iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 10 **Issue:** VI **Month of publication:** June 2022

DOI: https://doi.org/10.22214/ijraset.2022.44206

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue VI June 2022- Available at www.ijraset.com

GSM Based Motor Control System with Water Level Monitoring

Korukanti Ashray[1], Kavali Poornoday[2], Yeravelli Manideep[3], T. Venkata Rao[4]
[1, 2, 3]*B.Tech Scholars, Dept. Of Electronics And Communications Engineering, SNIST, Hyderabad, Telangana, India.*
[4]*Associate Professor, Dept. Of Electronics And Communications Engineering, SNIST, Hyderabad, Telangana, India.*

Abstract: ***Agriculture is the backbone of India's economy. In the eyes of the villagers, the agricultural sector is highly significant. The key factor that determines the productivity of agricultural fields is water supply. Irrigation is a technical procedure that involves artificially delivering water to cultivated land or soil. Irrigating the land with an agriculture motor involves pumping groundwater to the surface. This concept makes farming easier for farmers by allowing them to manage their field's Motor from their mobile devices. A Control system, according to a wise scientist, is a system that will enable us to shut down the machine at any time. That is the distinction between a machine that is controlled and one that is not. It is the goal of our project to make this control system more efficient and dynamic. The automatic control, as the name implies, is used to regulate the Motor from a remote location, monitor its working parameters, and get input from the Motor itself. Our goal is to control the Motor from afar using a mobile DTMF tone and receive feedback via SMS when it is on or off. These feedbacks are also sent to us by SMS. Because the GSM network is available everywhere in our country, we decided to use it to control our Motor and send feedback. We also use the GSM network because it eliminates the requirement for additional networking equipment. We utilize a GSM modem at the motor end to transmit feedback signals, and we generate control signals using mobile DTMF because it is very simple to generate DTMF using a mobile station and send feedback SMS using a modem. In the industrial sector, we expect that our project will be useful and cost-effective in operating motors.***
Keywords: Global system for mobile communication(GSM); short message service(SMS); Dual tone muti-frequency (DTMF); Irrigation; Agriculture.

I. INTRODUCTION

India is primarily an agricultural country, with agriculture providing all of the country's resources. Even in the modern era of industrialization, agriculture remains the most important factor in determining the country's economic progress. Agriculture also contributes for 8.56 percent of the overall exports of the country.

Agriculture is the most significant field in India. However, compared to other fields, the subsurface water level is slowly declining, and rainfall is also decreasing as a result of deforestation. In order to get the highest possible production in the agricultural process, the appropriate amount of water must be delivered on a regular basis. Only a well-planned irrigation system can accomplish this.

Irrigation is the science of planning and designing an effective, low-cost, and cost-effective irrigation system that is tailored to the needs of the environment.

Crop yield will be increased by constructing a proper distribution system and providing an appropriate water supply. These days GSM based project works are gaining popularity because of the unique facilities provided by the GSM network. The term GSM stands for Global System for mobile communications, and the network is designed based on European standards. Many concepts from simple to complex systems are designed based on this technology for various applications, but where the system designed with the GSM module is quite unique, and it is quite useful for domestic as well as commercial applications to control the appliances and get the information of accidents.

II. DESCRIPTION

In our project, we are controlling the agricultural Motor manually and with mobile. When the power supply is given or made ON, the owner of the field receives SMS, and he also receives the level of the water in the tank. Thus, in our project farmer's one of the problems is solved. i.e., A farmer can control his field's Motor with his mobile from anywhere at any time. Here power conservation is also done.

©IJRASET: All Rights are Reserved

A. Owner Receiving SMS Format

Alert water is empty Motor is OFF.
Alert, water is 10%
Alert, water is 50%
Alert, water is 90%
Alert, Motor is ON
Alert, Motor is OFF

III. HARDWARE AND SOFTWARE REQUIREMENTS

A. Hardware Requirements :

The hardware requirements for the system are as follows:

1) *(0-9)V transformer*: The 0-9 750mA Center Tapped Step Down Transformer is a general-purpose mains transformer for chassis mounting. The transformer's primary winding is 230V, and the secondary winding is centre-tapped. Flying-coloured insulated connection lines adorn the transformer (Approx. 100 mm long). The transformer acts as a step-down converter, converting 230V AC to 9V AC. The transformer has 9V and 0V outputs. The construction of the transformer is described below, including solid core and winding details. The transformer is a static electrical device that transfers energy between its winding circuits via inductive coupling. A changing current in the primary winding causes a changing magnetic flux in the transformer's core and, as a result, a changing magnetic flux in the secondary winding. In the secondary winding, the variable magnetic flux causes a varying electromotive force (E.M.F) or voltage. The transformer's cores are built of silicon steel with high permeability. The core serves to considerably lower the magnetizing current and confine the flux to a channel that closely connects the winding because steel has a permeability several times that of open space.

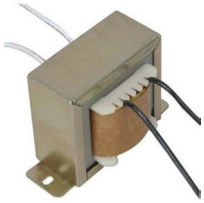


Fig 3.1: 9v Step-Down Transformer

Specifications of 0-9 750mA Center Tapped Transformer:-

- Input Voltage: 230V AC
- Output Voltage: 9V or 0V
- Output Current: 750mA
- Mounting: Vertical mount type

2) *Arduino Uno*: The Arduino ATMega 328p is a microcontroller board based on the ATmega328p. A 16 MHz crystal oscillator is provided, as well as 54 digital input/output pins (of which 15 can be used as PWM outputs), 16 analogue inputs, 4UARTs (hardware serial ports), a USB connection, a power jack, an ICSP header, and a reset button. It includes everything you'll need to get started with the microcontroller, including a USB cable to connect it to a computer and an AC-to-DC adapter or battery to power it. The ability to control several appliances from a single board is a huge plus.

Fig 3.2:Arduino uno ATmega328P

Microcontroller	ATmega328
Clock Speed	16MHz
Operating Voltage	5V
Maximum supply Voltage (not recommended)	20V
Supply Voltage (recommended)	7-12V
Analog Input Pins	6
Digital Input/Output Pins	14
DC Current per Input/Output Pin	40mA
DC Current in 3.3V Pin	50mA
SRAM	2KB
EEPROM	1KB
Flash Memory	32KB of which 0.5KB used by boot loader

Fig 3.3: Arduino ATmega328p specifications

3) *GSM Modem:* A GSM modem is a phone that accepts SIM cards from any GSM network operator and has its own phone number. This modem contains an RS232 interface that may be used to connect with and develop embedded programs, which is a big plus. GSM can be used to perform SMS control, data transfer, remote control, and logging applications.

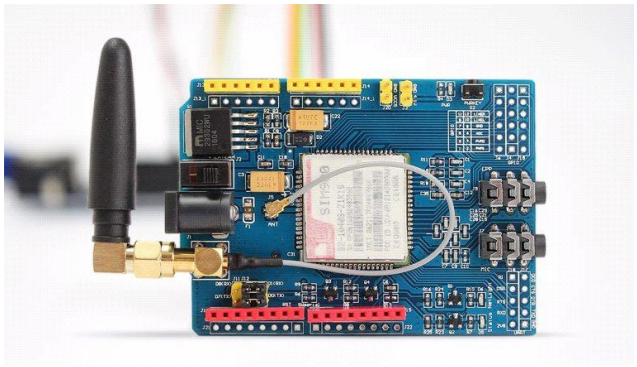


Fig 3.4: SIM 900 GSM module

RS232 can be used to link the modem to the Arduino microcontroller. It can send and receive SMS messages as well as make and receive phone calls. It can also connect to the internet through GPRS and run a variety of data logging and control applications. This SIM900A GSM modem is a plug-and-play quad-band modem that may be utilized with RS232 applications.

4) *5V Relay Module:* A 5v relay is an automatic switch that is typically used to regulate a high-current utilizing a low-current signal in an automatic control circuit. The relay signal's input voltage varies from 0 to 5V. The single-channel relay module is used to control high-voltage, high-current loads such as solenoid valves, motors, AC loads, and lighting. This module is primarily intended for use with micro-controllers such as the PIC, Arduino, and others.

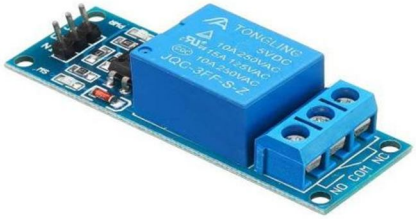


Fig 3.5: 5V Relay module

Specifications

- The following are the specs for a single-channel relay module.
- The supplied voltage ranges from 3.75V to 6V.
- The idle current is 2mA.
- When the Relay is turned on, the current is around 70 milli-amperes.
- A relay's highest contact voltage is 250VAC/30VDC.
- A maximum current of 10A is available.

5) *12-8V Straight DC Motor:* A DC motor, also known as a direct current motor, is an electrical machine that converts electrical energy into mechanical energy by creating a direct current magnetic field. A magnetic field is formed in the stator of a DC motor when it is turned on. The field causes the rotor to rotate by attracting and repelling magnets on the rotor. The commutator, which is hooked to brushes connected to the power source, supplies current to the Motor's wire winding to keep the rotor turning. One of the advantages of DC motors over other types of motors is their ability to precisely adjust speed, which is essential for industrial machines. DC motors can start, stop, and reverse quickly, which is critical for controlling the operation of manufacturing equipment.

Fig 3.6: 12-8V DC WATER PUMP MOTOR

B. Software Requirements

1) Arduino IDE: The Arduino IDE (Integrated Development Environment) is a free and open-source development environment. A code editor, a message area, a text console, a toolbar with standard function buttons, and a series of menus are all included.

2) Writing Sketches: The Arduino software is used to program Arduino sketches (IDE). These sketches were made using a text editor and saved as .ino files. While storing and exporting, the message section shows errors and provides feedback. The Arduino Software (IDE) sends text to the console, including comprehensive error warnings and other data. In the window's bottom right corner, the configured board and serial port are displayed. Using the toolbar buttons, you can evaluate and upload programs, produce, open, and save sketches, and view the serial monitor. The Arduino Language is a simple programming language that consists of a set of C/C++ functions that may be called from your code.

IV. WORKING

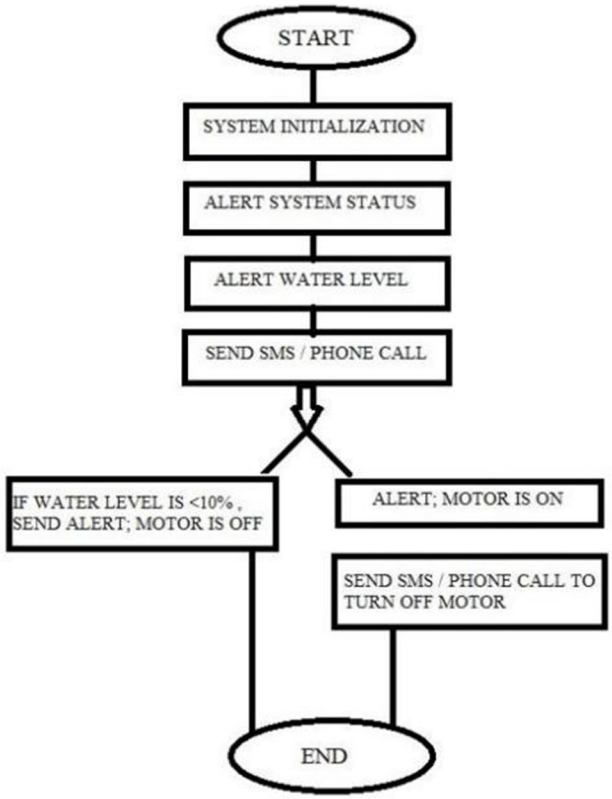


Fig 4.1: Work Flow

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue VI June 2022- Available at www.ijraset.com

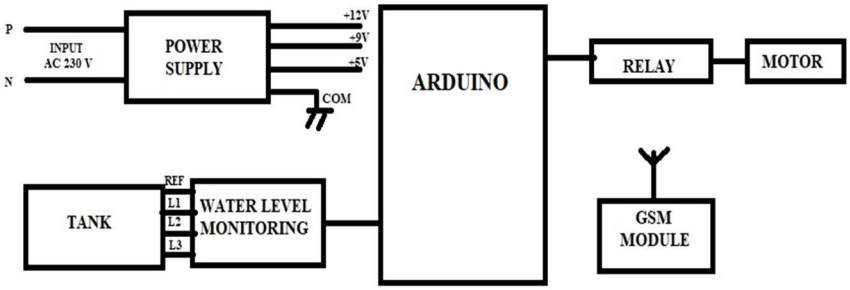


Fig 4.2: Block Diagram of the model

Once the message is received, a remote control program will assist or guide the farmers in doing operations like turning on and off the Motor. The Motor may be turned on and off automatically by sending a text message or making a phone call using a mobile phone. The input power is supplied using a 9V step-down transformer, which is then converted from AC to DC using a bridge rectifier, and the power is regulated to a steady output of 5V using a voltage regulator.

A GSM-based Arduino Uno model is designed to control the Motor and monitor the level of the Well (water body). With the help of 3 Level indicators connected at three different levels of the Well with respect to a reference node at the bottom of the Well, the user is able to monitor the water level from a remote location by an alert mechanism when the water crosses the respective levels.

Basically, in the agricultural irrigation, the Motor is connected to the Relay, which is further connected to Arduino Uno. When an SMS or a phone call is received at the GSM module, it sends a signal to the Arduino, which then sends a high digital pulse to the Relay to turn on the Motor. Similarly, to turn off the Motor, the user can either send an SMS or make a phone call. In order to prevent the dry running of the Motor, the Arduino, with the help of level indicators, automatically turns off the motor when the water level crosses past the 10% mark.

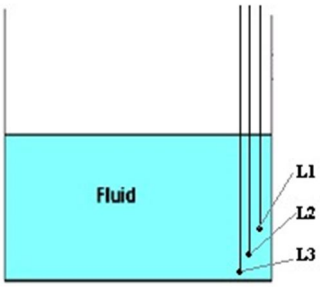


Fig 4.3: Water Level Indicators

V. RESULT AND DISCUSSIONS

The GSM-based irrigation system may offer users the flexibility to regulate and control the operations of their irrigation systems with little intervention to reduce runoff from over watering for improvement in crop yield. This enables users to take advantage of the globally deployed GSM networks with their low alerting service cost to use mobile phones and buffer to manage their irrigation system. It will be possible for users to monitor the conditions of their farmland directly and schedule the water. Needs of crops, automatically control watering and set operational control conditions in accordance with the water needs of crops. This will help minimize over-watering and crop production costs.

The system has been designed and tested using a 12-8v DC water pumping motor, and it has functioned successfully. Despite the water being pumped by the Motor, we have received timely alerts about the status of the water in the Well from the system.

©IJRASET: All Rights are Reserved | SJ Impact Factor 7.538 | ISRA Journal Impact Factor 7.894 |

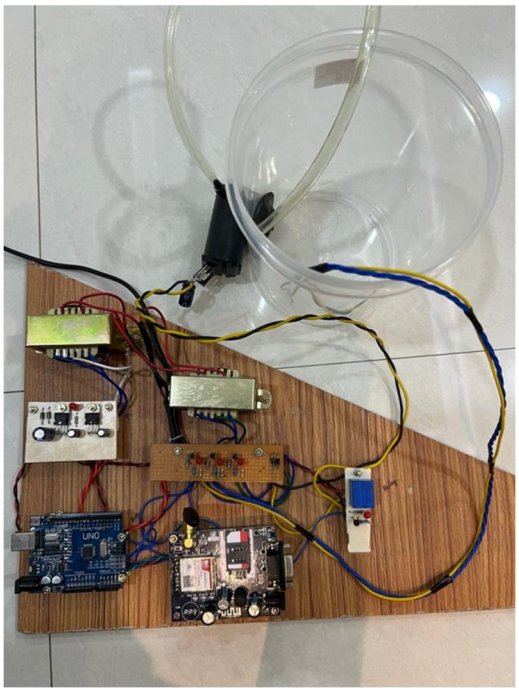


Fig 5.1: Hardware implementation

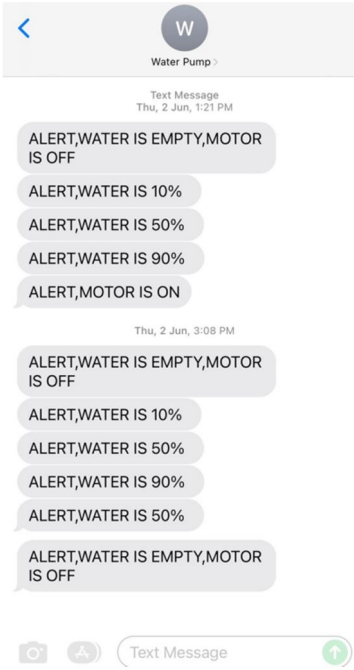


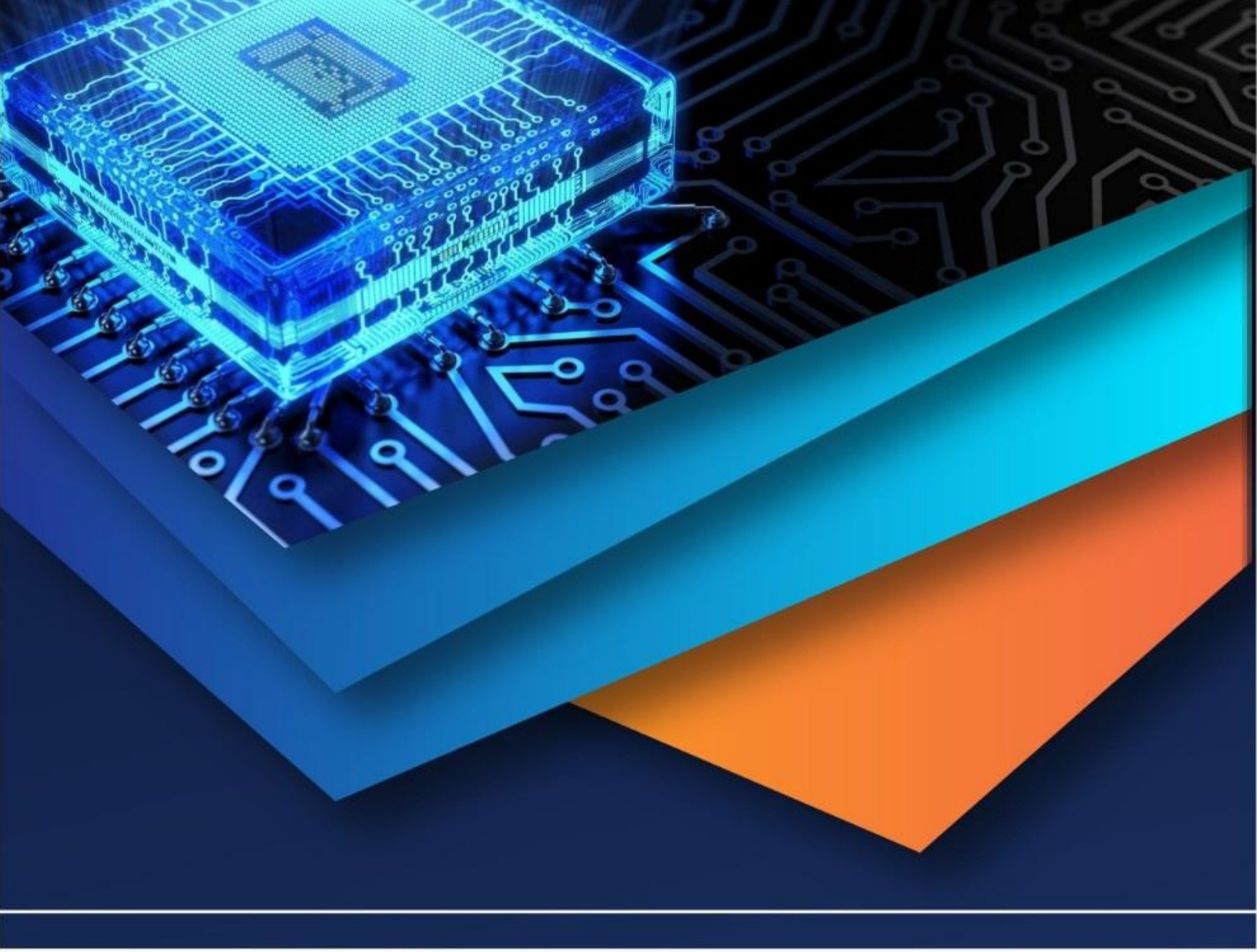
Fig 5.2: Alert SMS Mechanism

VI. CONCLUSIONS

As a result, the created system optimizes motor control in the field via wireless using GSM. The mechanism protects the Motor from overloads, dry running, and phase inversions. It also allows motors to be restarted automatically. The fundamental benefit of this system is that water is provided at regular intervals, and labour costs are reduced. Farmers are increasingly using mobile phones. Due to the capacity of remote control using a mobile phone, the system proves to be of immense benefit to farmers whose pump sets are located far away from their residences. Any mobile model or network can be utilized for communication, increasing the system's versatility. The system's main selling point is its low operational costs because of the use of messaging.

REFERENCES

[1] Xihai Zhang, Junlong Fang, Xiao Yu – 2010. “Design and Implementation of codes Based on CC2430 for the Agricultural Information Wireless Monitoring”. IEEE.
[2] Vasif Ahmed, Siddharth A Ladhake – 2010."Design of Ultra-Low-Cost Cell Phone-Based Embedded System for Irrigation". IEEE.
[3] Izzatdin Abdul Aziz, Mohd. Hilmi Hasan, Mohd. Jimmy Ismail, Mazlina Mehat, Nazleeni Samiha haron. Remote Monitoring in Agricultural Greenhouse using Wireless Sensor and Short Message Service (SMS)". International Journal of Engineering and technology IJET Vol:9 No.: 9.
[4] Zhen Yao, Guohuan Lou, XiuLi Zeng, Qingxin Zhao – 2010. “Research and Development Precision irrigation control system in agricultural”. International Conference on Computer and Communication Technologies in Agriculture Engineering.
[5] Zhang Feng – 2011. “Research on water-saving irrigation automatic control system based on Internet of things”. IEEE
[6] V. Bhaskar& T. GowriManohar, “GSM Based Motor Monitoring and Speed Control”, IJMIE Volume-1, April 2011.
[7] G.Ulaganathan,AzhaPeriasamy, E. Murugan, “Embedded System Based Submersible Motor Control for Agricultural Irrigation Using GSM and To Prevent It Against Over Loading, Dry Running and Single Phasing Automatically”, IJSRE Volume-2 2014.
[8] Kamrul Hassan,Raziul Islam Siddiqui,Md. Takdirul Islam, NahidAlam Siddique,” GSM Based Automatic Motor Control and Protection System”,IJART Volume-2, Feb 2013.
[9] VenkataNarayanaEluri, K.Madhusudhana Rao, A. Srinagar, "Wireless Solution for Water Saving In Agriculture Using Embedded System",IJCSBI, Volume 2, June 2013.
[10] S.Sumeetha , D.Sharmila, "Embedded based Remote Control Application using Mobile Phone in Irrigation" IJPCSC, Volume 3, March 2013.
[11] A. P. Bagade, S. L. Haridas, P. R. Indurkar, "Development of a Mobile-Based Device Remote Control with Voice Acknowledgment”,NCIPET&IJCA, March 2012.
[12] Ejiofor Virginia Ebere and OladipoOnaolapo Francisca, "Microcontroller based Automatic Water level Control System", Nnamdi Azikiwe University, International Journal of Innovative Research in Computer and Communication Engineering Vol. 1, Issue 6, August 2013.Pg. 1390- 1396.



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089 (24*7 Support on Whatsapp)