

# Prediction Irrigation System for Smart Agriculture Using IoT and KNN Algorithm

Theint Theint,  
GIS Lab, UCSY  
Myanmar  
[theinttheint@ucsy.edu.mm](mailto:theinttheint@ucsy.edu.mm)

Thin Lai Lai Thein  
GIS Lab, UCSY  
Myanmar  
[tllthein@ucsy.edu.mm](mailto:tllthein@ucsy.edu.mm)

**Abstract**— Agriculture plays an important role in the economy of many countries. Agriculture is one of the important aspects of Myanmar economy. Water is very important for agriculture and provides nutrients for plant growth. Food security is a challenge that countries must face. Agricultural yield is affected by climate changes since this latest decade. Agriculture is full of uncertainty due to climate change, rainfall, soil type and numerous other factors. Climate change is one of the major threats to agricultural development in Myanmar. Damage of plantations are caused by climate change. To minimize damages, there is a need for monitoring and irrigation in the plantations. Therefore, the system implemented the prediction irrigation system based on Internet of Things (IoT) enabled sensors, Microcontroller Unit (Node MCU) and Gateway. All sensors are connected to the node MCU. The system received sensor data from respective sensors and prediction irrigation decision for smart agriculture using k-nearest neighbor (KNN) algorithm. This system focuses on predict when irrigation will be needed for the plantations.

**Keywords:** Smart agriculture, Internet of Things, Microcontroller Unit, K-nearest neighbor

## I. INTRODUCTION

Myanmar is an agricultural country. Myanmar's economy is determined by agricultural products export and import. Nowadays, as grow of population the production of crops and agricultural products needs to be increased. The most common crops are paddy, beans and pulses, wheat and corn. Climate change is one of the difficulties faced by farmers. So, irrigation is a key component that can solve the problems faced by farmers and prevent crop damage.

As mentioned, climate change has caused water shortages and the destruction of plantations. It is very important to be able to plant crops when there is not enough rain. The proposed system provides the prediction of when irrigation will be needed for the plantations. The system composed of the Internet of Things (IoT) and KNN algorithm. From the rapid successes seen in the integration of the Internet of Things (IoT) to wireless sensor network (WSN) technologies for smart agricultural application through remote sensing, the monitoring of agricultural processes has enabled a better understanding of the changing dynamics of weather, soil, and crop conditions throughout the growing season [1]. Real-time data can be pooled continuously using IoT-enabled sensors. The system received sensor data from respective sensors and prediction the irrigation decision using KNN. Soil moisture sensors measure or estimate the amount of water in the soil. All these sensors collect the parameters such soil moisture and weather condition.

KNN model have emerged as an effective intelligence-based decision support tool for the context of sustainable prediction irrigation management [2]. Traditionally, farmers make the decision to irrigate based on their previous experience; however, with develop the technology, irrigation decisions can be better informed using the concept of predicting the water needs of crops based on the forecast of weather and soil conditions[3]. Prediction is very important feature for irrigation planning that involve knowing the water needs and soil moisture content, to be able to react proactively to ensure better management. The Node MCU is an open source IoT platform with firmware for the ESP32 Wi-Fi chip. The Node MCU is used to connect with all of the sensors and transfer data to the cloud. When implementing an prediction model collected the soil and weather data. This data fed into the prediction model. KNN algorithm can be employed to automatically extract new information in the form of generalized decision rules, in order to accomplish precision irrigation actions using sensor data. The architecture of the prediction irrigation for smart agriculture system is as shown in figure. The proposed system using based on IOT and KNN algorithm can provided prediction irrigation with different parameters values. The system can predict irrigation in the plantations and it also prevents damage to plantations prevent the damage to plantations.

The next section is system architecture. In section III explain general steps of the algorithm. The experimental result is show in section IV. Finally, section V presents the conclusion.

## II. SYSTEM ARCHITECTURE

### A. Architecture of the Smart Agriculture System

As already mentioned, climate change has been damaged the plantation and loss of costs. To minimize these loses, there is a need for monitoring and irrigation in the plantations. The system will design and implement the IoT and KNN model. Sensors data send to the cloud database through Gateway. Then, preprocessing of this datas. KNN algorithm can provided prediction irrigation with different parameters values. The architecture of the smart agriculture system is as follows.

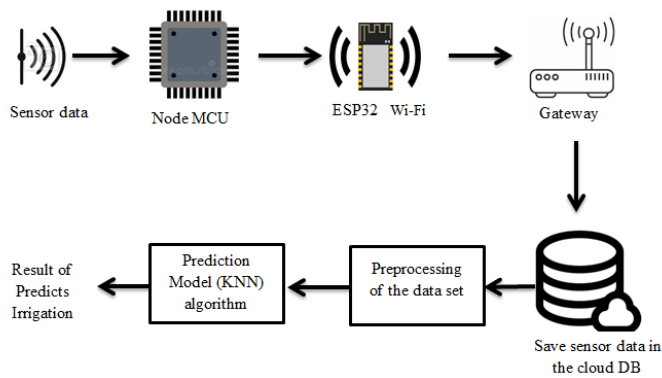


Figure.1 Predicts Irrigation System

### III. PROPOSED SYSTEM

The proposed system prediction irrigation and prevent the damage of plantation in our country. The general steps of the system are as follows:

- Step 1: It is accessing the data from sensors.
- Step 2: Node MCU connect with relevant sensors.
- Step 3: Sensor data wirelessly send to the cloud database through the gateway.
- Step 4: Preprocessing the data for the better accuracy.
- Step 5: Data fed into the KNN model.
- Step 6: The system displays the prediction irrigation for the plantations.

### IV. RESULT AND DISCUSSION

Climate change is one of the major threats to agricultural development in Myanmar. Damage of plantations are caused by climate change. This point is the challenges faced by farmers. The system can solve the problems faced by farmers and prevent crop damage. This system will provide an estimate of whether or not irrigation is needed for agricultural fields.

### V. CONCLUSION

The system using wireless sensor network is capable of real time and monitoring of different parameters such as weather and soil condition. It provides predict of whether or not irrigation is needed for plantations. Therefore, the system prevents the damage of crops and loss of cost.

### ACKNOWLEDGMENT

I would like to express specially thank to my teacher for providing guidance, motivation, and encouragement during this paper writing. I would also like

to thank to everyone who supports me during these studying.

### REFERENCES

- [1] Emmanuel Abiodun Abioye<sup>1</sup>, Oliver Hensel<sup>2</sup>, Travis J. Esau<sup>3</sup>, Olakunle Elijah<sup>4</sup>, Mohamad Shukri Zainal Abidin<sup>5</sup>, Ajibade Sylvester Ayobami<sup>6</sup>, Omosun Yerima<sup>7</sup> and Abozar Nasirahmadi<sup>2</sup>, "Precision Irrigation Management Using Machine Learning and Digital Farming Solutions", *AgriEngineering* 2022, 4, 70–103.
- [2] H. K. Karthikeya<sup>1</sup>, K. Sudarshan<sup>2</sup>, Disha S. Shetty<sup>3</sup>, "Prediction of Agricultural Crops using KNN Algorithm", *International Journal of Innovative Science and Research Technology*, Volume 5, Issue 5, May 2020.
- [3] Khalil Ibrahim Mohammad Abuzanoun<sup>1</sup>, Fahd N. Al-Wesabi<sup>2</sup>, Amani Abdulrahman Albraikan<sup>3</sup>, Mesfer Al Duhayyim<sup>4</sup>, M. Al-Shabi<sup>5</sup>, Anwer Mustafa Hilal<sup>6</sup>, Manar Ahmed Hamza<sup>6,\*</sup>, Abu Sarwar Zamani<sup>6</sup> and K. Muthulakshmi<sup>7</sup>, "Design of Machine Learning Based Smart Irrigation System for Precision Agriculture", *Computers, Materials and Continua* · January 2022.