# A NOVEL DECISION SUPPORT SYSTEM FOR AGRICULTURE AUTOMATION USING ARDUINO SYSTEM

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***Abstract-***Soil agriculture system is to develop an automation agriculture system using a Node MCU board with Internet being remotely controlled by any Android OS smart phone. So that agricultural lands are irrigate automatically without physical present of farmer. Modern agriculture pumps are gradually shifting from conventional switches to centralized control system, involving remote controlled switches. Remote controlled agriculture automation system provides a most modern solution with smart phones for those persons who want to do agriculture without physically present on that place. In order to achieve this, a IOT (Internet of thing) module is interfaced to the Node MCU board at the receiver end while on the transmitter end, a GUI application ¡.e BLYNK application on the cell phone sends notifications and emails to the farmer about the motor status based on the moisture and temperature values. These notifications and emails are send to the farmer in two ways i.e. automatically and manually. In automatic process the motor status is automatically sent to the farmer by using BLYNK application ,where as in manual process by using the BLYNK application the user has to send the status by clicking on the buttons based on soil moisture and temperature values. Along with this we use a soil sensor. Which detect whether soil is dry or wet? When soil condition is dry then BLYNK app sends notification to user that motor is turned on and it will start the pump automatically. When soil becomes wet it sends the notification to the user that motor is turned off and it stops the water pump automatically. It works in accordance with the soil condition.

## I. INTRODUCTION

India is an agricultural country, wherein about 70% of the population depends on agriculture. Farmers have wide range of diversity to select suitable fruits and vegetables crops. However, the cultivation of these crops for best outcomes and producing quality product is purely technical aspect. This can be improved with the support of technology. The management of agriculture can be improved using automatic watering system. It proposes an automatic agriculture system for the agricultural lands. Currently the automation is one of the important roles in the human life. This proposal helps the
farmer to find the status of the crop at any time, also reduces energy, and saves time. Many companies, industries investing
a lot of amount in machinery for automation which is high in cost and not suitable for using in a farm field.
So here it also designs a smart agriculture technology in low cost which is usable by Indian farmers. Smart agriculture or precision farming is a recent concept that came
out of the Internet of Things (IoT) applications The growing IoT landscape can almost be applied to different sectors and the agriculture field has been the recent one .The combination of IoT along with predictive data analytics in agriculture can equip farmers with critical information on soil and environmental parameters to take actions. The driving factor behind smart agriculture has been the demand for more food production to increase yields, optimize interdependent resources of energy, water and land and impact of urbanization . With advances in technology, there is more push by global stakeholders like the Food and Agriculture Organization (FAO) for farmers to use innovative toolsand digital technologies . The agricultural sector is faced with challenges connected to limited availability of arable land, water and energy, global climate change, and labour supply.

As technology is advancing so agricultures are also getting smarter. Presently, conventional pump switches located in different parts of the agriculture land are makes it difficult for the user to go near them to operate and physically present on those areas. Even more it becomes more difficult for the elderly or physically handicapped people to do so.
We proposed an innovative GSM/Bluetooth based remote controlled embedded system for agriculture. The system sets the agriculture time depending on the temperature and humidity reading from sensors and type of crop and can automatically irrigate the field when unattended. Information is exchanged between far end and designed system via SMS on GSM network. A Bluetooth module is also interfaced with the main microcontroller chip which eliminates the SMS charges when the user is within the limited range of few

meters to the designated system. The system informs users about many conditions like status of electricity, dry running motor, increased temperature, water content in soil and smoke via SMS on GSM network or by Bluetooth.

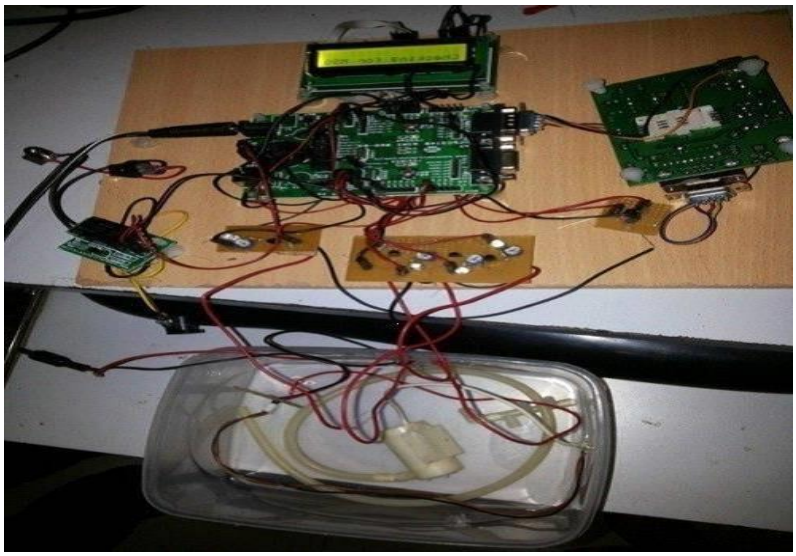


*Fig.1: manual layout for agriculture system*

Internet of Things (IOT)

Internet of Things (IoT) is the networking of physical objects that contain electronics embedded within their architecture in order to communicate and sense interactions amongst each other or with respect to the external environment. In the upcoming years, IoT-based technology will offer advanced levels of services and practically change the way people lead their daily lives. Advancements in medicine, power, gene therapies, agriculture, smart cities, and smart homes are just a very few of the categorical examples where IoT is strongly established. Over 9 billion 'Things' (physical objects) are currently connected to the Internet, as of now. In the near future, this number is expected to rise to a whopping 20 billion.

## II. PROPOSED METHODOLOGY

Agriculture is the backbone of Indian Economy. Because without agriculture living is impossible since agriculture produces the main source of food for us. The farmer has to toil himself day in and day out to produce the crop which brings him little revenue, so he has to try some other options for his sustenance, also today the availability of labour for carrying out agricultural activities is less, therefore the automation in agricultural process is needed. Agriculture system is critical in the development of agriculture of every country. It has been established that efficient agriculture processes has the potential of literally doubling the amount of food a farm processes. The smart agriculture model main aim to avoid water wastage in the agriculture process. It is low cost and efficient system. The main objective of this paper is to develop an automation agriculture system using a Node MCU board with Internet being remotely controlled by any Android OS smart phone. So that agricultural lands are irrigate automatically without physical present of farmer. As technology is advancing so agricultures are also getting smarter.

Modern agriculture pumps are gradually shifting from conventional switches to centralized control system, involving remote controlled switches. Presently, conventional pump switches located in different parts of the agriculture land are makes it difficult for the user to go near them to operate and physically present on those areas. Even more it becomes more difficult for the elderly or physically handicapped people to do so. Remote controlled agriculture automation system provides a most modern solution with smart phones for those persons who want to do agriculture without physically present on that place. In order to achieve this, a IOT (Internet of thing) module is interfaced to the Node MCU board at the receiver end while on the transmitter end, a GUI application ¡.e BLYNK application on the cell phone sends notifications and emails to the farmer about the motor status based on the moisture and temperature values. These notifications and emails are send to the farmer in two ways i.e. automatically and manually.

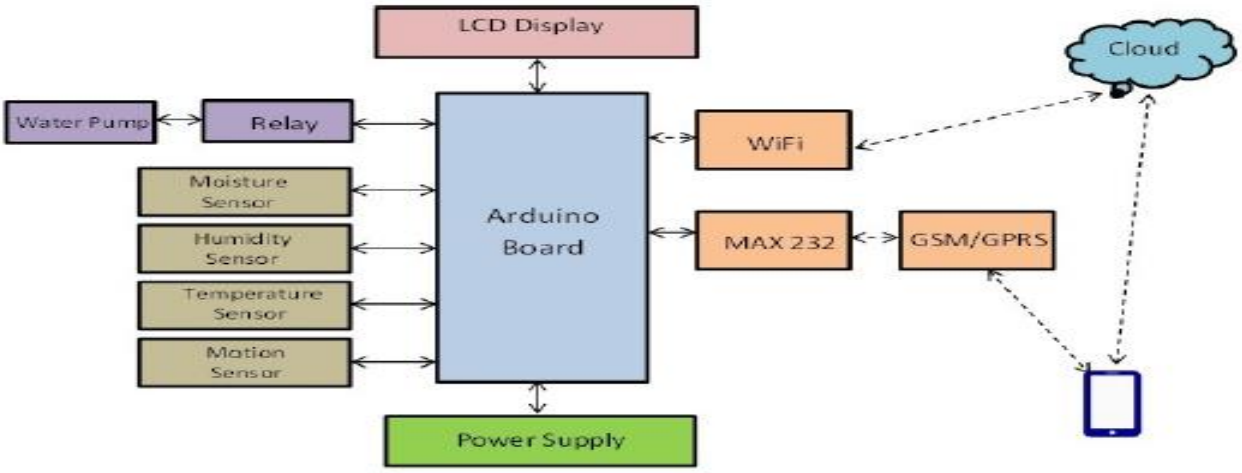



*Fig.2: Hardware diagram for proposed system*

## III. HARDWARE COMPONENTS

### A. *ESP8266 NodeMCU*

An ESP8266EX Wi-Fi module is a self-contained TCP/IP protocol that can able to access the any kind of Wi-Fi network. ESP8266 NodeMCU WiFi Module is an extremely cost effective, power management, requires minimal external circuitry, powerful enough in terms of storing capability and on-board processing. It allows integration of different sensors through GPIO pins with minimal run time. It is integrated with on chip self-calibrated RF allowing to work under any operating conditions.

Features:-

*1)* It supports WLAN 802.11 b/g/n and antenna di-versity.
*2)* It is integrated with a low power 32-bit Microcon-troller unit.
*3)* It is integrated with a 10 bit Analog to Digital Converter.
*4)* It is integrated with network protocols named TCP/IP protocol stack.
*5)* It is Integrated LNA, TR switch, matching network and power amplifier.
*6)* It is Integrated PLL, regulators, and power man-agement units.
*7)* To support WLAN here it use Wi-Fi technology (uses the 2.4 GHz spectrum ) and also it supports WPA/WPA2.
*8)* Supports networking operation modes like STA/AP/STA+AP.
*9)* Support the Smart Link Function for Android as well as iOS devices.
*10)* Supports connectivity like SDIO 2.0, GPIO (H) SPI, UART, I2C , IR Remote Control, PWM and I2S.
*11)* Also supports two types of frame aggregation A-MPDU and A-MSDU, having guard interval as 0.4s.
*12)* Deep sleep power < 10uA, Power down leakage current < 5uA.
*13)* The Wake up and the transmit packets < 2ms.
*14)* Standby power consumption is less than 1.0mW (DTIM3).
*15)* 802.11b mode the output power is +20 dBm.
*16)* To support working of this module the temperature is ranges from -40C to 125C.
*17)* Certified from FCC, CE, TELEC, WiFi Alliance and SRRC.

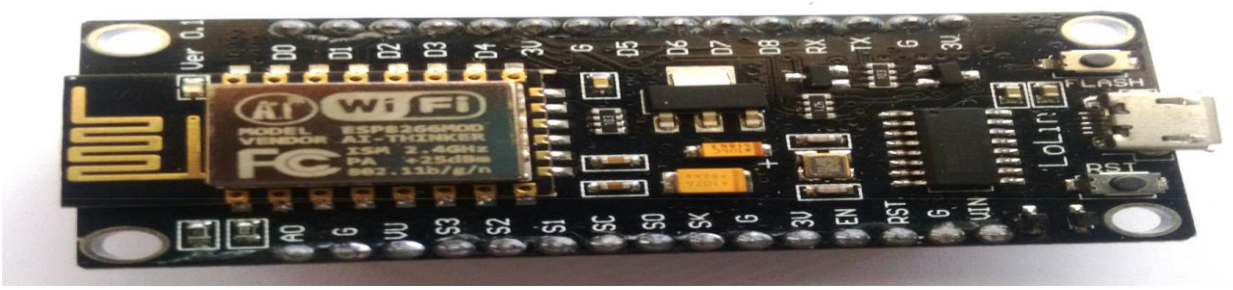



*Fig.3. ESP8266 NODEMCU WIFI Module*

*B. Soil Moisture Sensor:-*

The soil moisture sensor is used to detect the quantity of water in a soil. The dielectric permittivity of water tells the ability of water to pass the electricity through it. Basically it is having two electrodes and generating the electromagnetic field line across this sensors and effected area by this waves is around 2cm. The sensor generates the voltage proportional to dielectric permittivity. Means it is able to configure the dielectric permittivity of the soil. So overall it measures the resistance of soil. If higher the resistance lower will be the moisture content of that particular soil.

*Fig.3:Soil Moisture Sensor*

*C. Servo Motor:-*

The electrical motor is a device that has brought about one of the biggest advancements in the fields of Motoring and technology ever since the invention of electricity. A motor is an electro-mechanical device which converts electrical energy to mechanical energy. Lot of advancements has taken place in this field of Motoring since the invention of motors.

This Electric motors impact almost every aspect of modern living. Refrigerators, vacuum cleaners, air conditioners, fans, computer hard drives, automatic car windows, and multitudes of other appliances and devices all use electric motors. Electric motors are also responsible for a very large portion of industrial processes and manufacturing process

*D. Humidity and Temperature Sensor:-*

The Humidity and Temperature Sensor measures the amount of water vapour and temperature in the surrounding air of plant.

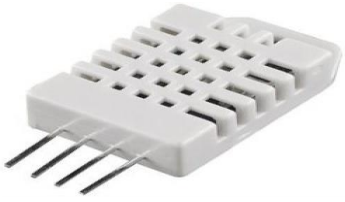
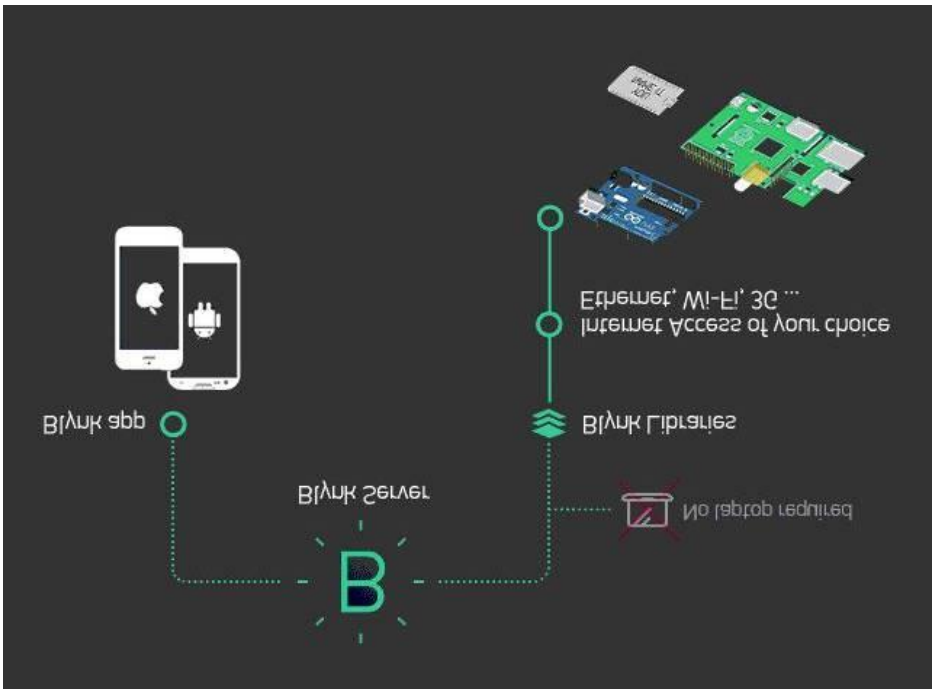


*Fig. 4: Humidity and Temperature Sensor*

*E. Blynk App:-*

BLYNK was designed for the Internet of Things. It can control hardware remotely, it can display sensor data, it can store data, visualize it and do many other cool things. There are three major components in the platform.




## IV. RESULTS

The results are obtain by using Node MCU as a hardware component and Arduino as a software and also we have used BLYNK app which is a mobile application to send the notification and email to the user regarding motor status.

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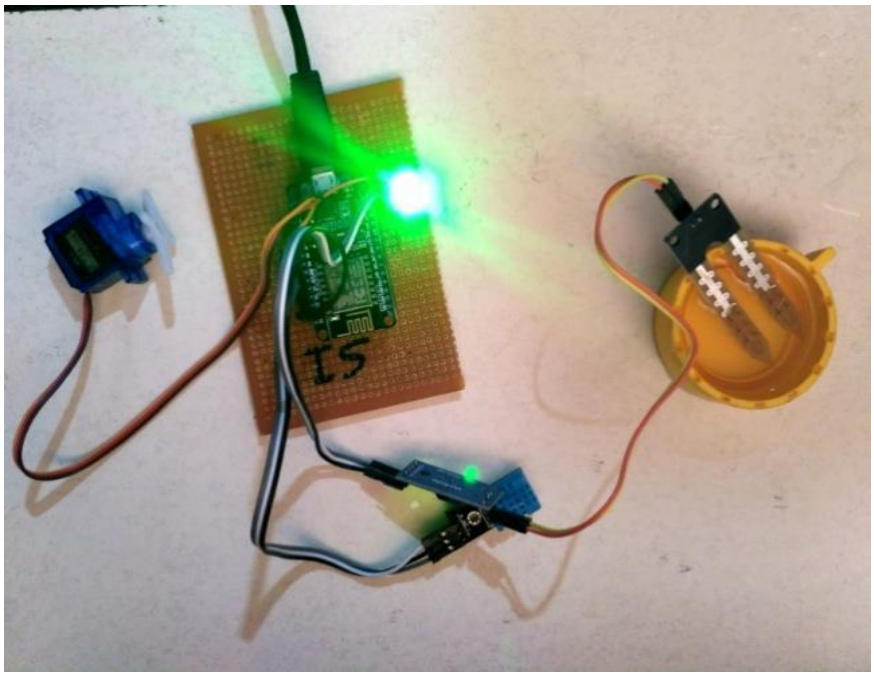
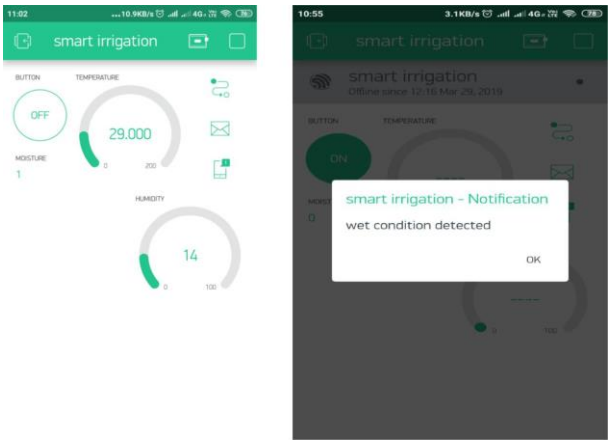
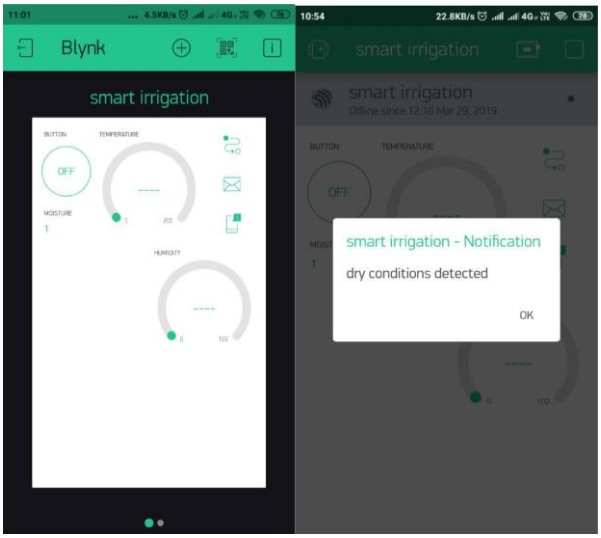


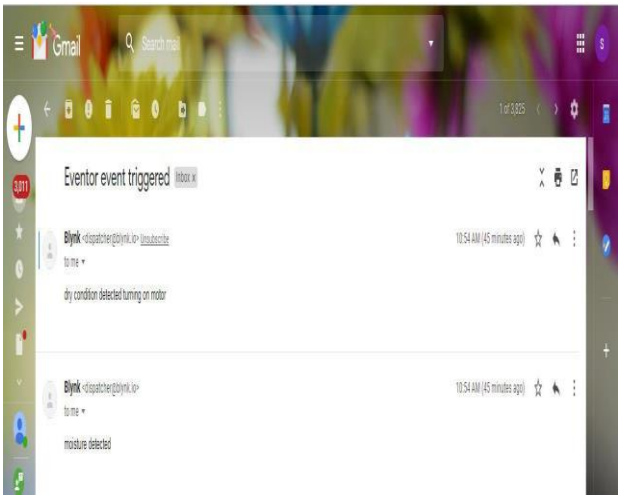
*A. Wet condition:-*




*B. Dry condition:-*




*C. Notifications:-*



## V. CONCLUSION

The smart agriculture using IOT has been experimentally proven to work satisfactorily by monitoring the values of humidity and temperature successfully. Through the internet control the motor in the field. It also stores the sensor parameters in the timely manner. This will help the user to analyze the conditions of various parameters in the field anytime anywhere. Then control or maintain the parameters of field properly. Finally, we conclude that automatic agriculture system is more efficient than scheduled agriculture process.

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