Vishwakarma Institute of Information Technology

(Department of Electronics & Telecommunication)

Group No.: - B2

A Final Year Project Synopsis
Project entitled

"PreciFarm - Integrated wired and wireless IOT solution for Precision Agriculture"

(SPONSORED BY: Infiniti Systems)

(Domain: Embedded Electronics and IoT)

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INDEX

Sr. No.	Contents	Page No.
1	Introduction	3
2	Literature Survey	4
3	Objectives	5
4	Motivation	5
5	Block Diagram	6
6	Methodology	7
7	Hardware and Software requirement	8
8	Budget	8
9	Applications	9
10	Implementation plan	9
	References	10

1. Introduction:

IoT has the capability to influence the world we live in; advanced industries, connected vehicles, and smarter cities are all components of the IoT equation. However, applying technology like IoT to the agriculture industry could have the greatest impact.

In today's world farming is something which dates many problems. The need of the hour is to automize farming and use the trending technologies to solve the major issue. Against the challenges such as extreme weather conditions and rising climate change, environmental impact, wastage, no proper monitoring, unproductive yield resulting from intensive farming practices, the demand for more food has to be met.

PRECIFARM is an Integrated wired and wireless IoT Solution for Precise Agriculture aimed at solving problems using latest technologies available.

Precision farming based on IoT technologies will enable growers and farmers to reduce waste and enhance productivity ranging from the quantity of fertilizer utilized to the number of journeys the farm vehicles have made.

This Project uses WSN (Wireless Sensor Network) to cover large area fields, along with our own Cloud with latest development tools like Django platform for making User Interface Better and customized for the use.

2. Literature Survey:

- ❖ In farming maximum production requires certain parameters to be precise and some of them are as follows:
  1. Soil moisture
  2. Soil temperature
  3. Air moisture
  4. Air temperature
  5. UV and light

- ❖ The effects of soil salinity on plant growth are various, mainly in the following aspects :
  - ▪ Physiological drought. Too much soluble salt in the soil, the soil water potential was decreased with the increase of osmotic potential.
  - ▪ Destruction of normal metabolism.
  - ▪ Toxic effect of ions.

- ❖ The soil electrical conductivity is the indispensable parameter in the precision agriculture; it contains the soil quality and the physical properties of information. For example: salt, moisture, temperature, organic matter content in the soil and texture structure is different degree affects the soil electrical conductivity

- ❖ Considering other factors of farming we know that wastage is something which comes into highlight not only water but also fertilizers.

- ❖ Covering the range of field and maintaining the precision are two factors which need to go hand in hand.
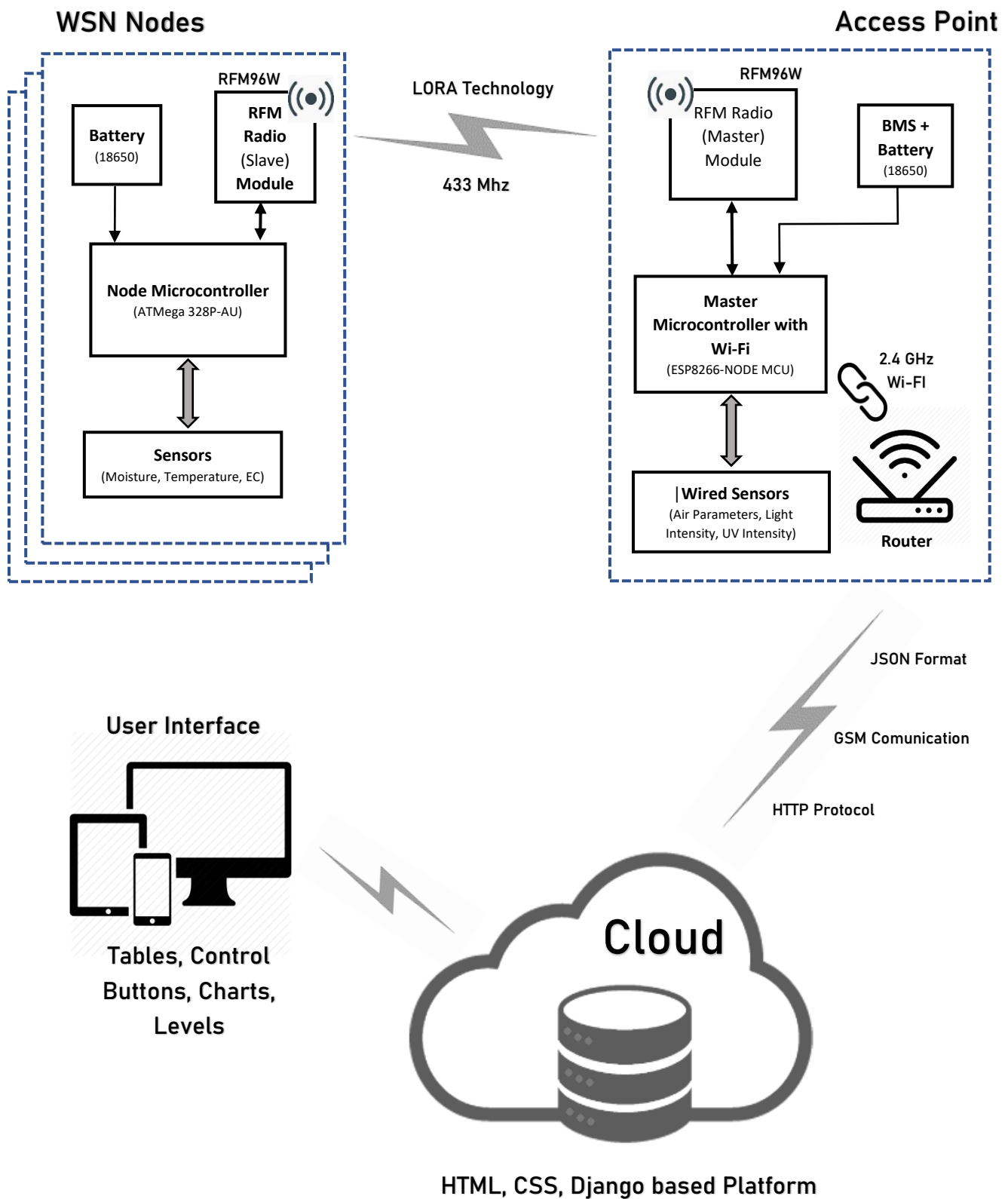
3. Objectives:

- To precisely monitor the parameters and build a robust interface in order to increase the overall efficiency of agriculture.
- Automation of the overall process along with increasing the efficiency, in order to increase the yield.
- To commercialize the project into a product for future development in the agriculture industry.

4. Motivation:

- Agriculture in today's world holds the utmost importance and working towards its precision is our duty.
- This is a small attempt by us where we have applied our engineering knowledge practically for a better green life tomorrow and a happier farming today.

5. Block Diagram:

WSN Nodes

Access Point

RFM96W

RFM Radio (Slave) Module

Battery (18650)

LORA Technology

433 Mhz

RFM96W

RFM Radio (Master) Module

BMS + Battery (18650)

Node Microcontroller (ATMega 328P-AU)

Master Microcontroller with Wi-Fi (ESP8266-NODE MCU)

2.4 GHz Wi-FI

Sensors (Moisture, Temperature, EC)

|Wired Sensors (Air Parameters, Light Intensity, UV Intensity)

Router

JSON Format

GSM Comunication

HTTP Protocol

User Interface

Tables, Control Buttons, Charts, Levels

Cloud

HTML, CSS, Django based Platform

6. Methodology:

- ❖ Initiation (requirements specification)
  - ▪ Listing of Hardware and Software Requirements
  - ▪ Selecting of Radio Modules
  - ▪ Selecting of Controllers
  - ▪ Selection of Battery and Management Systems
- ❖ Planning and design
  - ▪ Access Point Development (Hardware)
  - ▪ Node Development (Hardware + Software)
  - ▪ Node and Access Point Integration (Software)
  - ▪ Cloud Platform Development (Django)
  - ▪ User Interface Development (HTML, CSS)
- ❖ Execution (construction and coding)
  - ▪ Construction of needed Libraries for LoRa Mesh
  - ▪ Hardware Design and PCB Manufacturing
  - ▪ Integration of Code from Sensors till cloud
  - ▪ Django and Interface Integration Code
- ❖ Control and integration
  - ▪ PCB Assembly
  - ▪ Hardware Integration
- ❖ Validation (testing and debugging)
  - ▪ Testing and Debugging at every stage
  - ▪ Node and Access testing
  - ▪ Mesh Testing
  - ▪ Access Point with Cloud testing
  - ▪ Django Data Handling testing
  - ▪ User Interface to Hardware Connectivity and Control
- ❖ Closure (installation and maintenance)
  - ▪ Design of IPA rated Hardware Enclosure
  - ▪ Enclosure for various Sensors
  - ▪ 3D Printing of Enclosures

7. Hardware and Software Requirement

- ❖ Hardware:
  - ▪ ATMEGA 328P-PU
  - ▪ RFM 96W (LoRa Radio Module)
  - ▪ ESP8266 12-E
  - ▪ WIFI Hotspot
  - ▪ Battery Management Systems
  - ▪ Battery
  - ▪ 3D Printer
- ❖ Software:
  - ▪ Arduino IDE
  - ▪ KiCad
  - ▪ Espressif IDE
  - ▪ TinkerCad

8. Budget:

Sr. No.	Components	Price(₹)
1	**Node**	
1.1	RFM 96W LORA Module	340
1.2	ATMega 328P-AU	110
1.3	Battery (18650)	150
1.4	Sensor (Soil Moisture, Temperature, EC)	150
2	**Access Point**	
2.1	RFM 96W LORA Module	340
2.2	ESP-8266 NODE MCU	280
2.3	Battery (18650) - 3P	240
2.4	Sensor (UV Intensity, Light Intensity, Air Parameters)	1000
2.5	Battery Management System	300
2.6	LCD 16*2	150
2.7	SMPS Buck Converter	150
3	**Other components, packaging, wires, etc.**	1000
	TOTAL	**4210₹**

9. <u>Applications</u>

❖ Farming

PRECIFARM is a precision agriculture organization focused on ultra-modern agronomic solutions while specializing in the management of precision irrigation.

❖ Smart Greenhouses

This design intelligently monitors as well as controls the climate, eliminating the need for manual intervention.

For controlling the environment in a smart greenhouse, different sensors that measure the environmental parameters according to the plant requirement are used. We can create a cloud server for remotely accessing the system when it is connected using IoT.

This eliminates the need for constant manual monitoring. Inside the greenhouse, the cloud server also enables data processing and applies a control action. This design provides cost-effective and optimal solutions to the farmers with minimal manual intervention.

10. <u>Implementation Plan</u>

Work Plan	July 2019	Aug 2019	Sept 2019	Oct 2019	Nov 2019	Dec 2019	Jan 2020	Feb 2020	Mar 2020
1.	Listing Features and Sensor Requirements	Making of Components Lists	Starting with master node (Hardware and Programming)	Code for master Station	Node Module Design And code	Implementing LoRa Mesh And Setting up Mesh with master	Starting with Cloud	Frontend & Backend	Integration and Packaging

References :

❖ **Precision Agriculture (2019) 20:926–958**:

https://doi.org/10.1007/s11119-018-09624-8

❖ **LoRa Mesh Network Documentation:**

https://nootropicdesign.com/projectlab/2018/10/20/lora-mesh-networking/

❖ **Iot in Agriculture:**

https://www.iotforall.com/iot-applications-in-agriculture/

❖ **MEC10 ECE SENSOR DATASHEET**:

http://www.infwin.com/manage_zheqin/ewebeditor5_5/attachment/20170718114523993.pdf

❖ **LORA Module**:

http://www.open-sensing.org/lorablog/2017/2/28/working-with-adafruit-rfm9x-lora-radio-transceiver-modules

❖ **Django Documentation**:

https://docs.djangoproject.com/en/2.2/intro/

❖ **GitHub links:**

https://github.com/sandeepmistry/arduino-LoRa

https://github.com/nootropicdesign/lora-mesh

https://github.com/rptshri/Project_Major

https://github.com/rptshri/Project-Major-Documentation

Project Guide:

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