



# IRRIGATION PUMP AUTOMATION USING BLUETOOTH

Mamatha Balipa<sup>1</sup>, Pradeep Kumar<sup>2</sup>, Harshaa K<sup>3</sup>, Vicky Shet<sup>4</sup>

<sup>1</sup>Associate Professor, Dept. of MCA, NMAM.I.T, Nitte

<sup>2</sup>Associate Professor, Dept. of E & E, NMAM.I.T, Nitte

<sup>3,4</sup>Student, Dept. of MCA, NMAM.I.T, Nitte

## Abstract

**This paper is to help the farmers who are in remote areas where there might be no cellular network availability to switch on and off the Pump remotely without going near pump using Bluetooth enabled Android Phone. Previously farmer has to go to farm in order to switch on or off the pump which was difficult because of difficult terrain and weather conditions or during night time visit to pump may be wild animals out there or frequent power cut problems which eliminates frequently travelling to pump. Keywords: Android; Bluetooth;Automation; Irrigation Pump**

## I. INTRODUCTION

Supplying water to Agriculture fields plays major role in growing the good crops, the farmer has to water the fields every now and then, and in order to switch on or the pump he has to go near the field now and then not even in normal weather conditions but also in bad weather which we can eliminate by using this smartphone, microcontroller and bluetooth technology. Bluetooth is available in almost all modern smartphone that works with the radio waves that works in smaller coverage area and no need of network connectivity like internet or cellular network. This paper is proposed to control the irrigation pump remotely through the android phone with bluetooth which can be used to control the pump via the arduino uno microcontroller using relays to control the switching on or off pump and checking whether pump is either on or off using sensors. The components used here is very cost effective and affordable. This paper describes the components used in section 2 and then followed by block diagram or architecture of this system in section 3. Implementation in section 4 finally end with future, acknowledgment, conclusions.

## II. COMPONENTS USED

### A. *Arduino Microcontroller (Arduino Uno)*

Arduino<sup>[2]</sup> is an open-source hardware electronics platform for building interactive projects. The Arduino Uno is a microcontroller board based on the ATmega328<sup>[12]</sup>. It has 14 digital input/output pins, 6 analog inputs, a 16MHz crystal oscillator, a USB connection, a power jack that works with 5 volt, an ICSP header, and a reset button.

### B. *Bluetooth Module (HC -05)*

Bluetooth HC-05<sup>[3]</sup> module is an easy to use Bluetooth SPP (Serial Port Protocol module), designed for transparent wireless serial connection setup. The HC-05 Bluetooth Module can be used in a Master or Slave configuration and it operates on two mode DATA mode and COMMAND mode. The HC-05 Bluetooth Module has 6 pins TXD, RXD, VCC, GND, EN, STATE.

Serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband which used to simplify the development.

### C. *Relay*

Relay<sup>[5]</sup> is a device that works based on the principles of electromagnetic switch operated by a relatively small electric current that can turn on or off a much larger electric current. A relay as a kind of electric lever, switch it on with a tiny current and it switches on another appliance using a much bigger current. Here we used 2-channel relay module, which is designed to be integrated with 2 channel relays that it is capable of

control 2 relays, it 4 pins - GND, IN1, IN2, VCC.

When the current is switched off, the contacts open again, switching the circuit off. A relay completely separates two circuit which operates on different voltage so it is used where a safe low-voltage circuit controls a high-voltage circuit.

#### D. Current Sensor(ACS712)

A current sensor<sup>[8]</sup> is a device that can detect electric current (AC or DC) in a wire, and generates a signal proportional to it. The generated signal could be analog voltage or current or even digital output. Hall Effect current sensor is a type of current sensor which is based on phenomenon of Hall Effect discovered by Edwin Hall<sup>[8]</sup> in 1879. The Hall effect is the production of a voltage difference (the Hall voltage) across an electrical conductor, transverse to an electric current in the conductor and a magnetic field perpendicular to the current. Here we used ACS712 Hall Effect-Based Linear Current

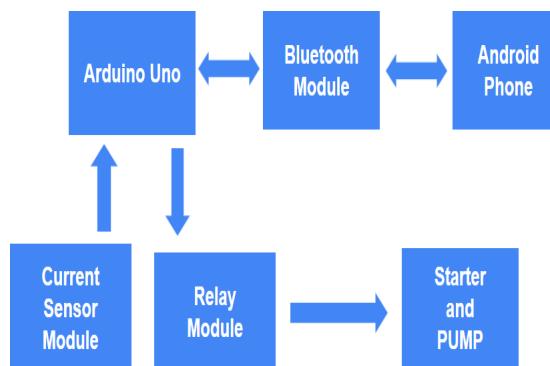
#### E. Android Phone

Android<sup>[1]</sup> is an open source Operating System for smartphones which is based on Linux Kernel mainly works with touchscreen using touch gestures and contains several sensors. It is also used in smart watches and smart TVs.

### III. SYSTEM MODEL

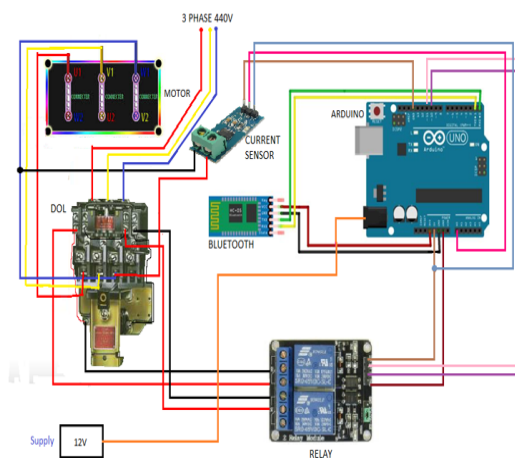
Here we have the block diagram of a system that has an Android phone to control the pump with the application that can easily connect and send data through bluetooth devices using a bluetooth module which is attached to the Arduino Uno microcontroller which is in turn connected to a relay module to switch on and off the pump using small current to switch larger circuit, the sensor module is also connected to the current Arduino that senses the current in the circuit to determine whether the pump is on or off. The relay is directly connected to the starter of the pump. When we send an on message from the app on the Android phone to Arduino's bluetooth module that receives the message and sends it to Arduino then Arduino interprets it and sends a signal to the relay to turn on the pump, this is the same for turning off the pump. To check if the pump is either on or off, when we send a check message from the phone the Arduino receives it and gets the reading from the current sensor, the reading from the current sensor value is proportional to the current

in the circuit and if the current is above the threshold value we assume that the pump is on and send back a message to the Android phone.



### IV. IMPLEMENTATION

We have built a system for automation of 3 phase Agriculture pump with Arduino Uno<sup>[2]</sup> using a bluetooth module HC-05<sup>[3,4]</sup> and a 2 channel relay module<sup>[3]</sup> and a Hall Effect current sensor ACS712<sup>[9]</sup> and we wired up all the components then we used Arduino IDE we developed an application for an Android phone over Jellybean OS using Android Studio<sup>[6]</sup> that can connect to a bluetooth device and send messages and receive messages. In the UI part we have 3 buttons called ON, OFF and CHECK respectively for turning the pump on, off and checking if the pump is on or off. The below shows the connection setup of the system.



The bluetooth module is connected to the Arduino ATmega328 microcontroller, digital pin no 1 is used for sending (TX pin) and digital pin no 0 for receiving (RX pin) and here the bluetooth module is powered with the onboard 5 volt power supply but HC-05 module power ranges from 3.3v to 5v (VCC pin) and GND pin as ground. The relay module used here is a 2 channel PNP type that is

also powered with 5volt and out pin is connected to 10th and 11th digital pin of arduino,the relay module is also connected to the pumps starter DOL<sup>[13]</sup> on circuit and off circuit.The Current sensor modules works with 5volt and out pin is connected to analog A5 pin of arduino and also connected to one of the lines between pump and starter.

#### V. FUTURE SCOPE

The Automation can be implemented for switching ON/Off the pump using timers in a Scheduled way and turn on Pump only if water is present in well.The project can be modified to be used with other device too.Project can be implemented with wifi or other technology so that it could be used greater distance.The Moisture sensor can be used so that we can detect the moisture in the soil.

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#### CONCLUSION

This system is cost effective and helpful for irrigation process, helpful for the remote locations where there is no network availability farmers can use their mobile phones to control the pump using Bluetooth. We can control the pump easily without wasting time to go near the pump in the field which saves the time using automation of irrigation pump.

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