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A Modernized IoT Enabled Smart Farming Using LoRa WAN Techniques

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ABSTRACT

The Internet of Things (IoT) is growing its way in a number of application domains as its potential effects are being implemented in various scenarios. Agriculture is a domain in which IoT can prove highly beneficial by improving operational efficiency through using the resources carefully, disease monitoring, harvesting process etc. In our paper we develop a decision based support system for smart farming that exploits data from a multitude of sources that provide vital information. Specifically, we combine data from a number of sensors receive via a LoRa WAN network along weather and crop data to carry out informed decisions which at the current stage are primarily focusing on the usage of water as well as crop protection from adverse weather which is increasingly troubling farmers due to the climate changes the whole world is experiencing. In our implementation we utilize off-the-shelf hardware and industry standards demonstrating the high potential of our proposal while indicating that the technological barriers are significantly lower now a days.

Keywords : IOT, Lora-WAN, Smart farming

I. INTRODUCTION

The technological revolution brought by the Internet of Things (IoT) has inevitably started introducing major changes and enhancements in numerous application domains that include transportation, health, the environment etc. One application domain where we anticipate significant penetration of IoT-based technologies is agriculture with an increasing number of smart farming deployments and case-studies beginning to appear. Farmers and their agricultural advisors are set to benefit immensely from the introduction of the IoT in their sector provided that systems meet their needs and are affordable representing value for money.

The main contribution of our work is the fusion of data from the most modern sources of information i.e. IoT with longstanding sources for weather forecasting as well as crop related information. Based on the combination of information, recommendations for irrigation management are provided to ensure that crops are properly irrigated while water is conserved where possible. Moreover, our alerting concept is expected to help farmers protect their crops from adverse weather conditions. Note that we utilize off-the-shelf components in our proof-of-concept to demonstrate that the entry barriers are no longer 'very high'.

The rest of this paper is organized as follows: Section 2 contains background information on our work with Section 3 describing the key concepts of our system architecture. Section 4 presents our implementation and results with Section 5 concluding the paper with our summary and future work plans.

II. LITERATURE SURVEY

PAPER NAME	TRANSACTION	ADVANTAGE	DIS-ADVANTAGE
Base Paper: Internet of Things in Agriculture: a Decision Support System for Precision Farming (2019).	**Author:** Lambros Lambrinos **Serial number:** 978-1-7281-3024-8/19/$31.00 ©2019 IEEE	• Identification of temperature, atmospheric pressure ,humidity , etc. • Low cost , adaptation.	• Only large scale experiments can be conducted. • Requires more working time.
Reference Paper 1: A Machine Learning Based Smart Irrigation System with LoRa P2P Networks(2019)	**Author:** Yu-Chuan Chang+, Ting-Wei Huang*, Nen-Fu Huang*. **Serial number:** The 20th Asia-Pacific Network Operations and Management Symposium (APNOMS) 2019	• In the LoRa P2P network, we have eight radio channels for frequency hopping . • LoRa P2P module can be combined to the controller	• Applicable in rural areas. • Only two way communication.

PAPER NAME	TRANSACTION	ADVANTAGE	DIS-ADVANTAGE
Reference Paper 2: IoT agriculture system based on LoRaWAN(2018)	**Author:** Danco Davcev, Kosta Mitreski, Stefan Trajkovic, Viktor Nikolovski, Nikola Koteli. **Serial number:** 978-1-5386-1066-4/18/$31.00 ©2018 IEEE	• Maximum coverage of hundreds of square meters. • It provides Security layer.	• Struggles to provide sufficient indoor coverage. • Struggles to provide sufficient indoor capacity.
Reference Paper 3: LoRaWAN in Climate Monitoring in Advance Precision Agriculture System(2018)	**Author:** Nik Hisham Nik Ibrahim, Ahmad Rizan Ibrahim, Ibrahim Mat, Ahmad Nizar Harun MIMOS Berhad . **Serial number:** 978-1-5386-7269-3/18/$31.00 ©2018 IEEE	• Its use is perfectly suited for annual operating sensors. • LoRaWAN has long-range communication capabilities like cellular.	• Data transmission rate is limited. • Obstacles can reduce the wide coverage.

III. EXISTING SYSTEM

3.1 MONITORING TEMPERATURE FOR GRAPE FARMING:

The measurements can be in range that is preferred for optimal quality assurance in producing grape for wine, but frequently they can fall in range that is not optimal or even in range that is harmful for the production.

3.2 SMART MUSHROOM FARMING:

In a Smart Mushroom House condition utilizing control innovation, our test demonstrates unmistakably that a framework is productive to keep up the reasonable condition for mushroom development.

IV. PROPOSED SYSTEM

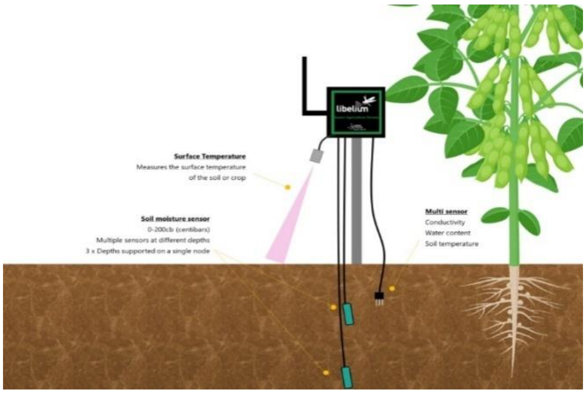
Our vision is to provide solution for the problem faced by the farmers in the agricultural fields. We cover the problems like:

4.1 Soil irrigation:

Soil irrigation is one of the major problem faced by the farmers our solution is that we use soil moisture sensor to measure the water potential in the soil. It transmit the data to the module and the Arduino board process the data and switch on the motor of the water pump using the drip irrigation method. During rainy days by using the interfacing rain sensor with Arduino -UNO pumps the water collected in the container to the water pump.

4.2 Soil nutrient enhancement:

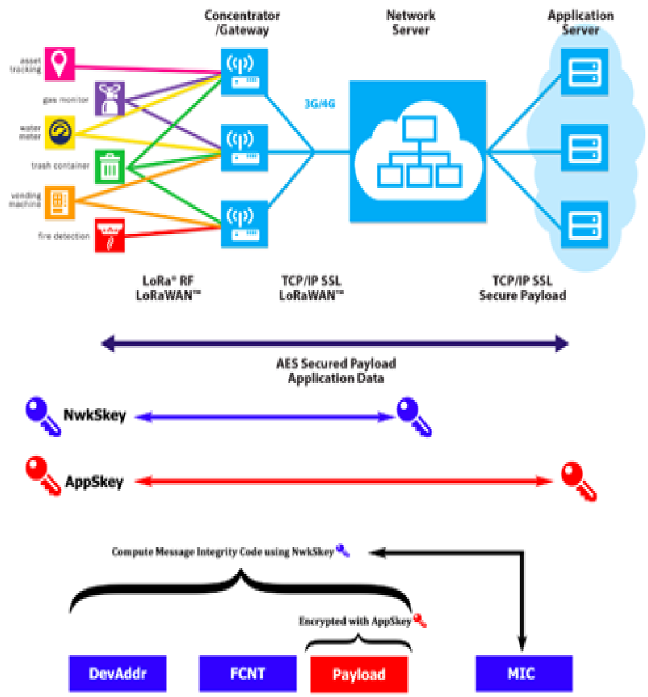
The soil nutrient sensor provides the necessary data in order to enhance the nutrients of the soil. This data allows the farmer to initiate all possible ways to improve the nutrient of the soil.



4.3 Organic farm practices:

Based on the data sensed by the sensor provide the deficiency in the soil and it insists the necessary organic fertilizers to be taken by the farmer for organic farming.

V. SYSTEM ARCHITECTURE



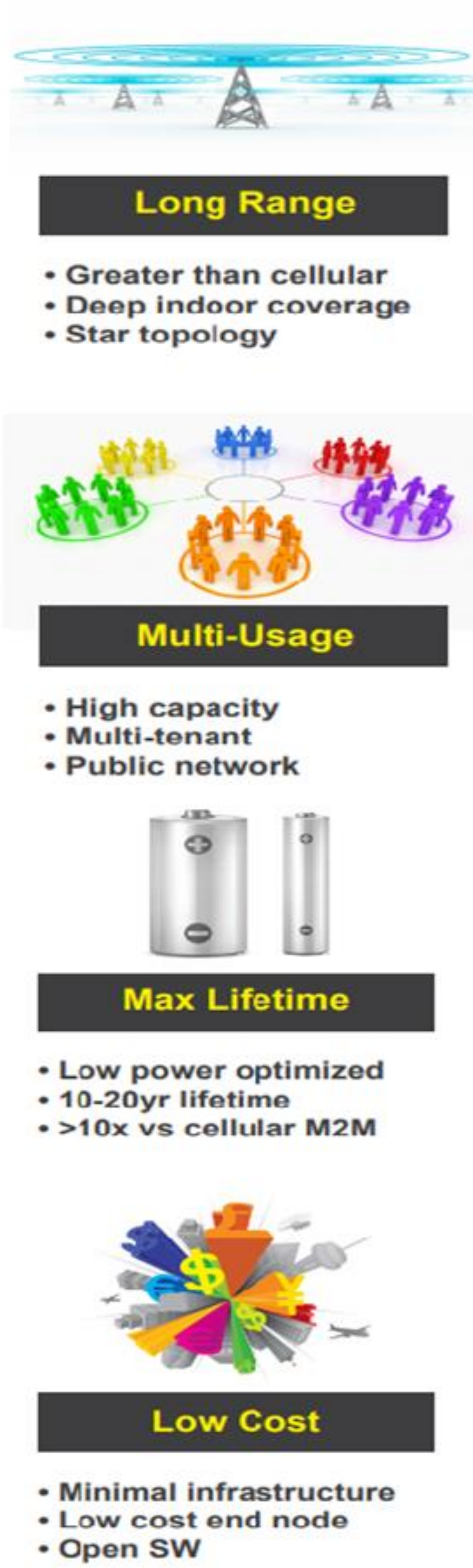
This is the architecture diagram of the proposed system what we are going to do in our project this architecture is built in a way that;

Firstly the senors senses the data from the ground or the area where we place them , then the sensors send the sensed data from it to a LoRa gateway to the network.

if we are going to access it through internet means we can upload and access it through the network.

if we are going to access it offline means that is without internet means we must connect it to another LoRa and then built it in star topology and then retrieve the data from it and then access it through the application.

ADVANTAGES OF PROPOSED SYSTEMS:



VI. SYSTEM MODULES

6.1 Soil moisture sensor:

Soil moisture sensor is used to sense the moisture content in the soil .The soil moisture sensor consists of two probes which are used to measure the volumetric content of water. The two probes allow the current to pass through the soil and then it gets the resistance value to measure the moisture value.

6.2 Rain drop sensor:

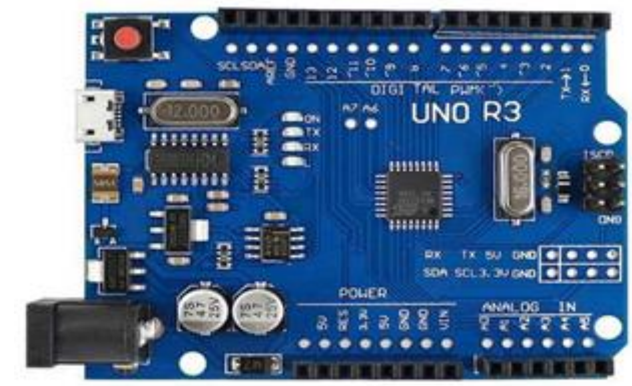
The rain drop sensor module is used for rain direction. Rain drops are collected on the circuit board; they create paths of parallel resistance that are measured via the op amp.

6.3 PH sensor:

A pH sensor is one of the most essential tools that are typically used for water measurements. This type of sensor is able to measure the amount of alkalinity and acidity in water and other solutions.

6.4 Arduino UNO:

Arduino UNO is a microcontroller board based on the ATmega328P (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator (CSTCE16M0V53-R0), a USB connection, a power jack, an ICSP header and a reset button.



6.5 LoRa module:

LoRa is a new, private and spread-spectrum modulation technique which allows sending data at extremely low data-rates to extremely long ranges. Libelium's LoRa module works in both 868 and 900 MHz ISM bands, which makes it suitable for virtually any country.

VII. CONCLUSION

The outcome of LoRaWan is long range of communication among the cultivators that creates a community and also uses IOT applications that helps in increasing the crop growth. There are 'n'number of sensors available in the market that can be used for various purposes in agricultural applications. By using Agro Wan, cultivators can have information about their field which can relatively increase their income in the field of agriculture that exponentially increases the income of the village as well.

VIII. CONCLUSION

In this monitoring and management for green environment.

IX. REFERENCES

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