

# A BLUETOOTH BASED AUTOMATIC IRRIGATION SYSTEM

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**Abstract** - An automated irrigation system was designed based on Bluetooth to use in the agricultural crops. The Bluetooth is a wireless radio communication between the farmers Smartphone and the Arduino. The Bluetooth is preferred because of its cost efficient, so that it can be affordable to almost all farmers. This paper describes the details of the design and instrumentation of wireless network, control of irrigation system with correct soil, water, and temperature content. Also the light emitted by AC load is also sensed by LDR. The information on the Arduino is displayed in the LDR. The experimental results show that the use of Bluetooth in the irrigation process of agriculture could become a practical tool for agriculture.

**Key Words:** Automatic irrigation system, Bluetooth based irrigation system, Arduino Uno controlled irrigation system, Low cost irrigation system, and Low power consuming irrigation system.

## 1. INTRODUCTION

Irrigation is the delivery of water to grow crops. The irrigation system helps the farmers to have less dependency on rain-water for the purpose of agriculture. The types of irrigation are Tanks, Well, Canal. Some 53.5 billion gallons of groundwater are used daily for agricultural irrigation. In today's irrigation method, 2000 more cubic km of water will be needed per year. It is mainly used to monitor temperature, humidity, light intensity and water level. In this paper, an automatic irrigation system that works based on Bluetooth wireless network by the use of Arduino UNO is designed in order to reduce the manual work of farmers using Bluetooth based smart wireless sensor network.

## 2. LITERATURE SURVEY

An automated irrigation sensor uses a Smartphone to capture and process digital images of the soil nearby the root zone of the crop and estimates the water content. An android app was developed in the Smartphone to operate the direct computing and connectivity components such as digital camera and WIFI network. This device characters include high performance at low power consumption, has vast memory, running frequencies of over 1GHZ and contains high resolution touch screen with graphics capability. Irrigation sensor is a low power consumption standalone device [1]. This method is used to reduce waste of water and maximize the crop yield. To acquire heterogeneous environment and control the function of irrigation system, WSN technology is used [2]. Satellite observations are used

to estimate surface parameters for irrigated agricultural system and evaluate land surface attributes. It is conclude Urbanization increases land surface temperature but irrigation decreases land surface temperatures [3]. The temperature coefficients of both saline solution and sensor circuit are picked up to produce accurate temperature [4]. An irrigation machine was converted to be electronically controlled by a programmed logic controller that updates the location of sprinklers. Communication signals from sensor and irrigation controller were interfaced using low cost a Bluetooth wireless radio communication [5]. The two most important input parameters for agriculture are water and electricity. Agriculture is very water and electricity intensive. CoT based automated irrigation system provides more effective energy uses for pumps, lighting, boosters, remotely control the status ,working conditions and performance of equipments. Cot provides number of advantages. Also it generates performance reports and statistics to provide the farmer with real-time information on the activity and to enable the farmer to make well informed and timely decisions [6].

## 3. AGRICULTURE



Figure 1: Agriculture in India

Agriculture or farming is a process of cultivation and breeding of animals, plants and micro-organisms present in soil such as fungi for food, medicine, fuel and other products that are essential for leading a self-sustainable and auto enhancing human life. Agriculture play a vital role in rise of human civilization which led to farming of domesticated species with the motive of creating food surpluses that nourished the developing civilization. The agriculture is the back bone of Indian economy and ranks second world wide for agro products in today's scenario. Agriculture along with its supporting sector accounts 13.7%as its contribution

to Indian GDP. Agriculture is a sector where more human power is required along with climate support. This sector does not yield money as much as its products. Though the monetary benefit is less, the demand for agro-products increases with increase in population as it is the only source for food and nutrients to human beings.

#### 4. IRRIGATION

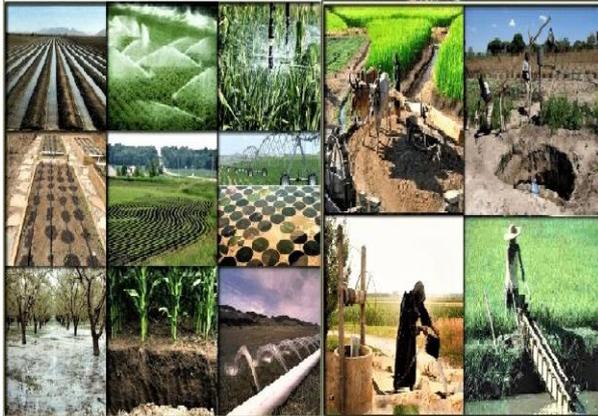


Figure 2: Different types of irrigation

Irrigation is a process of watering the crops in the field in controlled manner at specific intervals of time. It plays a most significant role in agriculture such as distribution of soil nutrients to crops; maintain landscapes and collection of distributed soil from dry area, etc. Irrigation is must for agriculture both in modern and organic way during the season where monsoon fails. In organic farming farmer depend on seasonal rainfall and this type of farming is known as dry land farming. In today's environment dry land or rain-fed farming is not completely reliable. Thus, irrigation technique is employed. The irrigation technique varies from country to country, region to region, state to state as it has to be adapted to climatic condition, soil types and variety of the crop in agricultural fields.

#### 5. AUTOMATIC IRRIGATION SYSTEM (EXISTING SYSTEM)



Figure 3: Automatic irrigation system

The irrigation process used for cultivation of crops in order to supply the required amount of water to them during inadequate rainfall can be automated. Though irrigation technique varies depending on soil type, water availability and type of crop. An automatic system can be developed using micro-controllers which can adapt to any type of irrigation method with a main objective to cut down the man power once and for all after its installation. Some of such systems which differ in their circuits, components used and their way of working are elaborated here.

##### 5.1. Automatic Irrigation System Based on Soil Moisture Sensing



Figure 4: Automatic Irrigation System Kit

In this system, 8051 micro-controller is used to control and co-ordinate the entire process of irrigation. The required power of 5v is given by a supply circuit that contains a transformer, bridge rectifier circuit and a voltage regulator. The soil moisture content is measured by using two metallic rods. These metallic rods are inserted in the soil and their output is given to an OP-AMP IC which acts as a comparator and compares the sensed value with the fixed value. The output of this OP-AMP is given to the 8051 controller which ON (or) OFF the submersible pump of the motor through a relay driver circuit.

##### 5.2. Solar Powered Auto Irrigation System



Figure 6: Solar Powered Auto Irrigation System Circuit

This system is enhancement of the above mentioned system. Here the power required to drive the entire system is obtained by harnessing solar energy by using photo-voltaic cells. The moisture content of the soil is determined by inserting two stiff copper wires in the soil which output is given as input to OP-AMP IC -the comparator. The output of comparator is given as input to 8051 which decides whether the motor to be ON (or) OFF and implement it through driver circuit.

### 5.3. GSM Based Automatic Irrigation System

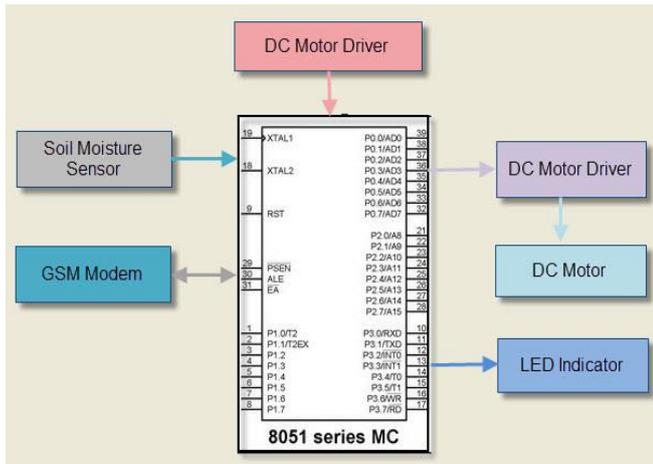


Figure 8: GSM Based Automatic Irrigation System

In this system, a GSM modem is used for indicating the Status of the irrigation system. Here, the soil moisture is sensed by a sensor whose output is given as input to 8051 micro-controller. Depending up the result of soil moisture sensor, the motor is switched ON or OFF by 8051 through motor driver circuit or relay. The status of the motor is indicated to the farmer through the SMS by the GSM module. Similarly the farmers can control the irrigation system through an SMS.

### 6. DESIGN OF BLUETOOTH BASED AUTOMATIC IRRIGATION SYSTEM

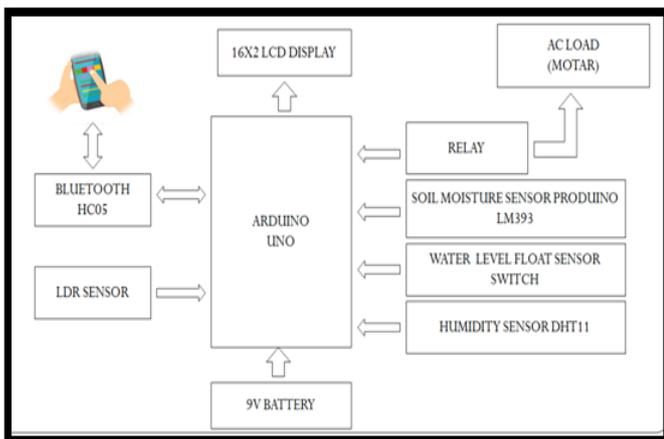


Figure 9: Block Diagram of the Proposed System

The project aims at designing a Bluetooth based smart wireless sensor network for monitoring an Agricultural Environment. Bluetooth is a wireless technology that uses radio frequency to transmit data through the air. Bluetooth has initial speeds of 1mbps to 2mbps. Bluetooth transmits data in the frequency band of 2.4 GHz. It works by implementing the concept of frequency division multiplexing.

### 7. WORKING OF THE IRRIGATION SYSTEM IN THE FIELD

The Arduino Uno is a boot loader which has inbuilt ATMEGA microcontroller, programmer and an assembler. Thus, it functions like a micro controller. The initial step of working is that the signals are send from Smartphone through the Bluetooth HC05 to the Arduino Uno. Four types of sensors are humidity sensor, moisture sensor, water level sensor and LDR sensor. To check the level of water in the wells, water level sensors are employed and it works like switch. When the sensor is floating in water, it sends a digital 0 to the Arduino and the circuit operates in closed manner indicating that there is adequate water in the well. Similarly when the sensor is not floating in water, it indicates that the water content in the well is low; the circuit becomes open and sends a digital 1 signal to the Arduino. Thus the Arduino OFF the Motor using the relay driver and sends an alert message through the Bluetooth as "Water Level Low". Humidity sensors detect the relative humidity of the immediate environments in which they are placed and when it is likely to rain, the sensor read a high value which leads to tripping of the Motor when moisture is low in soil by the Arduino. It is indicated to the farmers by sending a message that "Humidity occurred" and the Motor can be OFF by sending "2" through the Bluetooth. A Light Dependent Resistor (LDR) or a photo resistor is a device that senses the light radiation. Thus it is also known as photo conductors, photo conductive cells or photocells. The motor is turned on and off by a relay.. After collecting the information it is displayed on the 16X2 LCD screen. Finally the Arduino transmits alert information to the farmer's Smartphone through the Bluetooth.

### 8. PROTEUS SIMULATION DESIGN OF THE PROPOSED SYSTEM

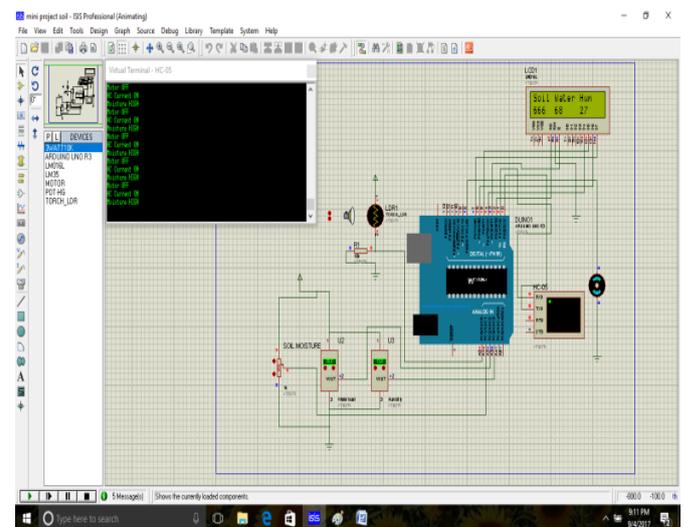
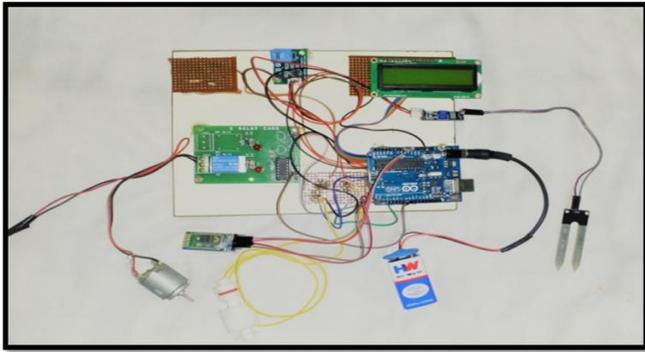


Figure 10: Proteus Simulation Design of the Proposed System

## 9. PROTO-TYPE MODEL OF PROPOSED SYSTEM



**Figure 11:** Proto-type Model of the Proposed System

## 10. CONCLUSION

The design proposed in this paper incorporates the usage of Arduino-Boot loader. Arduino board designs use a variety of microprocessors and controllers and also the board is equipped with sets of digital and analog I/O pins which can be interfaced to various expansion boards and other circuits along with inbuilt ADC IC for signal conversion turned as boon to the proposed system. Automation is done using wireless sensor network reduces the delay when compared to a circuit designed using OP-AMP IC and to increase the accuracy of measuring the physical quantities for real time environment. The Bluetooth's connection establishment is very quick, has less interference and data communication is more secure than GSM and cut down the cost of the system. Thus the design proposed in this paper is low cost, low power consuming, more efficient and secure which helps to reduce the manual work of farmers and this system helps the farmers in a huge way for their agricultural process.

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