# Prototype Implementation of Ble Based Automated Data Collection Scheme in Agricultural System

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**ABSTRACT**: Due to a lot of base station requirement to provide network connection for large field area and continuous consumption of energy to collect data using smart phone sensing application ,smart data collection scheme is used to reduce excessive consumption of energy .The scheme which uses a smart phone to find automated measurement information collection from the sensor devices serves the purpose .hence the project comes up with Bluetooth Low Energy(BLE) based automated data collection scheme for agricultural measurement system.

**KEY WORDS**: Automated data collection scheme ,Sensor device ,IOS applications ,cloud storage ,Bluetooth low Energy(BLE)

## I.   INTRODUCTION

As the price of sensor devices are low , using of these sensors in the agricultural system can increase agricultural production. A number of sensing technologies are used in  agriculture providing data that helps farmers monitor and optimize crops  as well as adapt to changing environmental factors .Usually sensors use cellular network  to collect information ,but nowadays Bluetooth  and short range wireless communication are used. WIFI is a suitable solution when an existing network is available in a field .The typical field infrastructure does not provide electricity and network connection ,instead a lot of base stations provide a network connection to a large field area because WIFI devices support  one-hop communication. Nowadays smart phone have been used as a new data collection scheme .smart phone sensing application usually consumes energy to collect data continuously because it runs as a background process .But IOS   does not allow typical applications to run as a background process to reduce power consumption .So farmers and users suffered from excessive consumption of power due to background operation of the application to collect data. In order to overcome this, farmers may not accept the installation of the application. This paper develops  Bluetooth low Energy (BLE) based automated data collection scheme in Agricultural measurement system .BLE is a standard device to realize a short range communication with low power consumption. It is necessary to develop sensor devices with long life operation. The developed scheme used to collect the measurement information from the sensor devices with the help of smart phone. Therefore we developed a special application to collect measurement information through BLE communication .Automated data collection is the main advantage of this scheme .This shows how these sensing devices collect the data and can transfer to the cloud storage automatically without any user's operation.

         In subsequent sections we will be explaining the system component , implementation and the working of the sensors to collect the information and also explains how the data's are stored in the excel sheet.

## II. SYSTEM CONFIGURATION

In this wireless, agricultural and environmental sensing system for crop monitoring , many studies and researches have been done. Here in this system   we use five different types of sensors and an Arduino mega microcontroller.

**List Of Sensors:**
 1. LDR sensor
2. Level sensor
3. PH sensor
4. Humidity sensor
5. Temperature sensor

**LDR Sensor:**

It is basically a   resistance that changes with the light intensity that falls upon the object. It is  used in light sensing circuits.

**Level sensor:**

The level sensors is a device that determines the level of liquid or any other fluid that flows in a open or closed system.

**PH sensor:**

The PH senor is an electric device used to measure Hydrogen-ion activity in water based solutions, indicating its alkalinity or acidity expressed as Ph.

**Humidity sensor:**

A Humidity sensor sense and  measures and reports both moisture and air temperature.  Humidity sensor work by detecting changes that alter electric currents or temperature in air.

**Temperature sensor**:

A temperature sensor is a device , usually an RTD (Resistance Temperature Detector) or Thermocouple , that collects the data about temperature.

**BLE Communication:**

BLE is a 2.4 GHZ based short range communication technology .The system model of BLE has peripheral and central. The peripheral is used to broadcast messages.BLE is designed significantly to provide low power consumption.BLE has strict power requirements such as proximity sensors, heart rate monitors  and fitness devices.

**ARDUINO MEGA MICROCONTROLLER:**

It is a microcontroller meant to make the application more accessible and this features with  hardware designed around a 8-bit  AVR microcontroller.It is based on ATmega 328.It has 14 input and output pins in which 6 can be used as PWM outputs.
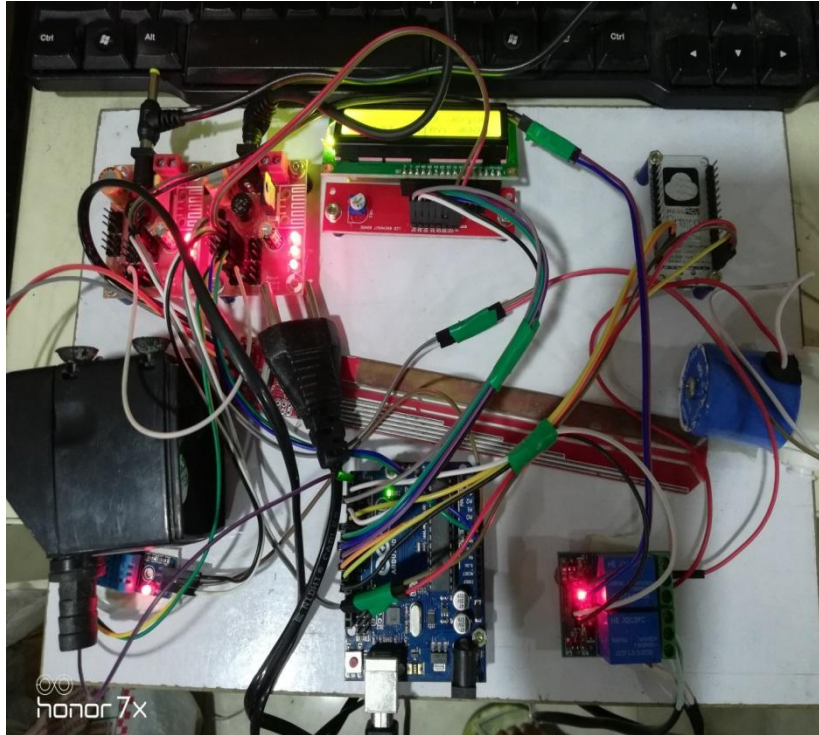
### III. AUTOMATIC DATA COLLECTION SCHEME

This is a computer application that facilitates the process of data collection.DCS displays the form that accepts data input from a user and then validates the input prior to committing the data to data base.DCS can be considered as the specialized form of content management system when they allow information to be published,edited or modified.This system has sensor device with BLE function, smart phone application and cloud storage.this idea can be applied to all the OS such as android OS .This prototype focuses on the IOS that is suitable to reduce power consumption.The application collects measurement information from sensor devices .When the BLE communication is established between sensor device and smart phone the measured information is transferred to cloud storage.Atlast the application writes the measurement time to sensor device as acknowledgement.

### IV. PROPOSED SYSTEM

In the existing system ,the power consumption  has been high and hence in order to reduce the power consumption the system of introduction of BLE in hydroponics system has been done.The automatic data collection scheme is implemented by arduino processor.the concept of hydroponics is introduced in this system. Hydroponics  is a method of planting trees  without soil by using mineral and nutrient solutions in aqua solvent.Terrestrial plants may be grown with only their roots with only their roots exposed to the mineral solution and  the roots may be supported by an inert medium,such as gravel.The field sensors  are used to collect information for agricultural field .
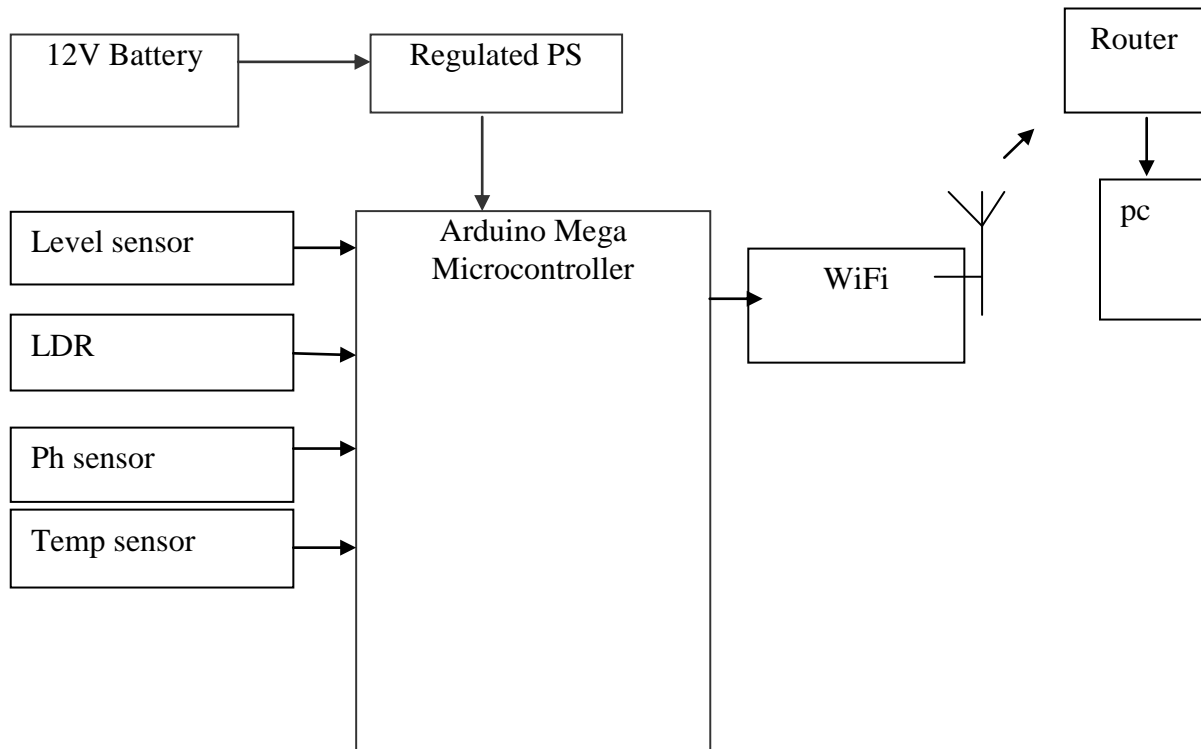
In this BLE based system ,the above five sensors senses and collects the information about the agricultural field and it is given to the arduino microcontroller.Arduino controller sends data to the router via a wifi.The router sends data to personal computer or laptops.

## V. EXPERIMENTAL RESULTS AND CONCLUSION

We have evaluated our developed system. Our developed OS is used to obtain the measured information and transfer it to the cloud storage .In this experiment sensor device stores the measured information and then it trasmits the message periodically. The experimental results show that the developed smart phone application can collect the data in excel form.

| Date | Time | Ph | Water Level | Light | Temperature | Humidity | Water Pump ON/OFF | Amount of Electrical Energy spent | Amount of water spent | |
|---|---|---|---|---|---|---|---|---|---|---|
| 08-12-2018 | 10:31:38 | 37.76 | 0 | 3 | 51 | PH: | 183 | ON | 0 | |
| 08-12-2018 | 10:32:08 | 7.12 | 21 | 43 | 51 | PH | 187 | ON | 3 | |
| 08-12-2018 | 10:32:34 | 7.12 | 21 | 43 | 51 | PH | 187 | OFF | | |
| 08-12-2018 | 10:32:50 | 7.79 | 18 | 21 | 47 | PH | 199 | OFF | | |
| 08-12-2018 | 10:33:35 | 7.83 | 19 | 14 | 46 | PH | 183 | ON | 2 | |
| 08-12-2018 | 10:33:57 | 7.71 | 17 | 15 | 43 | PH | 184 | ON | 2 | |
| 08-12-2018 | 10:34:22 | 8.53 | 0 | 0 | 41 | PH:8 | 184 | ON | 2 | |
| 08-12-2018 | 10:35:10 | 8.45 | 0 | 0 | 41 | PH:8 | 185 | ON | 0 | |
| 08-12-2018 | 10:35:32 | 27.39 | 0 | 27 | 42 | PH | 185 | ON | 2 | |
| 08-12-2018 | 10:43:58 | H:8.12 | 0 | 7 | 42 | PH:8 | 183 | OFF | | |
| 08-12-2018 | 10:44:20 | H:8.12 | 0 | 2 | 42 | PH:8 | 183 | OFF | | |
| 08-12-2018 | 10:45:04 | H:36.84 | 0 | 15 | 42 | PH | 203 | OFF | | |
| 08-12-2018 | 10:45:31 | H:36.98 | 0 | 8 | 44 | PH: | 192 | OFF | | |
| 08-12-2018 | 10:46:07 | H:36.98 | 0 | 9 | 46 | PH: | 192 | ON | 2 | |
| 08-12-2018 | 10:46:28 | H:37.02 | 0 | 0 | 47 | PH: | 193 | ON | 3 | |
| 08-12-2018 | 10:46:51 | H:37.06 | 0 | 5 | 47 | PH: | 196 | ON | 0 | |
| 08-12-2018 | 10:47:13 | H:37.13 | 0 | 4 | 47 | PH: | 192 | ON | 4 | |

HyDatalog

The above data shows the time, date, PH of the water, water level, temperature, humidity, amount of electrical energy spent and the amount of water spent in the form of excel sheet.

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