International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 04 Issue: 09 | Sept-2020 ISSN: 2582-3930

IOT BASED SMART WATER PUMP

Aprojaha Hundekar[1], Malanbi S[2], Mohammed Umair Soudagar[3], Misbha jagirdar[4], Adil Hathiwale[5]

[1]Student, Department of Computer Science and Engineering,Malik sandal polytechnic, Vijayapur, Karnataka, India
[2]Lecturert, Department of Computer Science and Engineering, Malik sandal polytechnic, Vijayapur, Karnataka, India
[3]Student, Department of Computer Science and Engineering, Malik sandal polytechnic, Vijayapur, Karnataka, India
[4]Student, Department of Computer Science and Engineering, Malik sandal polytechnic, Vijayapur, Karnataka, India
[5]Studen, Department of Computer Science and Engineering, Malik sandal polytechnic, Vijayapur, Karnataka, India

---

Abstract -One of the main problem facing modern cities is water scarcity. In day-to-day activities, water wastage in the Field has increased and proper supply of water from main source is getting wasted. To overcome this problem we have developed" smart water pump management system". In this system, we have developed two IoT devices, one for automatic water tank that senses the water tank level and stores it in cloud for analysis using GPRS module and second device, motor with an Arduino and GSM module to get automatically on and off. This project helps us to automatically measure the level of water in the tank and prevent the wastage of water resource available.

.

***Key Words*:**GPRS Module, GSM Module, Arduino, Cloud, UR Sensor

1.INTRODUCTION

In recent times, use of the android/hybrid apps have gain greater importance for daily life. In day-to-day activities, water wastage in the Field has increased and proper supply of water from main source is getting wasted. We developed two IoT devices, one for automatic water tank that senses the water tank level and stores it in cloud for analysis using GPRS module and second device, motor with an Arduino and GSM module to get automatically on and off. In this project, we are presenting the idea of smart water pump management system which is operated with Arduino microcontroller. By using this microcontroller, we are preventing the manual intervention for continuous water supply. Our project helps us to automatically measure the level of water in the tank and prevent the wastage of water resource available. We all know that water is very essential for each and every living creature in this world so, wasting water is not good for anyone. So monitoring the water management system automatically helps us to reduce the wastage of water. The system is made using the ultrasonic sensor which will sense the accurate level of water and according to that we can smartly manage our system through the mobile app which is used by each and every person in today's world. The procedure to implement this system is very easy. But what we have to deal with the monitoring system consists of many valve, tanks, and pumps. Managing this type of system is a challenging task with existing resource and technology available. Also we are living in an era where everything is controlled with mobile application.

The smart level device sends signal to the controlled motor device to ON or OFF the motor at the specified time (when tank height reaches top and it reaches bottom) automatically. The second controlled motor device uses the relay connected with a motor to get on/off automatically. The motor and relay are configured with Arduino and GSM module to receive the signal and perform the specified operation to make motor on/off. The signal will be in the form of text SMS sent from the app to the GSM module in the controlled motor device which will automatically turn on/off the motor using the relay. The water tank system can be loaded with bunch of sensors on all three components, i.e. tank, valve, and pump. The data from each sensor is stored in form of tables in database. The database consists of three tables. The first table is for sensor value of tank. The second and third tables consist of input and output values of sensors which control signal. The Smart level device uses the ultrasonic sensor to sense the tank height and uploads the sensed data to the cloud every minute. The cloud is used for storage and analysis purpose; the GSM/GPRS module has been used configured with Arduino and UR sensor to upload the data to the cloud.

2. Methodology

Once when we were on a picnic to a farm, we heard the farmer's trouble of working at night to turn on and off the water supply pump. So we began to think of the solution for this problem as the field needs water on regular basis. We went through several options to solve this problem as farm needs water according to the moisture level of soil. So we have made Automatic farm Watering System Using Arduino UNO.In this system, soil moisture sensor senses the moisture level of the soil. If soil gets dry then sensor senses low moisture level and automatically switches on the water pump to supply

water to the farm. As farm gets sufficient water and soil gets wet, then sensor senses enough moisture in soil after which the water pump will automatically get stopped.We have used a self made water pump in this system using 5 volt DC motor. WE could use 12 volt water pump in the system. To operate this, it will require a relay module. So, to reduce all these hardware complexity, we have made DC motor based water pump using diode, transistor and registers combined circuit which operate motor according to the Arduino code.

a) DC Motor Using Water Pump

In this, I use DC motor to make water pump. The DC motor has two leads one is positive and another one is negative. If we connect them directly to the Arduino board then it will damage the board. To overcome this problem, NPN transistor is used to control the switching activity of the motor according to the code. Arduino pin 13 (named as WATERPUMP in code) is used to turn on and off the transistor. According to the code to control the speed of the motor we need to enter a value between 0 and 255 Serial Monitor. We used 200 values for the speed of the motor.

b) Soil Moisture Sensor

The soil moisture sensor consists of two leads that are used to measure volume of water content in soil. These leads allow the current to pass through the soil and in return calculate the resistance value to measure the moisture level. If there is more water in soil then soil will conduct more electricity, means less resistance value along with high level of moisture. In the same manner if there is less water in soil then soil will conduct less electricity, means resistance value along with low level of moisture.

c) Introduction to Embedded Systems

As its name suggests, Embedded means something that is attached to another thing. An embedded system can be thought of as a computer hardware system having software embedded in it. An embedded system can be an independent system or it can be a part of a large system. An embedded system is a microcontroller or microprocessor based system which is designed to perform a specific task. For example, a fire alarm is an embedded system; it will sense only smoke.

An embedded system has three components −

¼It has hardware.

¼It has application software.

¼It has Real Time Operating system (RTOS) that supervises the application software and provide mechanism to let the processor run a process as per scheduling by following a plan to control the latencies. RTOS defines the way the system works.

3. System Analysis

Moisture Sensor - The sensor mainly used for this purpose contains two conducting metal probes which consist of a pair of electrodes to measure the resistance in the soil. These probes sense the moisture content of the soil. Greater the moisture content value smaller the resistance.

Pump - A 12V DC motor is used which is fully controlled by the Arduino board. These motors can be turned off and on according to the needs.

Relay - For switching on and switching off the pump according to the water needs.

UV Sensor - This sensor is mainly used for sensing the crop growth at different intervals of time.

Water Level Depth Detector - These are used for knowing the amount of water available in various resources through which irrigation is done.

a) Hardware Requirements

- Arduino UNO
- Ultra Sonic Sensor
- Wires
- Breadboard
- Display
- Battery
- Motor
- Moisture sensor

b) Software Requirements

- Arduino UNO
- Embedded C

4. SYSTEM IMPLEMENTATION

a) 16x2 LCD Display

As Liquid crystal displays (LCD's) have materials which combine the properties of both liquids and crystals. Rather than having a melting point, they have a temperature range within which the molecules are almost as mobile as they would be in liquid, but are grouped together in an ordered form similar to a crystal. The LCD's are lightweight with only a few milli meters thickness. Since the LCD's consume less power they are compatible with low power electronic circuits and can be powered for long durations. The LCD's are used extensively in watches, calculators and measuring instruments is the simple seven-segment displays, having a limited amount of data.

Figure:1 Liquid Crystal Display

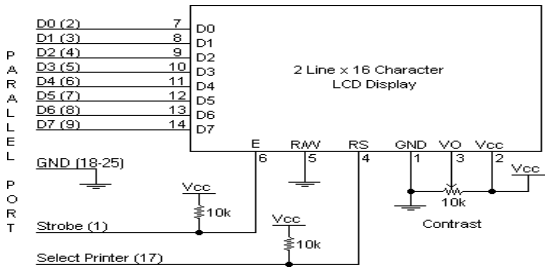

Figure:2 Pin Diagram of Liquid Crystal Display

a) Ultrasonic Sensor

Ultrasonic (US) sensor is a 4 pin module, whose pin names are Vcc Trigger Echo and Ground respectively. This sensor is a very popular sensor used in many applications where measuring distance or sensing objects are required. The module has two eyes like projects in the front which forms the Ultrasonic transmitter and Receiver. The sensor works with the simple high school formula that Distance = Speed × Time The Ultrasonic transmitter transmits an ultrasonic wave, this wave travels in air and when it gets objected by any material it gets reflected back toward the sensor this reflected wave is observed by the Ultrasonic receiver module. Now, to calculate the distance using the above formulae, we should know the Speed and time. Since we are using the Ultrasonic wave we know the universal speed of US wave at room conditions which is 330m/s. The circuitry inbuilt on the module will calculate the time taken for the US wave to come back and turns on the echo pin high for that same particular amount of time, this way we can also know the time taken. Now simply calculate the distance using a microcontroller or microprocessor.

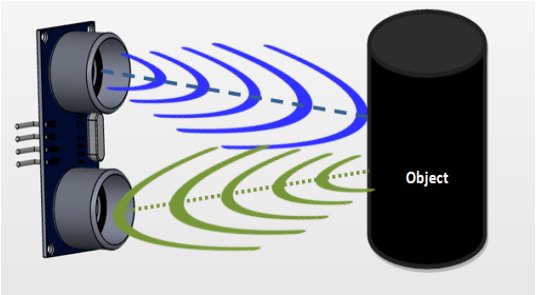

Figure:3 Ultrasonic Receiver Module

a) Soil Moisture Sensor

Soil moisture sensor measure the water content in soil. Measuring soil moisture is important in agriculture to help farmers manage their irrigation systems more efficiently. Not only are farmers able to generally use less water to grow a crop, but they are also able to increase yields and the quality of the crop better management of soil moisture during critical plant growth stages. Besides agriculture, there are many other disciplines using soil moisture sensors. Golf courses are now using sensors to increase the efficiencies of their irrigation systems to prevent over watering and leaching of fertilizers and other chemicals offsite. The module uses LM393 comparator to compare the soil moisture level with the preset threshold. When the soil moisture deficit module outputs a high level and vice versa.

b) GSM Module to Arduino

There are different kinds of GSM modules available in market. We are using the most popular module based on Simcom SIM900 and Arduino Uno for this tutorial. Interfacing a GSM module to Arduino is pretty simple. You only need to make 3 connections between the gsm module and Arduino. A GSM Module is basically a GSM Modem (like SIM 900) connected to a PCB with different types of output taken from the board – say TTL Output (for Arduino, 8051 and other microcontrollers) and RS232 Output to interface directly with a PC (personal computer). The board will also have pins or provisions to attach mic and speaker, to take

out +5V or other values of power and ground connections. These types of provisions vary with different modules.

c) L293D Motor Driver

The L293D is a popular 16-Pin Motor Driver IC. As the name suggests it is mainly used to drive motors. A single L293D IC is capable of running two DC motors at the same time also the direction of these two motors can be controlled independently. So if you have motors which has operating voltage less than 36V and operating current less than 600mA, which are to be controlled by digital circuits like Op-Amp, 555 timers, digital gates or even Micron rollers like Arduino, PIC, ARM etc. this IC will be the right choice for you. Using this L293D motor driver IC is very simple. The IC works on the principle of Half H- Bridge, let us not go too deep into what H-Bridge means, but for now just know that H bridge is a set up which is used to run motors both in clock wise and anti clockwise direction.

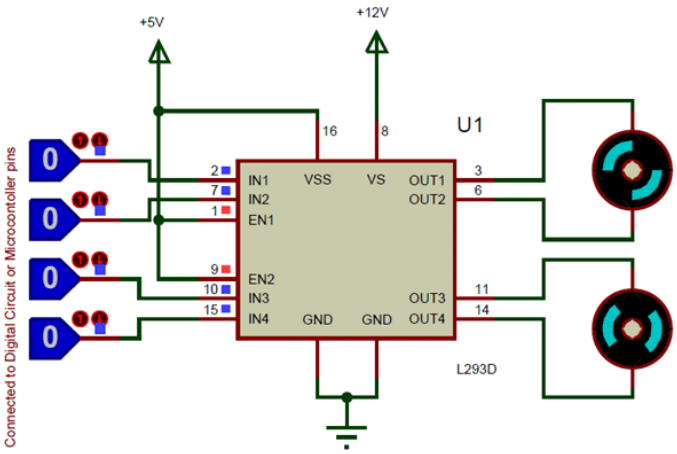

Figure:4 Microcontroller pin diagram

a) Advantages

- **Water pumps**: come in a wide array of types. As well, there is no ideal pump for every circumstance. One thing is certain, a water pump is mainly utilized to decrease down time from heavy rains and to move water from one area to another.
- **Saves Money**: With a programmed water system framework there is no cash or water squandered, for everything is coordinated, modified and these frameworks all have rain sensors, so every drop of water is utilized just when it is required.
- **Saves Water**: Whatever sort of water system framework you introduce, there will be more prominent saving money on water. You can preserve the water with programmed frameworks, for there is no squandering of water, each drop is utilized not squandered away. You can spare somewhere in the range of 30 and 50 percent of the water that you would ordinarily use with other more customary watering strategies.
- **Improves Growth**: Whenever plants, yields, yards or blossoms are watered with littler measures of water over a more drawn out timeframe, they become quicker, for it is the perfect condition for development.
- **Weed Reduction:** You will notice a reduction in the number of weeds appearing, this is due to the fact that those areas that need water are the only areas receiving water, with the implementation of a specifically designed water supply.
- **Reduced or No Water Wastage**: The water control is not only important for the crop or to obtain high yields, it is also an important factor that has a big role in environmental control. Using more water than required is not good for crops as well as the environment. By using smart pumps we can control the water and avoid wastage of water.
- **Optimized Power Consumption**: The IOT based on smart water pump can help us to save energy by optimizing water control. This system pumps the water only when there is a requirement. This way we can reduce the power consumption used in irrigation.

b) Disadvantages

- High installation cost
- High maintenance is required
- Challenges in selection of water quality, quantity and topological parameters Breadboard
- Needs continues power supply
- Electronics are usually built separately
- More difficult installation
- Most float switches are outdated
- No LED indicator lights
- No Warranty or Guarantee

5. RESULTS AND DISCUSSION

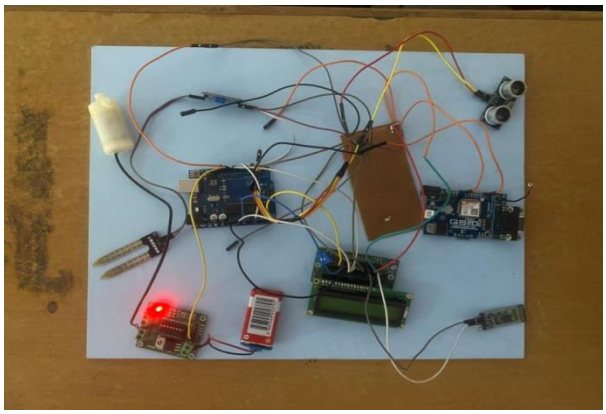

Figure:5 Hardware Connection

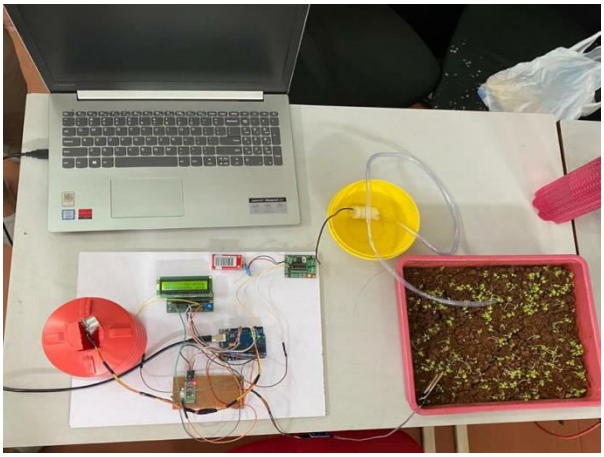

Figure:6 smart water pump management system

6. CONCLUSIONS

Smart Water Pump system to automatically turn on/off the Farm motors using the IoT devices according to the tank levels and using the cloud for analyzing the data for efficient and no wastage of water will be done and an app that controls the house motor and finds the leakage dimension in the water tank of each Farm. Water is a very important resource and it is very important that we save it efficiently so that our future generation can also enjoy its presence. Thus water conservation becomes a very important aspect. Our soul intension of taking up this project is to establish a system by which we can implement and reduce wastage of water. On execution of this system, it will certainly help to reduce water wastage.

ACKNOWLEDGEMENT

The satisfaction that implies the successful completion of our work would be incomplete without the mention of people who made it possible. We wish to place gratitude to our beloved HOD Mrs.Netravati Purohit and all the staff of Computer Science Department .We indebted to our deepest guide Asst.Prof Ms.Malanbi S in Computer Science Department who motivated us and guiding us for final year-project work. She made entire task simple with her valuable suggestions. Finally, no words be sufficient to express our acknowledgement to our parents, We thank for their inspiration, moral support.

REFERENCES

1. Guruprasadh, J.P.; Harshananda, A.; Keerthana, I.K.; Krishnan, K.Y.; Rangarajan, M.; Sathyadevan, S. Intelligent Soil Quiality Monitoring System for Judicious Irrigation. In Proceedings of the 2017 International Conference on Advances in Computing, Communications and Informatics (ICACCI), Udupi, India, 13–16 September 2017. 2. Bruce, K.B., Cardelli, L., Pierce, B.C.: Comparing Object Encodings. In: Abadi, M., Ito, T. (eds.): Theoretical Aspects of Computer Software. Lecture Notes in Computer Science, Vol. 1281. Springer-Verlag, Berlin Heidelberg New York (1997) 415–438
2. Parra, L.; Ortuño, V.; Sendra, S.; Lloret, J. Low-Cost Conductivity Sensor based on Two Coils. In Proceedings of the First International Conference on Computational Science and Engineering, Valencia, Spain, 6–8 August 2013. 4. Michalewicz, Z.: Genetic Algorithms + Data Structures = Evolution Programs. 3rd edn. Springer-Verlag, BerlinHeidelbergNew York (1996)
3. irrigation systems and the proposal to make the irrigation system intelligent. Int. J. Comput. Sci. Eng.2018, 6, 357–360.
4. Joshi, A.; Ali, L. A Detailed Survey on Auto Irrigation System. In Proceedings of the IEEE Conference on Engineering Devices and Smart Systems, Tamilnadu, India, 3–4 March 2017.
5. Kansara, K.; Zaveri, V.; Slah, S.; Delwadkar, S.; Jani, K. Sensor based automated irrigation system with IOT: A technical review. Int. J. Comput. Sci. Inf. Technol. 2015, 6, 5331–5333
6. Munoth, P.; Goyal, R.; Tiwari, K. Sensor based irrigation system: A review. Int. J. Eng. Res. Technol. 2016, 4, 86–90.
7. Yahide, P.B.; Jain, S.A.; Giri, M. Survey on web based intelligent irrigation system in wireless sensor network. Multidiscip. J. Res. Eng. Technol. 2015, 2, 375–385.
8. Brajović, M.; Vujović, S.; Dukanović, S. An Overview of Smart Irrigation Software. In Proceedings of the 4th Mediterranean Conference on Embedded Computing, Budva, Montenegro, 14–18 June 2015.
9. Debauche, O.; El Moulat, M.; Mahmoudi, S.; Manneback, P.; Lebau, F. Irrigation Pivot-Center Connected at Low Cost for the Reduction of Crop Water Requirements. In Proceedings of the International Conference on Advanced Communication Technologies and Networking, Marrakech, Morocco, 2–4 April 2018.
10. Nikolaou, G.; Neocleous, D.; Katsoulas, N.; Kittas, C. Irrigation of greenhouse crops. Horticulture 2019, 5, 7.