IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Automatic Syrup Storage Control System using Arduino

Razaan Solkar, Sameed Mhaskar, Danish Mukadam, Amol Sutar

Finolex Academy of Management and Technology, Ratnagiri, Maharashtra, India.

Abstract: There are some cases where it is needed to monitor or fill the tanks that are located high from the ground level and labors have to continuously keep monitoring it or filling it by climbing at the tank level high up. It takes lots of time and wastage of syrup to fill the tanks. Especially, for the company in which this model will be fitted which has many problems regarding filling upper tanks situated at high level, labor injury while climbing at high level peak and overflow of water in overhead storage tanks, etc. This is where automatic liquid control system comes into picture. The operation of Syrup control system is based upon the Fact that Arduino will get signals from sound waves emitting from the ultrasonic sensor. As the level of water reaches to the bottom in the tank it will trigger the motor to be turned on and the motor will start filling the tank with water to the maximum level. As soon as the tank is filled with water to its maximum capacity the ultrasonic sensor will emit sound wavesand Arduino will receive the pulse required to stop the motor and the motor will stop pumping the water. This automation holds the main motive of reducing labor work.

Index Terms **– Arduino, storage system, ultrasonic sensor, motor, relay module.**

I. INTRODUCTION

Mobile phones have made human life easier. They help us to contact with our friends, families, customer and also a lot of work can be done through mobiles which saves a lot of time. It makes life easier and more pleasantby saving lot of energy as well as lot of time so that the work can be done in an instant. It also holds the upper hand of communication from anywhere at any time, and can learn a lot of things through this electronic device.As well as one can earn money through this device in various methods. This project is also similar to this device as it is convenient and easy to use. It saves a lot of man power and time. As it is reliable and very effective it will leave a good impact on automatic systems.

Thus, this project also saves a lot of time and labor work by controlling the syrup storage system through mobile by fitting the system to control it. By fitting the setup in the industry, it helps the industry in reducing the labor work also it does not need to be monitored continuously and reduces the loss of flavoring fluid as it turns offautomatically.

As short survey on internet is conducted and some articles that came across have almost about the sameidea which is being presented i.e. automated syrup management system [1]-[3]. Author mentioned about water automation is all about controlling monitoring and even billing of the water usage in different places like Hotel, House, Irrigation, Land and Industry. The researchers done water automation based on different purposes using different types of hardware and technologies. And the other article is very valuable to this project smart syrup management system [2]. Author of this article have mentioned how the author used technology to achieve an excellent output by the system that can monitor water tank by measuring the water level and sending notification to the user through mobile connected through an android application that is much more efficient and easier to monitor the whole process.

II. METHODOLOGY

The major problem labours facing in the factory is the labours have to fill the syrup tanks manually using buckets by climbing the ladder as the tanks are almost at a height of 6 feet. Labours had to check syrup tanks manually for the status of how much it is filled. There are some incidents like, while refilling the tanksand climbing the ladders their labors are injured in one or two incidents while climbing the ladder with syrup gallons heavily weighted. Well, it's not an easy task. So, to make it easier the thought of an automation so that thewok can done automatically without any sevier casualties. The suggestion of this automation is given to the factory head which is to make the setup in such a way that the problem of climbing the stairs to fill the tanks would be solved. The use of sensors to check the status of upper syrup tanks. The project will also have the sytem to check the status through the app with the help of Bluetooth module which will be designed for mobile. So, the manually work would be done very less as per the main motive here is of reducing the labor work. Where the labors and theowner are extremely satisfied with this automation.

Fig. 1 The machine used in factory for syrup filling

III. HARDWARE DESCRIPTION

The **HC-05** has two operating modes, one is the Data mode in which it can send and receive data fromother Bluetooth devices and the other is the AT Command mode where the default device settings can be changed. We can operate the device in either of these two modes by using the key pin as explained in the pin description. It is very easy to pair the HC-05 module with microcontrollers because it operates using the Serial Port Protocol (SPP). Simply power the module with +5V and connect the Rx pin of the module to the Tx of Arduino and Tx pin of module to Rx of Arduino as shown in the figure (2). During power up the key pin can be grounded to enter into AT Command mode, if left free it will by default enter into the data mode. As soon as the module is powered you should be able to discover the Bluetooth device as "HC- 05" then connect with it using the default password 1234 and start communicating with it. The name password and other default parameters can be changed by entering into the AT command mode.

Table 1. Arduino and Bluetooth module connections

Arduino Pins	Bluetooth Pins
Rx (Pin 0)	TX
Tx (Pin 1)	RX
5V	VCC
GND	GND

The Arduino Uno R3 is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits.The configuration of Arduino and Bluetooth module is done as shown in table 1. To check whether the modules are working properly or not. connect led positive to pin 13 of the Arduino through a resistance (valued

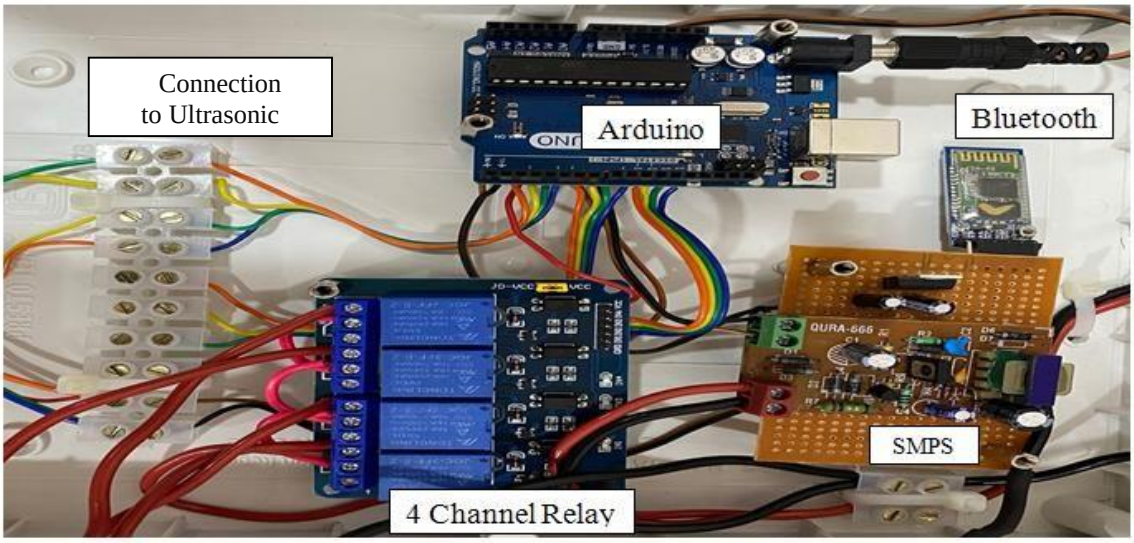

Fig. 2 Hardware connection.

between 220ohm-1k). Connect its negative to GND and. The android app will send serial data to Bluetooth module if the output is 1, LED blinks then the module are working fine.

The system uses sensors ultrasonic waterproof 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 based on distance formula given as 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 namely transducer sensor with waterproof specially designed to work under water with the frequency of 200 khz. With ultrasonic sensors, the water depth can be calculated by finding the distance between the bottom of the tank and the surface of the water. It is an instrument that measures the distance to an object using ultrasonic sound waves. An ultrasonic sensor uses a transducer to send and receive ultrasonic pulses that relay back information about an object's proximity. High frequency sound waves reflect from boundaries to produce distinct echo patterns. In this project motor used is Kirloskar Chhotu (0.5 HP) motor, which is low maintenance pump, very light in weight and easy to handle. With 33.6 LPM water flow and 50 Hz frequency, this water pump is applicable for use at household as well as at commercial places. It's small but powerful water pump set saves power consumption. This water pump has self-pumping feature that can pump up to 0.5 hp.

Relay module used is a 5V 4-channel relay interface board, and each channel needs a 15-20mA driver current.It can be used to control various appliances and equipment with large current. It is equiped with high-current relaysthat work under AC250V 10A or DC30V 10A. It has a standard interface that can be controlled directly by microcontroller. When the signal port is at low level, the signal light will light up and the opto-coupler it transforms electrical signals by light and can isolate input and output electrical signals will conduct, and then the transistor will conduct, the relay coil will be electrified, and the normally open contact of the relay will be closed. When the signal port is at high level, the normally closed contact of the relay will be closed. So it can connect and disconnect the load by controlling the level of the control signal port. Pin connections of relay module and Arduino board are shown in the table 2.

Table 2. Arduino and relay module connections

4 channel relay module pins	**Arduino Pins**
GND	GND
IN1	10
IN2	11
IN3	12
IN4	13
VCC	5V

A switched-mode power supply is an electronic power supply that incorporates a switching regulator-an internal control circuit that switches the load current rapidly on and off in order to stabilize the output voltage.

IV. SYSTEM DESCRIPTION

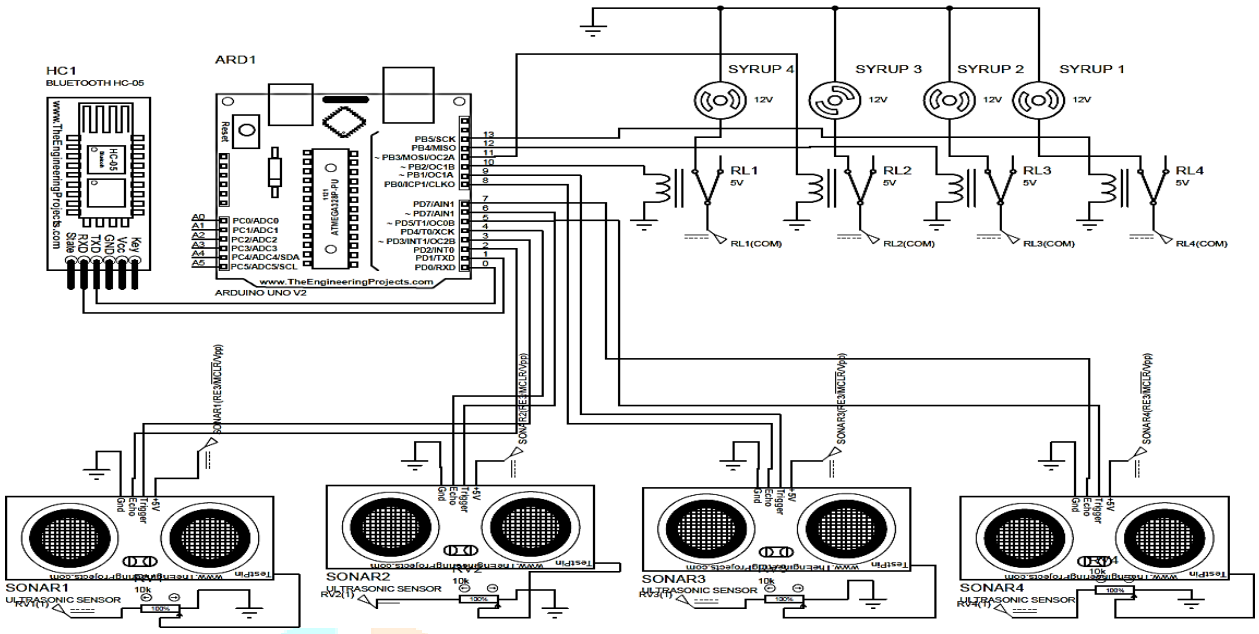

Fig. 3 Circuit Diagram of this project

Figure 3 is the simple representation of how the project is going to work in the block diagram format. First of all the main and the controlling unit in this project is Arduino which is ATMEGA 328p, but why have selected Arduino instead of any other boards like Raspberry pi, etc. As per the points of cost reduction as well as it is good reliable and it is perfect for this project, so Arduino board is selected for this project. Through mobile command will be sent to the Arduino by connecting the Bluetooth module (HC05) designed for wireless serial connection setup. It employs radio frequency for communication. It makes use of frequency modulation to generate radio waves in the ISM band. HC05 works on serial communication.

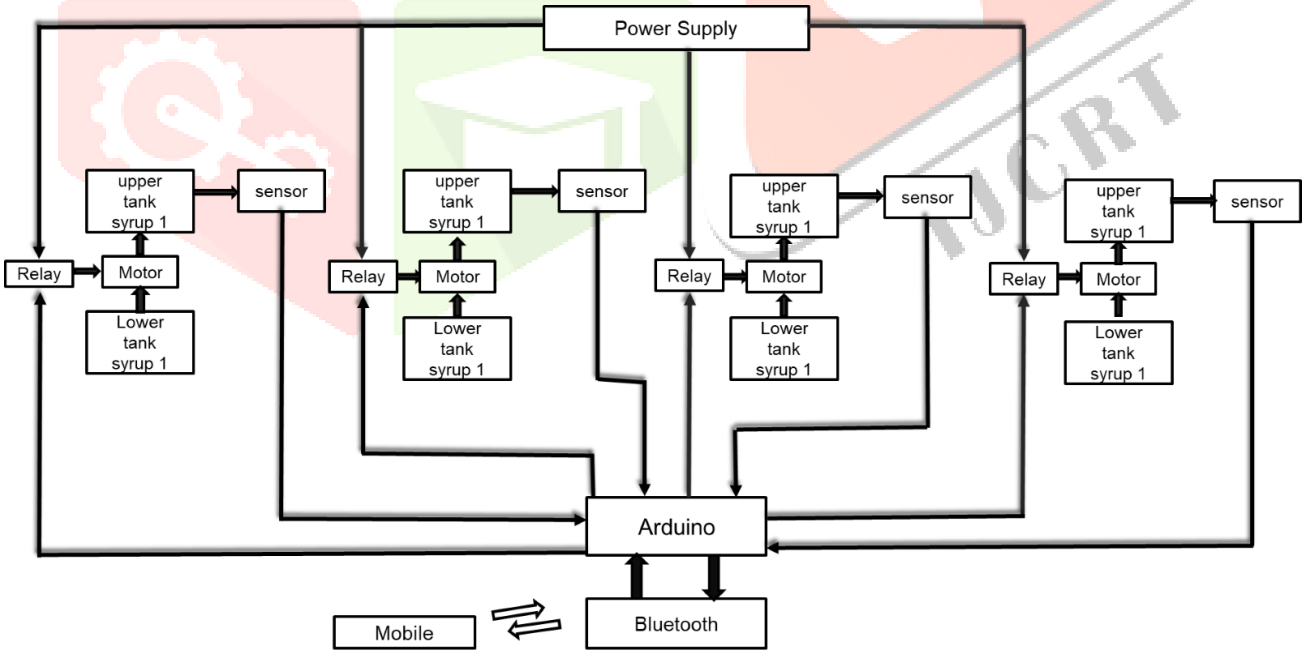

Fig. 4 Block diagram of project.

The android app will be designed to send serial data to the Arduino Bluetooth module at the other end receives the data and sends it to the Arduino through the TX pin of Bluetooth module (connected to RX pin of Arduino). The code uploaded to Arduino checks the received data and compares it. If the received data is 1 it will give the output and if the data is 0 the output will be 0. as well as know that the output from the electronic devices usually works on 5v or 12V DC. But the electrical devices need 230V AC supply voltages So always a relay is used asa switch an external Power supply is connected given to the relay and then it is given to the motor. The motor used is Kirloskar Chotu (0.5HP) motor, which is also suitable for this project as it is low on maintenance as well as light weight & easy to handle. It pumps 33.6 LPM (Liter Per Unit) of flow and 50 Hz frequency. This pump is applicable for use at household as well as at commercial places. Its small but powerfulwater pump saves power consumption. This water pump has self-pumping feature that can pump up to 0.5 hp. The proper circuit diagram of the project in block diagram form is shown in

Fig. 4. As for simulation purpose, there are switchesgiven to the sensor test pins. The system uses sensors ultrasonic waterproof, namely transducer sensor with waterproof specially designed to work under water with the frequency of 200 khz. With ultrasonic sensors, thewater depth can be measured by finding the distance between the bottom of the tank and the surface of the water. When the water level reaches the minimum level of 20% the motors will start and they will not stop until the water level >= 90%.As RF module which is commonly referred to as a radio frequency module. It is a small electronic device that is used to transmit and receive radio signals between Arduino and motors. As the Arduino gives command as output 1 the motors will turn on and on output 0 the motors will turn off. 433 MHz is used for RF transmitter and receiver module.

V. RESULTS AND DISCUSSION

Fig. 6 Control algorithm

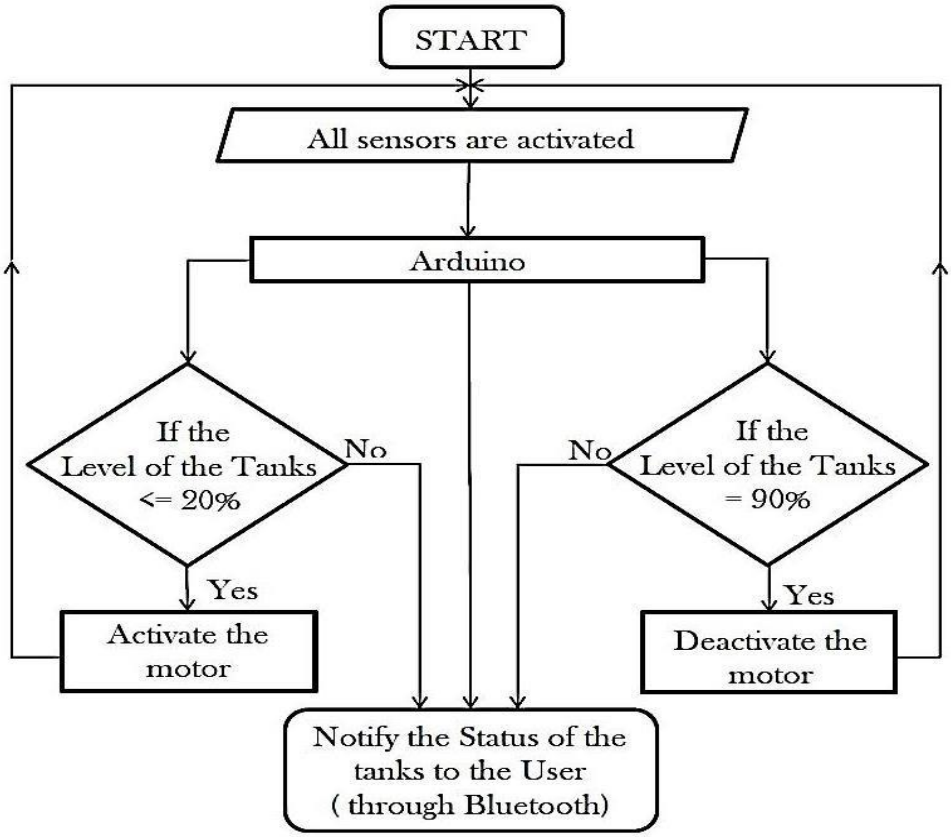

Figure 6 shows the algorithms of our project, as it starts all the sensors are activated there are four ultrasonic sensors in each tank. The sensors will measure the quantity of the syrup and give the response to the Arduino. Arduino will monitor the responses of each sensor and will send further the responses to next blocks. If the level of the syrup at the particular tank is fallen below or is equal to 20% , The Arduino will send the signal to activate the motor of that particular tank. If no then the current status of all the tanks will be notified to the user through Mobile application. And if the level of the particular tank reaches 90% or above then the Arduino will send the signal to deactivate the particular motor . If no then then the current status of all the tanks will be notified to the user through Mobile application. When the motors of the respective tabs are activated or deactivated the user will be notified immediately. In figure 7 shows the project model representing overall picture of the project idea. there are four types of syrup tanks situated that are denoted as lower tanks in block diagram, from these tanks the motors will pump the syrup to the above tanks. The motors will get started when the Arduino gets the response from the sensors located in the upper tanks. Once the syrup from the above tank goes below certain level the signal is send to the Arduino then the Arduino will start the motor of that particular tank. The motor will remain on until another response received by the sensor to Arduino. When the tank gets filled till the 90% then the sensors will give the signal to Arduino and the Arduino will stop the motor. the response to the Arduino will also notified to the user through Bluetooth to the app which will be created for the user to monitor the automation whenever needed.

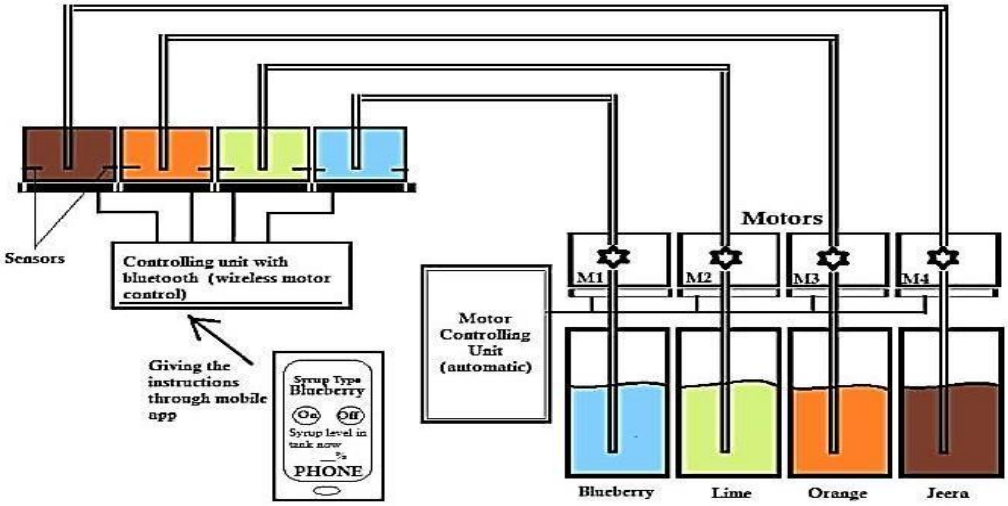

Fig. 7 Model of the project

VI. CONCLUSION

Labor work is minimized as it is stated above that 3 labors are required before automation .one for arranging bottles, second to hold the ladder. And third one to climb the ladder holding gallons of syrup and then filling the empty syrup tanks. After automation only one labor will be required and there will be less chance of casualties falling from ladder. And the other two labors will be doing their other work without worrying about the storage of syrup. Automation will save lots of time in filling bottles the one who will arranging the bottles at dispenser will be focusing on only one task without any interruptions of storage issues. Through this there will be no wastage of syrup as well. No monitoring will be required 24/7 so the labors can focus on their other task without interference.And as the product is promisingly highly reliable and compatible no replacement would be needed.

REFRENCES

[1] Gilg and S. Barr, “Behavioral attitudes towards water saving? Evidence from a study of environmentalactions,” Ecol. Econ., 2006.

[2] E. V. Ebere and O. O. Francisca, “Microcontroller based Automatic Water level Control System,” Int. J. Innov. Res. Computer. Commun.Eng., 2013..

[3] Shaukat. N, “PLC based automatic liquid filling process,” Multi Topic Conference 2002, IEEEpublications.

[4] Dunning Gray (1998) – “Introduction to Programmable Logic Controllers” – Delmar publishers,pp.421- 428.

[5] Petruzella, Frank D. (2010) – “Programmable logic Controllers,” Tata McGraw Hill Education, pp.6-12.

[6] Asutkar, Sachin More (2013), “Automated bottle filling using microcontroller Volume correction”, International journal of engineering research and Technology (1JERT). (Vol 2, Issue 3, march-2013).

[7] A.S.C.S. Sastry, K.N.H. Srinivas (2010), “An automated microcontroller based Liquid mixing system”, International journal on computer science and Engineering. (Volume II, Issue 8, August2010).

[8] Geremy Blum, “Exploring Arduino,” Tools and Techniques for Engineering Wizardry.

[9] Brain W. Evans, “Arduino Programming Notebook”