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Water Pump Controller using Internet of Things Theft Detection in Shopping Cart using IR Sensor

Ms Shital Prakash Wasade, Ms Sharayu Vinay Suryakar, Mr Aashutosh Ravi Mulankar
Mr Saurabh Pramod Kale, Mr Tejas Ashokrao Randhe
Department of Electronic and Telecommunication Engineering
P. R. Pote Patil College of Engineering & Management, Amravati, India

Abstract: *In today's world, people get so busy in their work. So they do not have enough time for doing their all work. Everyone wants to accomplish their work on a fingertip. So, with the increase in the living standards, there is an immediate need for developing circuits that would change the complexity of life to simplicity. And with the increasing population, the demand for the resources also get increased. Food and water are the very essential resource es. Water is very needful for the daily uses. Most part of the earth is covered with water, but less amount of that is useful. So it is very important to save the water without wasting it. This automated device is designed to reduce the wastage of water as well as electricity. When the water tank get full then the water pump get automatically off and this automation is done using IoT. The sensor is present in the water tank. When the water level touches the sensor then the water pump get automatically off. So, there is no need to go at that place for switching activities. This device is beneficial for the people who live in flat system or building because for the switching activities of the water pump, always they have to come to the ground floor. This is very time consuming process and exhausting also.*

Keywords: IOT Webpages (Internet of Things), Node MCU (Microcontroller Unit), Water, Pump, Far-Distance

I. INTRODUCTION

Internet is the most important requirement of today's world. With the help of internet, people can communicate with each other very easily and quickly. We can't say that internet is just connecting people but things can also communicate with other objects [1]. This concept is called as "Internet of Things". In this IoT concept, object has the ability to transfer the data over internet without requiring the human or computer interaction [2].

IoT is called as Internet of Things. IoT concept is used to make the device automated. Because, in market, various water pump motors are available. But to make that motor advanced and automated, IoT technology is used. Sensors play important role in this. The electricity consumption get automatically reduced and it is our duty to use electricity very carefully without doing the wastage of it. This automation is very helpful to those which are physically disable and for the elder people. Because it reduce the efforts of going to that place for doing that switching activities. From our comfort zone we can operate the devices. Nowadays, there are various automated devices available in the market, but some of these are highly expensive hence all the people cannot afford it. It is today's need to design the device which are pocket friendly so that all needy people can easily buy it. And all these advanced automation we are doing is due to IoT i.e Internet of Things. It is becoming the major part of our life. It plays a very important role [3].

So the device "Water Pump Controller Using IoT "made by using hardware as well as software. To reduce the human efforts and to reduce the wastage of energies i.e. water and electricity this device is very beneficial So the structure of this device is shortly explained as follows. The circuit contains 16*2 LCD display which shows the instructions that we will give to the device, potentiometer which is used to set the brightness of LCD display, Node MCU, Jumper Wires for connections, Switch, Ultrasonic sensor to sense the water level (Ultrasonic sensor contains 2 types i.e. echo and trigger from which one get the input waves and another sensor gives the output that means it shows the water level from the tank), then it contain relay, motor of 1hp or half hp. The Node MCU is a development board based on the ESP8266 microcontroller that provides wifi connectivity [3]. For operating the device, first of all, wifi connection is necessary. From mobile phone the person can operate the device. Only search the website "Adafruit io", it shows the water level in tank and there is one button from which we can ON and OFF the motor. If sometimes the person forgot to OFF the motor, then the motor gets automatically off after filling the tank, only some necessary settings should be necessary to do. Because one sensor is present in tank, when water level is near to that sensor at a particular distance then motor get

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automatically off. Or if the water level of the tank get down then also automatically the motor gets switch ON. When a person buy this device, then they have to do some changes in the program, as per the height of tank some of the values they have to change for the perfect working and result. There are different types of water pumps available in the market on the basis of their applications and the material from which they are constructed. But this device is very beneficial and feasible as compared to other devices, because it can be automatically operated, and also the person can operate this device by using his phone from particular distance.

II. LITERATURE SURVEY

Increasing population and changing in environmental condition results in facing the conditions like scarcity of water and other natural resources. So there is need to save these resources. Various authors suggested solutions for this. Electricity is one of the most important resource for us. So there is need to save it. That's why various devices came into market to overcome these problems. There are various devices came into market which save the water as well as electricity. Some devices fulfilled the parameters and some of them are failed to fulfil it.

One of the device is came in demand i.e. "IoT Based Water Pump Switch " which indicates the water level present in tank i.e. it is used as water level indicator also. This device is automated i.e. when the tank get filled then the water pump get automatically off and when the water level is less then the pump get automatically switched on, hence the labour over this work get reduced. And hence the water as well as electricity can be saved. This device can also show the water level increased during floods. This automation is done with the help of IoT which is called as Internet of Things [4].

The other device for saving the water is "Neural Network-Based Water Pumping Control System For Smart Irrigation". The main aim of this device is to save the wasted water and used it for irrigation process using IoT. This device work on a set of sensors and MLP neural network i.e Multi-Layer Perceptron. The sensors present in the system measures some factors such as temperature, soil moisture and humidity. And this data is developed by the system using Arduino Board for controlling the water pump automatically. The water pump control system mainly consists of hardware and software tools such as Arduino Remote Interface and electronic sensors. This device is based on Artificial Intelligence, Smart Agriculture, Embedded System and IoT. [4]

Then the another device is "Water Level Control System " . In this device ESP8266 microcontroller is used, which provide the monitoring of water level in the container. Ultrasonic Sensor is used to detect the water level present in the tank. It utilizes the Blynk IoT service, Blynk is the application used in automated devices. It incorporated the PHP web programming in providing water level control [7].

The other device is Arduino based, the sensor present in the tank sends the signal to Arduino after the tank get fully filled. The buzzer is attached in the circuit, and the buzzer will ring the water reaches to the specified level. The another one is GSM (Global System for Mobile Communication) based system. In this system the whole process is monitored and happened through the SMS. This device sends message to your system when the tank is empty or when the tank is overflowing to Switch on or off it. One of the device is there which is made using "Microcontroller IC". This device controls the water pump automatically and it works as "Water Detector" also. The main moto of this device is to get the accurate output by sending the message to IC, then the water pump get automatically switched on or off. Reed switch and sensor is used in it for monitoring the water level [5].

But "Water Pump Controller Using Internet of Things" is advanced than the other systems. The main thing is that How this device is different than the other devices". So the answer is that, this device can be operated through our mobile also from long distance. Through the website "Adafruit io" we can operate this device. And if we forgot to switch off or switch on the water pump then it automatically done the switching activities after doing some settings in the system. So there is no need to go at that place for switch ON or OFF the pump. So this system is very feasible. This system is very beneficial in flat systems and offices.

III. HARDWARE ARCHITECTURE

This "IoT Based Water Pump Controller " is a hardware plus software device and it is based on both hardware as well as software components. There are various hardware components required to make this device. It includes Relay, Water Pump, Motor of 1 hp or half hp, 16*2 LCD display, Node MCU, Potentiometer, Switch button, Jumper Wires,

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Ultrasonic Sensors (Echo and Trigger). It conatin the hardware IC555, which is very important hardware. It is the "Integrated Circuit "and it is very cheap in cost hence it is used in making various device. It can also be used as timing device. Integrated circuit consists of 8 types of pins [1]. Ground, Trigger, Output, Reset, +vcc, Discharge, Threshold, Control Voltage are the 8 types of pins. The principle which is present in the oscillator, the device worked on it. It converts the vibration signal into electrical signals. Oscillator is an IoT device, that's why it acts as sensor [2]. LEDs are used to indicate that the motor is ON or OFF. Relay acts as switch for this device [3]. Relay works according to the signal sent by IC. Due to this, the power supply cuts and the motor get turn off. IC555 is vey prompt, which can turn ON and OFF at regular time interval without any delay. And this is very important to work ON- OFF the motor at perfect time, to reduce the wastage of water, electricity and other resources [4].

This device is made up of the ultrasonic sensors, which sends the signal to turn off or on the motor as per the conditions. This device is totally IoT based device, wires are not required to send the signal. Hence it is time saving device. The block diagram of "Water Pump Controller" is as follows.

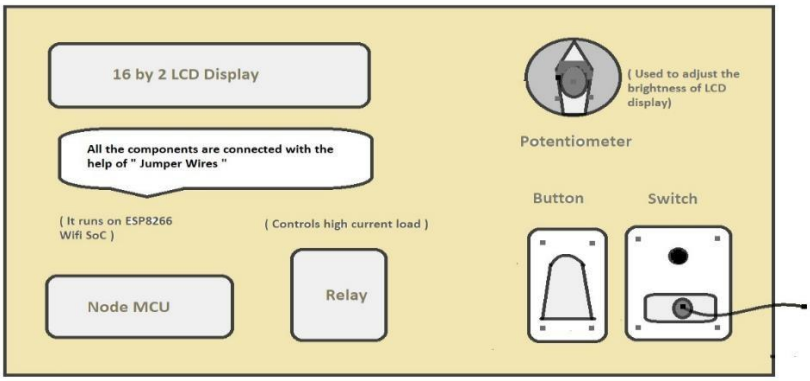

Fig. Block Diagram of Water Pump Switch

Now a days, people are so busy in their work that's why they don't have time to do the household activities. Hence they look for the advanced and automated device for their home. In future, this automated devices will on very high demand. Everyone wants home automation. Now both husband and wife go outside home for their duty, hence they have no time for doing this household things. So this device we can operate from our place by using our mobile phone. Sometimes we start the motor and forgot to turn off, then the motor get automatically switched off after filling the tank. Sensor is present in the tank, which sends the signal that the tank is full. Or we can operate that motor from our mobile by opening the website "Adafruit io" in chrome. One switch button is given there to OFF or ON the motor. Water level of tank will be shown there. There is no need to go for checking the water level of tank by going on terrace or on the ground floor where you kept the tank [13].

IV. METHODOLOGY

Internet of things contain two keywords, internet and things. Internet is used for interconnection networking, to connect with other devices by using TCP/IP i.e. Transmission Control Protocol / Internet Protocol. Things are referred to as the daily things around us, like temperature [1].Without human interference, information about this parameters we get from the sensors. So. in Internet of Things object generate data without any human interference, object generates data through sensors and send through internet. We can say that it is a device to device communication (D2D) or Machine to Machine (2M) is there i.e. one device communicate with the other device and get the data through internet connection. This system is consist of hardware as well as software, for making the system advanced and automated [2].

ESP8266 is a microcontroller designed by Espressif system. Microcontroller is a chip, that is used to control the electronic devices. Always it is stored in a single IC (Integrated Circuit) and it is used to perform one specific application [3]. And at a time it focuses on only one application, hence the execution time required for a particular application is also less. It does one operation at a time, hence efficiency of that device get increased and the operation will give accurate results [4]. Microcontroller is mostly used in automatically operated electronic devices and it contain processor, memory and programmable input/output. The term programmable means the architecture or the data can be erased or changed. It contain microprocessor. Microprocessor is a single integrated circuit and the various functions are

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combined with it. It performs the logical as well as arithmetic operations and connect one device with another device, the concept on which IoT works [5]. Ultrasonic sensors are used to sense the sound vibrations, and then this sensor send the information, that the water tank is full or empty. Ultrasonic sensor has two pins i.e. echo and trigger. One pin gives the input signal and the another pin gives the output signal Ultrasonic sensor has sound vibrations above frequencies of 20 khz [6]. Ultrasonic sensor contain transmitter module and receiver module. These modules are used for the particular purposes. Transmitter module generates and send the information to the object. And the receiver receives that information [7].

This device is operated from the website, that website contain the dashboard. On that dashboard, one button is there for switching activities of motor. This website can be accessed on mobile phone as well as PCs also. On that page it shows the water level present in the tank, in terms of percent. Only the setup requires wifi connection. Then from our comfort zone, we can operate this device. This automated device will become very demanding in future.

Settings to do:

- At the time of purchasing, there is need to do some settings in the device which are as follows:
- Set the accurate measurement of tank i.e height in the program (According to that value it will give the output. If the value set in the program is correct, then it will give correct output)
- Do login to the website “Adafruit io” by using the ID and Password which is set in the program.
- Set the same password to the hotspot which is set for logging in to the website (it is necessary), multiple logins are also possible

Specification :

- Though the advanced feature like automation is available in other devices also but this device differ from other devices by one feature i.e. from mobile phone also the person can operate this device by using “ Adafruit.io ” website. (and this is very beneficial when the person wants to fill the tank at its desired level)
- In future, we develop this website into an application
- It’s run time is as high as compared to other systems

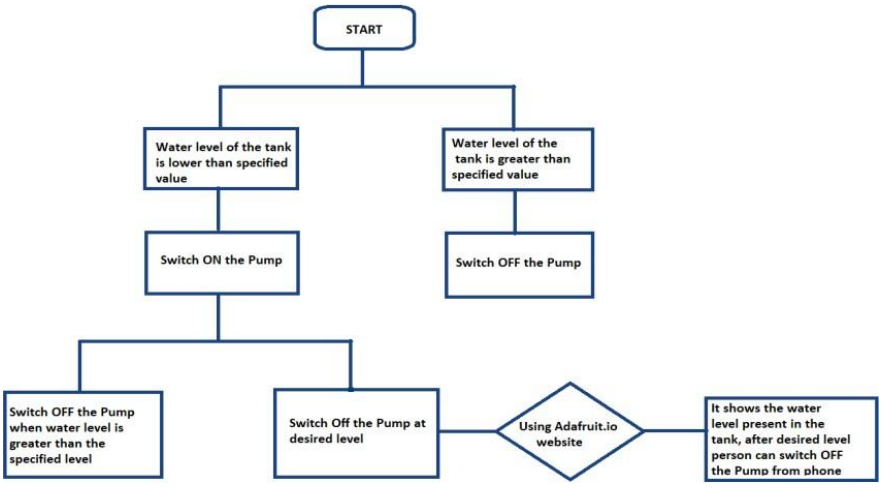

Fig. Flowchart of Operational System

V. RESULT

One such device that is benefiting from IoT technology is the Water Pump Controller. This device is designed to reduce human efforts and save energy by controlling the power supply of a water pump. The device consists of various components, including an LCD display, potentiometer, Node MCU, jumper wires, switch, ultrasonic sensor, relay, and motor. The Node MCU is a development board that provides wifi connectivity, allowing the device to be operated remotely via a mobile phone.

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To operate the Water Pump Controller, the user needs to connect to the device's wifi and access the "Adafruit io" website. From there, the user can view the water level in the tank and turn the motor on and off with the touch of a button. The device also has a sensor that automatically turns the motor off when the tank is full or turns it on when the water level gets too low. The device can be customized to suit the height of the tank, making it suitable for a range of applications.

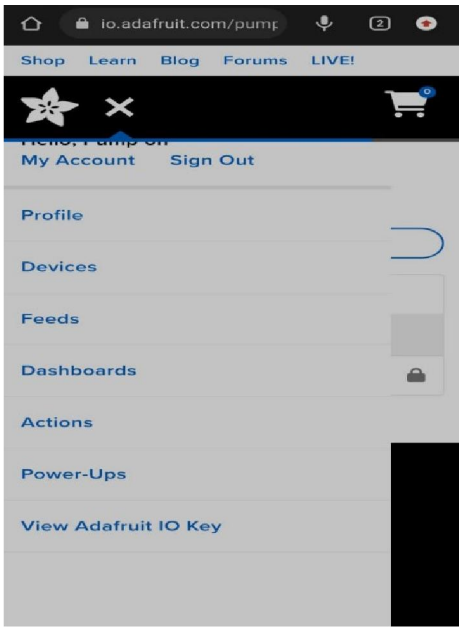

Fig. Homepage of Adafruit.io Website

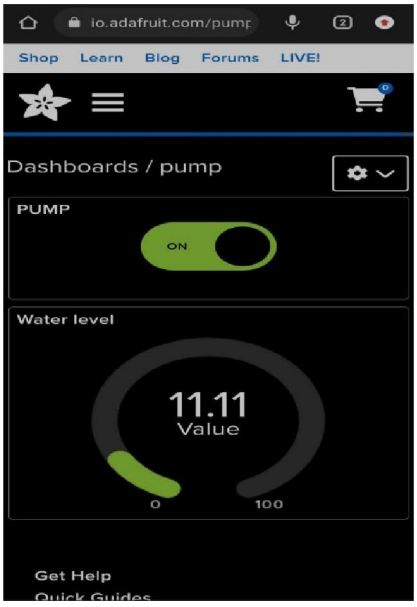

Fig. When pump is ON (showing the water level present in the tank)

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Fig. Working System of Water Pump Controller Using Internet of Things

Comparison of Water Pump Controller Using IoT with other devices available in market

Features	Water Pump Controller Using IoT	IOT based Smart Water Pump Switch	IoT Based Water Level Control System	Automatic Water Tank Level and Pump Control System	Automatic Water Pump Controller and Water Level Detector with Microcontroll er IC
Run Time	Less as compared to other GSM and other technology based device	Runtime is high	Run time is high	It is also high	Runtime is high
Operating Type	From our mobile phone and from our comfort place by using website, we can operate it for getting desired water level in the tank	Only automation feature is there, for getting desired output person have to operate it manually by going at that place	Manual operating type i s there	Manual operating type is there	Manual operating type is there
Other option for operating the device (if error is occur)	Another option is present for operating the device i.e. Adafruit io website	Manual operation	Manual operation	Manual operation	Manual operation

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Feasibility	More feasible for everyone (including physically disable people also) as there is no need to go at the place for switching activities if automation feature get failed	Less feasible	Less feasible	Less feasible	Less feasible

VI. CONCLUSION

The Internet of Things has revolutionized the way we interact with devices and has paved the way for the development of automated devices that promote responsible energy use and reduce human intervention. The Water Pump Controller is one such device that is benefiting from IoT technology, making it more efficient and cost-effective for users. As we continue to advance technologically, it is essential that we develop devices that are pocket-friendly and accessible to everyone, promoting a sustainable and efficient future.

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