# MIT academy of Engineering school of computer engineering AND TECHNOLOGY

# MAJOR PROJECT activity no. 1

# SEMESTER 8 (Academic Year 2019-2020)

.

Project Title: IOT Based Precision Agriculture using Wireless Sensor Networks

Group ID: 36

Project Guide Name: Prof. Santosh Warpe

Project Guide Email and Contact No.: stwarpe@comp.maepune.ac.in

# Name and Roll Number of the Students:

|  |  |  |  |
| --- | --- | --- | --- |
| Roll No. | Student Name | Contact Details | Email |
| **194158** | **Prashant Walunj** | **7304373999** | **pvwalunj@mitaoe.ac.in** |
| **194032** | **Arjun Yachwad** |  | **amyachwad@mitaoe.ac.in** |
| **194048** | **Mangesh Gund** |  | **mggund@mitaoe.ac.in** |
| **198040** | **Chaitanya Barsawade** |  | **cmbarsawade@mitaoe.ac.in** |

**Abstract**

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| Tip icon | *Agriculture plays a major role in the economic development of India, therefore we need to carry out new technologies for Precision Agriculture. Manual method for soil analysis gives inaccurate value because there is a difference between soil samples at the field and measuring in the laboratory with technologies. In India, it is required automated distribution of fertilizers and technologies. Because most of the farmers using traditional types of farming which gives less amount of productivity with respect to efforts. The productivity of India is less as compared to other countries. To enhance productivity and profit margin, the adaptation of new technologies can help us to a great extent. So, this paper based on a survey of Wireless Sensor Network because these technologies useful for precision of agriculture. This paper presents the study of Wireless Sensor Network that can be applied in agriculture for automated farming. This will help the end-users like farmers to make the right decision, gain better yield, and economic advantage.* |

## Project Background and Description

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| Tip icon | *Soil Analysis is one of the valuable tools in the Agriculture field for yielding good crop. Soil Analysis helps farmers to determine the values of nutrients needed for efficient and economical production. Most Soil usually has a very high supply of nutrients. But whenever new crop gets harvested the nutrients in the soil get used for crops. Because low nutrition growth of crops doesn’t happen properly. To get better proper crop yield, the nutrients must be restored in the soil. Hence farmers need to know the right proportion of Nitrogen (N), Phosphorus (P), and Potassium (K).*  *In the 21st century, Farmers need to use precision farming to improve their crop yields. To calculate the ratio of NPK we are using the Wireless Sensor Network nodes. These notes are placed at a specific distance so we can get precise calculations of NPK values. But for big farms, we will need a very large number of nodes. So, to overcome this problem we are using the cubic spline method. which is a type of interpolation. In this, we can estimate a method of constructing new data points within the range of the discrete set of known data points. By this method, we can reduce the nodes so it will be economical for farmers* |

## Aim and Objectives

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| Tip icon | *Aim-*  *•To understand the importance of soil fertility.*  *• To study the essential nutrients in plant growth.*  *Objectives-*  *•To determine the level of availability of nutrients or the need for its introduction*  *•To provide a basis for fertilizer recommendations for a given crop.*  *•To evaluate the fertility status of the soil and plan a nutrient management program.*  *•To provide an index of nutrient availability or supply in a given soil.* |

## Project Scope

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| Tip icon | *We are using two master nodes and four slave nodes and one base station. Each master node connects to two slave nodes. the slave nodes of master node M1 called M1S1, M1S2 and other slave nodes of Master M2 are called M2S1 and M2S2. All slave nodes send data to their respective master node M1 and M2 for Sensing, collecting, storing, and processing the sensed data and then transmitting that data to the appropriate base station* |

## Deliverables

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| Tip icon | *This project is useful for farmers.Any Farmers can use our system for calculation Of NPK.*  *This system present study and analysis of Wireless Sensor Network that applied in agriculture for automated farming. This can help the end users like farmers for the better understanding of agriculture practices to be adopted for distribution of fertilizers.*  *To improve productivity and profit margin, adaptation of new technologies can help us at great extent.As there are 2 types of fertilizers Primary and Secondary, in primary nitrogen, phosphorus, potassium are there and in secondary calcium, magnesium, sulfur.* |

## High-Level Requirements

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| Tip icon | *Eliciting requirements*  *• The system should throw the fault & error*  *• User Interface (UI) should be user friendly.*  *• Dataset should be updated as per reading taken on the field.*  *• System Should provide a precious value of NPK.*  *• Results from the system should be in minimum period of time.*  *Analyzing requirements*  *• Incomplete explanation of requirement. Level- Medium*  *• Good GUI must be designed. Level- High*  *• The WSN network should be good. Level- Low*  *• Ambiguous with respect to time. Level- Low* |

## Implementation Details/Plan

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| Tip icon | *Wireless Sensor Network is an emerging technology that helps the development of precision agriculture. WSN comprises of sensors and micro-controllers to process the data, battery or source of powers, base station to transmit the data. Recent trends and advancements in WSN technology have carved the path for the development of less cost. Low consumption of power and multi-functioning sensor nodes. Sensor node deployed at different places senses the different environmental parameters at that place and the processes the data accordingly. Sensor nodes can monitor parameters like soil fertility, temperature, humidity, moisture, etc. WSN has a wide range of applications in fields of agriculture, military, industries. In the agricultural field, WSN can be used for realtime monitoring of data on the field. In our case, it is to monitor the NPK fertilizer values.*  *NPK Fertilizers*  *There are six essential nutrients like nitrogen (N), phosphorus(P), potassium(K), magnesium (Mg), sulphur(S), calcium (Ca) that helps to grow plants. They help to create new cells. Out of these NPK are the most required nutrients for plants. Nitrogen is responsible for giving plants green colouring. Phosphorus helps to grow roots and fruit development. Potassium also plays a part in root growth as well as stem development. So determining the NPK value of the soil will help in calculating the optimal value of the fertilizer required.*  *ARCHITECTURE DESIGN*  *we are using two master nodes and four slave nodes and one base station. Each master node connects to two slave nodes. the slave nodes of master node M1 called M1S1, M1S2 and other slave nodes of Master M2 are called M2S1 and M2S2. All slave nodes send data to their respective master node M1 and M2 for Sensing, collecting, storing, and processing the sensed data and then transmitting that data to the appropriate base station.* |

## High-Level Timeline/Schedule

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| Tip icon |  |

## Literature Review

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| Sr. No. | Title of the Paper | Authors | Publication and Journal/Transaction Name | Year of Publications | Problem Statement and Solution  (Findings) |
| 1 | Precision agriculture for small to medium size farmers - An IoT approach | **-** Victor Grimblatt, Guillaume Ferre, Francois Rivet, Christophe Jego, Nicolas Vergara | IEEE | 2019 | Improving the soil yield with IoT is a new way to feed this population growth. Their proposed solution integrates IoT to monitor precisely agriculture. The subsequent manufacture of a SoC will demonstrate on site how farmers can be helped to improve soil yield. |
| 2 | Integrated optical sensor for NPK Nutrient of Soil detection | Marianah Masrie\*, Ahmad Zahid Mohd Rosli, Rosidah Sam, Zuriati Janin and Mohd Khairi Nordin, | IEEE | 2018 | The developed integrated optical sensor was able to detect the NPK nutrients in soils. The light for LED at 470 nm, 950 nm and 660 nm emitted at 1 kHz modulation frequency was successfully received by detection system within 15 mm optical path length. The optical transmittance of each LED light through the transparent container is high, approximately at 80 %. Based on the testing results, there was a significant interaction between the light and NPK samples taken from different location that made the light intensity reduced as the voltages were dropped. The output responses for high NPK were found at 32.0 volts for Nitrogen, 4.6 V for Phosphorus and 19.8 V for Potassium. |
| 3 | Micro-controller Based Fertilizer Dispenser Control System | A.Izuddin Zainal Abidin1, Faizal Ahmad Fadzil2, Yen | IEEE | 2018 | This study provides a significant impact especially to farmers as it offers an easy and efficient way to automate the fertilizer spreading process. The functionality of the system provides a user-friendly platform for users to monitor their soil condition and fertilization process. All research activities including literature review, qualitative interview, system design, prototype development and testing are interrelated and are conducted with the aim to achieve research objectives. |
| 4 | Detection Of Fertilizer Quantity In Soil Using Hyperspectral Data | Jay Prakash Kumar, Shailesh Deshpande, Arun Inamda | IEEE | 2018 | In this paper, they have developed a quantification equation between the diagnostic depths and the fertilizer concentration in soil. It would be challenging task to verify whether the developed equations remain valid for low to very low concentrations of fertilizers. They plan to extend these experiments with more number of soil samples and a few additional fertilizers. Hyperspectral detection of agrochemicals provides an opportunity to develop innovative methods in this regard. The present study reports efforts taken in the same direction. They focus on fertilizer application and attempt to analyze the spectral signature of soil and fertilizer mixture. |
| 5 | Detection of N,P,K Fertilizers in Agricultural Soil with NIR Laser Absorption Technique | Arpit Rawankar, Mayurkumar Nanda, Hemant Jadhav, Prem Lotekar, Rahul Pawar | IEEE | 2018 | Photon absorption technique is a simple and non-destructive analytical method that can be used to quantify several soil properties simultaneously. The main challenge for the evaluation of soil properties is to find suitable data pre-treatment and calibration strategies. In this study, a tunable laser is used to find reflectance and absorption photon data and values for soil properties. |

# Approval and Authority to Proceed

We approve the project as described above, and authorize the team to proceed.

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| Approved By | | |
| **Committee Member** | **Name** | **Sign and Date** |
| Guide |  |  |
| Reviewer No. 1 |  |  |
| Reviewer No. 1 |  |  |
| School Dean |  |  |