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DEVELOPMENT OF AUTOMATIC CONTROL AND MONITORING SYSTEM OF A WATER TANK

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Abstract- *More user-friendly and contribution of stopping the wastage of water and electricity is the main purpose here also reduction of human labor. There is no possibility of the interruption of water flow unless there is an interruption in electric flow. To develop the system some arrangements are to be installed. In automatic mode, it will permit the pump to run or stop according to the program installed in it. This project includes also some extra advantage. More than these it includes another feature that enables a user to monitor the system with smartphone. The sensor will detect the water level and send it to the Arduino. Then the Arduino controls the pump motor. The Bluetooth communication between the Arduino and smartphone enable the Arduino to control the water pump, generate the alarm, switching the LEDs and finally monitoring the status of the tank in the display and in the smartphone also. It also provides the opportunity to both monitoring and controlling the system within the range without the physical appearance. But in case of requirement, it also can be controlled by manual mode.*

Keywords: Bluetooth, display, Alarm, Water sensor, Mobile control.

1. INTRODUCTION

For agriculture, industry, and domestic consumption water is commonly used. Though efficient use and water monitoring are the most important but common method of level control for home appliance is simply to start the feed pump at a low level and runs until a higher water level of the water tank. This control system will control the motor pump, show the status in a monitor and maintain the water level in the overhead tank and ensure the continuous flow of water which saving time, energy, water, and prevent the pump from overworking. About 75% of the earth is water. total amount of water in the earth is 1.386 billion cubic kilometers. Main sources of water are Oceans, Seas, & Bays, Ice caps, Glaciers Permanent Snow, Groundwater [1]. Within 2050, the world's population will have grown up from 7 to 9 billion. This enormous upsurge means the need for water will increase by over 50 percent if we continue our consumption at the current rate. Estimates vary, but each person uses about 80-100 gallons of water per day [2]

Overall world annual water demand is huge since water has been used in so many sectors to different types of operations. To meet the demand a huge amount of water is being withdrawn. But there lies a major gap between the withdrawal and the consumption. Both withdrawals and consumptions of water in recent years have been increased drastically. Focusing thing is that withdrawals, consumptions and wastage of water are in peak position. So more attention should be given here [3].

Automatic water level controller performs a series of functions to control the Water Pump Controller Circuit in the water storage. Different technologies are castoff in its design, development, and implementation. Arduino UNO is used to automate the process of water pumping in the over-head tank storage system and has the ability to detect the level of water in a tank, switch on/off the pump accordingly. The water level and other important data are displayed on the LCD display. This project also enables a user to see the status of the tank on his/her phone.

2.BASIC WORKING PRINCIPLE

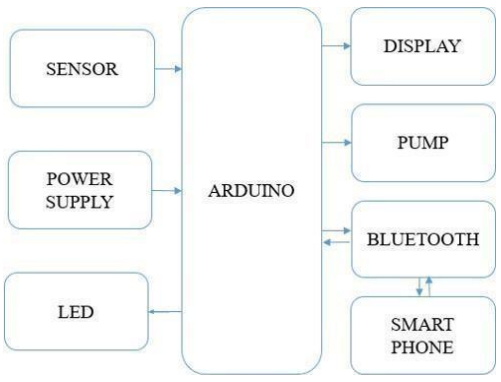

Fig. 1: Block diagram of the operation

Arduino is connected with power supply, Display, Sensors, Pump, LED, Bluetooth. Power is also connected with the sends the signal to the Bluetooth Module. This Bluetooth Module sends the signal to the android phone. Most important thing is that whenever the tank gets full it automatically stops the pump.

3.CONSTRUCTION OF CONTROL SYSTEM

In this project the system mainly consists of Structural components, Electrical components and Software.

3.1Structural components

Structural components are these components that basically form the basic structure of the system. This include platform made of wood on which all the components are mounted. The motor-pump set is mounted on a wooden pillar which stands on the base. The suction pipe connects water to the pump and the delivery pipe carries water to the reserve tank.

3.2 Electrical components

Electrical components are components that form the electrical network to perform the desired operation. The main electrical components that are used in making of controlling and monitoring device are:

3.2.1 Arduino UNO

Arduino is an open-source platform used for building electronics projects. It contains a physical programmable circuit board and a piece of software, or IDE that runs on a computer, used to write and upload computer code to the physical board. It encloses everything to support the microcontroller.

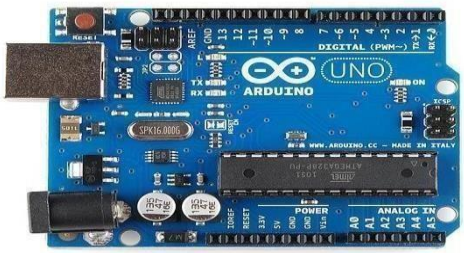

Fig.2: Arduino UNO [4]

3.2.2 Bluetooth Module

Bluetooth Module is an electrical component. Bluetooth Module builds communication between Arduino and smartphone to send data to show the status on the smartphone. In this project one Bluetooth Module that establishes wireless communication between the circuit and smartphone. The Bluetooth Module is connected to the circuit through cables.

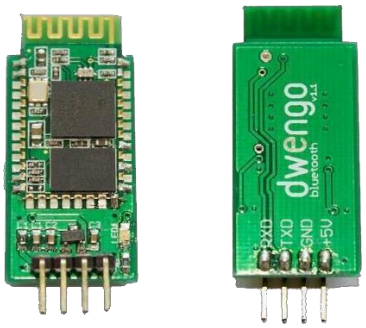

Fig.3: Bluetooth Module [5]

3.2.3 Sensors

A sensor detects and responds to some type of input from the physical environment. The input is moisture and other environmental phenomena. But the output is a signal which is converted to readable display.

Fig.4: Sensor

3.2.4 5V Relay

A relay is an electrically operated switch. Relays are normally used where it is obligated to control a circuit by a low power signal or where several circuits must be controlled by one signal.

Fig.5: Relay

3.2.5 Pump Motor

A motor pump set is a device that consists of a motor and a pump where the motor is an electrical device and pump is a mechanical device. A motor is an electrical device that produces some mechanical work by consuming electrical energy. The basic mechanism of a motor is current flow takes place through the coil which is placed in a magnetic field. As the moving charge passes the magnetic field a force is produced that causes the rotor of the motor to rotate. A pump is a mechanical device that moves fluids, or sometimes slurries, by mechanical action.

Fig.6: Pump Motor [6]

3.2.6 Volt DC Power Supply

An adapter is a device that converts attributes of an electrical device. A 12-volt DC Power supply is used here for continuous power supply.

Fig. 7: 12V DC Power Supply

3.2.7 Display (16×4)

A display is an output surface and projecting mechanism that shows text and often graphic images. It includes the screen and the device that produces the information on the screen.

Fig.8: Display(16×4)

3.2.8 Transistor (BD135)

A transistor is used as a semiconductor device to amplify or vary electronic signals and electrical power. It is composed of semiconductor material usually with three terminals for connection to an external circuit.

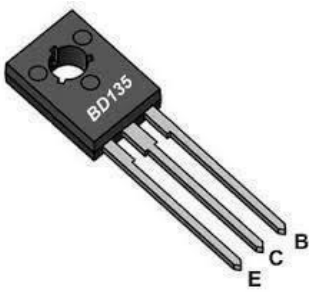

Fig. 9. Transistor (BD135) [7]

3.2.9 LED

Light-emitting diode (LED) is a semiconductor device which radiates visible light when an electric current goes through it. The light is not fully bright. P-type semiconductors and N-type semiconductors are placed in direct contact, forming a region called the P-N junction. In" Fig. 10" a red LED is shown.

Fig.10: LED

3.3 Software

The software used in this project is an Android application whose function is to receive the data sent by the Bluetooth module and enable the smartphone to show the status. The application was developed on android studio.

3.4 Circuit diagram

In this circuit, various electrical components are connected with Arduino. The display and Bluetooth module also connect here by which the monitoring can be done and the condition of the water tank can understand.

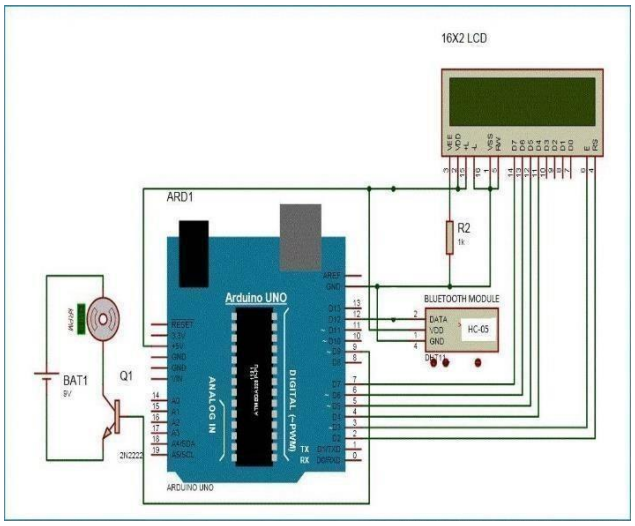

Fig.11: Circuit Diagram of the control system

3.5 Fabrication

The water tank and the water reservoir are connected with the motor by using a delivery pipe and a suction pipe. The power

source of a 12 Volt adapter convert 220Volt AC power to 12Volt DC power. Then 12Volt power is converted to 5 Volt using a resistor. This 5 Volt is supplied to Arduino. Arduino is connected to 5volt power supply, Display, Sensors etc. A 5volt relay is connected to the motor pump that supplies 5 Volt power to the motor pump at which it runs. The sensor senses the water level and sends the signal to the Arduino as an input. If the level of water is less than top level then the Arduino sends a signal to actuate the pump. At the same time, it shows the status of the water level in the display. And it sends the signal to the Bluetooth Module. This Bluetooth Module sends the signal to the android phone. The Android phone reads the data and shows the status on the screen. Whenever the water level is at the top level then its send the signal to the display and it also shows the status on a smartphone via Bluetooth communication. Most important thing is that whenever the tank gets full it automatically stops the pump. Again when the level of water is below the required level then the sensor sends the data to the Arduino as before. Then Arduino sends the status to the display and smartphone via Bluetooth. And immediately starts the motor. "Fig. 12" shows the implemented control and the monitoring system.

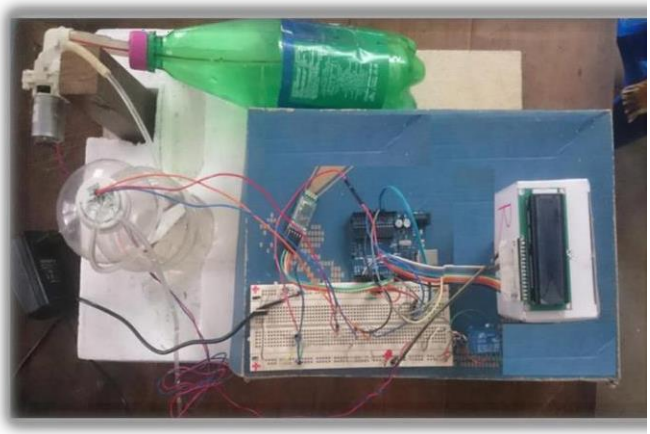

Fig. 12. Implemented control and monitoring system

4.RESULT

The experimental model was made according to the circuit diagram and the results were as expected. Whenever the tank gets empty it provides alarm in the same time indicator LED will turn on to show the status of the tank. Moreover, the display provided with the monitoring section shows the status of the tank. A user can get the status by using his mobile phone. Automatic operation enables the system to turn on the motor when the tank gets empty. Continuing pumping water in the tank, when the tank gets full it provides signal to all the monitoring devices as well as in mobile phone. With the help of this project water level can be controlled both in control section and also in mobile phone. It also provides the facility to monitor the system with the help of mobile phone without the physical appearance to the motor or the tank.

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