ग समजतो.
7. विद्यार्थ्यांना जागतिक घडामोडी द्वारे ज्ञान मिळवण्याकडे लक्ष केंद्रित करता येते.
8. विद्यार्थ्यांमध्ये विविध कौशल्यांचा विकास होण्यास मदत होते.
9. विद्यार्थ्यांमध्ये लोकशाही मूल्यांचा विकास करण्यास मदत होते.
10. विद्यार्थी इतरांची कल्पना व विचार स्वीकार करण्याचा प्रयत्न करतो.
11. विद्यार्थ्यांना प्राप्त ज्ञानाची धारणा शक्ती वाढण्यास मदत मिळते.
12. प्राप्त ज्ञानाची विद्यार्थी स्वतः मालक बनतात.
13. विद्यार्थ्यांमध्ये कृतिशीलता वाढीस लागते.
14. विद्यार्थ्यांमध्ये सहकार्य वृत्ती वाढीस लागते.
15. विद्यार्थ्यांमध्ये स्वयंअध्ययन प्रवृत्तीचा विकास होतो.
16. विद्यार्थ्यांमध्ये ज्ञानाची संक्रमण चांगल्या प्रकारे होण्यास मदत मिळते.
17. विद्यार्थ्यांना स्वतःच्या क्षमता पडताळून पाहता येतात.
18. विद्यार्थ्यांना विविधांगी अनुभव मिळतात.
19. विद्यार्थ्यांमध्ये संप्रेषण कौशल्यांचा विकास होण्यास मदत मिळते.

### ज्ञानरचनावादाच्या मर्यादा

1. ज्ञानरचनावाद त्याची प्रत्यक्ष अंमलबजावणी करणे कठीण ठरते.
2. ही विचारसरणी सर्व विद्यार्थ्यांसाठी उपयोगात येत नाही.
3. या विचारसरणीत द्वारे फारसे यश मिळवण्याचा पुरावा नाही.
4. आक्रमक विद्यार्थी मनमानी करण्याची शक्यता असते.
5. या पद्धतीने अध्ययन-अध्यापन प्रक्रिया पार पडताना वेळ व पैसा मोठ्या प्रमाणात खर्च होण्याची शक्यता असते.
6. एखाद्या विद्यार्थ्याचा वरचष्मा असण्याची शक्यता अधिक असते.
7. सर्व शिक्षकांना ज्ञानरचनावादाचा च्या आधारे अध्ययन अध्यापन करता येईलच असे नाही.
8. ज्ञानरचनावाद या विचारसरणीची प्रत्यक्ष अंमलबजावणी केलेली दिसून येत नाही.

पारंपारिक अध्यापन पद्धतींच्या तुलनेत ज्ञानरचनावाद विद्यार्थ्यांना अध्ययन अध्यापन प्रक्रियेत अधिक सक्रिय ठेवतो त्यांच्या चिकित्सक विचार, सृजनशीलता, तर्क, अनुमान, विश्लेषण निरीक्षण क्षमता इत्यादी विविध क्षमतांच्या विकासात सहाय्यभूत ठरतो, त्यामुळे शैक्षणिक वर्तुळात ज्ञानरचनावादाची लोकप्रियता दिवसेंदिवस वाढत चाललेली दिसते.

### References:

1. Adams, P. (2006). Exploring social constructivism: theories and practicalities.
2. Education 3-13, 34(3), 243–257. <https://doi.org/10.1080/03004270600898893>
3. Fosnot, C. T. (2013). Constructivism: Theory, Perspectives, and practice, second edition. Teachers College Press.
4. Larochelle, M., Bednarz, N., & Garrison, J. W. (1998). Constructivism and education. Cambridge University Press.
5. Steffe, L. P., & Gale, J. (2012). Constructivism in education. Routledge.
6. Shiland, T. W. (1999). Constructivism: The implications for laboratory work. Journal of Chemical Education, 76(1), 107. <https://doi.org/10.1021/ed076p107>

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