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Multilevel Water Level Control & Monitoring of Multiple Tanks

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ABSTRACT

The traditional method of water tank overflow indication is to insert one pipe in the tank and whenever the tank is completely filled the water starts flowing through this overflow pipe this indicates that water tank is completely filled and the pump should be turned off. But this shows only tank filling status and does not indicate different heights or levels of water in the tank.
In this project water level of 4 tanks is monitored and controlled by controlling the motor which pump the water from reservoir to tank. For sensing water level float is used as sensing element. One float switch will sense one water level therefore for sensing 4 different water levels 16 float switches are used. Microcontroller 8051 is used for expansion of tanks. Therefore water level of many tanks is monitored and controlled. All these information is provided to ESP8266 Wi-fi module which is prefabricated arduino board.ESP8266 is used for controlling motor driver circuit and uploading data to server by inbuilt Wi-Fi unit. This project can be used in multi-storied buildings where tanks are situated at high places knowing the tank filling status is difficult. The user can control the water level manually if given access through admin by turning on/off motors which pump the water from reservoir to the tank. Otherwise guest user can only monitor the status of tanks which are made visible by admin for guest user.
By doing all these practices the traditional work of water level controlling becomes much easier, people sitting at remote place form the tanks system can easily do the job of water level controlling and monitoring for in house as well as industrial applications.
Key Words: *Webpage, ESP8266 Wi-Fi module, 89S52 Microcontroller, Float.*

1. INTRODUCTION

The traditional method of water tank overflow indication is to insert one pipe in the tank and whenever the tank is completely filled the water starts flowing through this overflow pipe this indicates that water tank is completely filled and the pump should be turned off. But this shows only tank filling status and does not indicate different heights or levels of water in the tank.

Water level monitoring and controlling plays an important role at remote places like mutistoried buildings, overhead tanks and tanks where there are number of tanks water level is to be monitored and controlled. This also reduces human manpower required for manually turning ON the motor in case of empty tank and turning OFF the motor in case of water overflow from the tank. It replaces the traditional method of using tank ball and power saving also done because we will keep the motor on whenever required.
In this paper 4 different levels of water of 4 different tanks are continuously monitored by user accessing the server web page, floats are continuously sensing the water levels, this level information is uploaded to server on regular basis by ESP8266 W-Fi module.89S52 microcontroller is used to for controlling Water level sensors and motor driver circuits.

2. LITERATURE SURVEY

This section discusses the survey of the different past research in the area of water level control of multiple tanks through remote place. Various method and approaches proposed by different authors are also involved. Based on this problem is defined and proposed system is discussed in successive section.

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Narong Aphiratsakun et al., presents to control the level of water in the tank using mobile application. For this purpose PID controller is used. The sensed water level information by sensor is applied to amplifier circuit which converts this into strong signals so that it can be manipulated. The motor is controlled by PLC and water is pumped into the tank according to the set point entered from mobile application [1].

M. Bala Krishna et, al., shows the control of water level in tank through controlling motor on and off system and employing mobile middleware application. The level of water is sensed by this application through sensors and water pump is stopped whenever tank gets filled message information is sent to registered mobile user about tank status this saves energy and cost [2].

There are many techniques used for liquid level measurement among which capacitance probe is very useful. Hiranmoy Mandal et.al., explains how the level of liquid is measured using metallic electrodes immersed in metallic tank. Coaxial cable is preferred because of having both inductance and capacitance effect. The results obtained are linear.

A. Atojoko et al.,explains how the liquid level is monitored and controlled in industries where liquid flooding is major issued. Passive RFID tags are employed for this task and signal variations from Alien Reader software find the level of liquid [4]. The circuit attached then switches the motor ON/OFF and tank flooding or overflow avoided which created the water pollution in industries due to chemical tank overflow.

In paper Sojoudizaeh, Sadeq et. al., CMOS chip based on fuzzy logic controls the level of liquid in tank. Valves control the water flow which is controlled by motor. 0.35 um CMOS technology is used to design controlled using CMOS chip. Chip is 0.42mm in size and consumes less power [5].

3. PROPOSED SYSTEM ARCHITECTURE

3.1 Proposed system

In this project water level of 4 tanks are monitored and controlled by controlling motors which pump the water in the tank from reservoir. For sensing water level in the tank float is used as sensing element. Each float switches sense the predefined level of water.e.g.25%.Therefore for monitoring multiple level of water we require many float switches. In this project 4 different levels of water is monitored hence 4 float switches required. For monitoring of 4 different water levels of 3 tanks 4*4=16 float switches required. There are two modes of operation.

1) Auto Mode: In this mode motor is ON continuously till the 4 tanks are filled completely/Overflow. Then motors are turned off automatically.

2) Manual Mode: In this mode we can change the valve ON position by sensing multiple water levels and controlling motors manually which pump the water in the tank. Also we can add new tank and remove existing tank.

All these information is provided to ESP8266 Wi-Fi module which is prefabricated on aurduino board. ESP8266 is used for controlling motor driver circuits and uploading data to server by in built Wi-Fi unit. It is programmed in AT commands. For tank controlling 89S52 microcontroller is used which is programmed in embedded C.

All these information is uploaded to server and stored in database which is updated at predefined intervals. The proposed system is implemented as shown in block diagram. It contains ESP8266 microcontroller which is having in built Wi-Fi module so as to upload data to web server. It uses the 89S52 microcontroller for controlling no of tanks and float switches. Float level switches and Solenoid valves are also used. The server web page is having unique domain and display the water level of each tank. It is also having following buttons. After pressing Auto Mode button system switches to auto mode, all other buttons will disappear from web page. On pressing Manual Mode button all remaining buttons should be displayed on web page and system switches to manual mode. Motor ON button is used to Turn ON motor manually. Motor OFF button turns OFF motor manually. On pressing Add New Tank button message should be displayed “Please enter tank number/name”. We will enter tank number/name then new tank will be added. On pressing Remove Tank button message should display all existing tanks. We select the tank which is to be removed and tank will be removed. Refresh button is used for updating tank status to server manually.

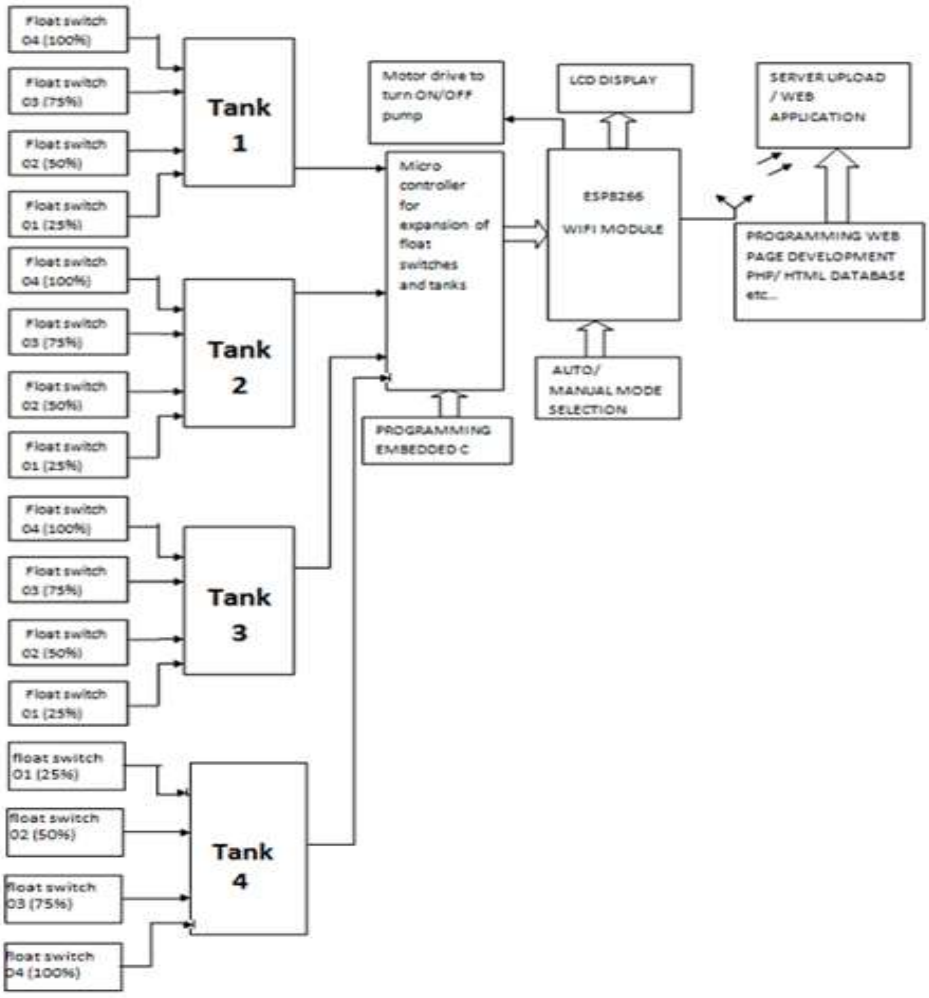

Figure1: Block diagram of proposed system

3.2 System Implementation

3.2.1 Software Tools used

The system requires 5v supply and only solenoid valve requires 12v supply for its operation. The software tools used for the proposed system are shown in below table.

Table 1: Software tools used

Sr.no	Software	Version	Description
1	Aurduino	1.6.9	Programming & compiling
2	Orcad	9.0	Circuit designing
3	PHP	5.0	Web page designing
4	HTML	Current	Database management

3.2.2 Hardware Implementation

3.2.2.1 ESP8266 Wi-Fi Modem

ESP8266EX itself has complete solutions of networking. It is used to host the application or to get Wi-Fi networking functionality from another application processor. ESP8266EX can be directly booted up from an external flash to host the application, it has in built cache to improve the performance of the system in such applications. Alternate to this, it serves as a Wi-Fi adapter and wireless internet access is added to any micro controller with simple connections. (SPI/SDIO or I2C/UART interface).

3.2.2.2 89S52 Microcontroller

In this project 89S52 microcontroller is used which is one of the version of 8051 microcontroller to control 3 number of water tanks connected. In this project 89S52 is used to connect and control 4 float switches, motor driver circuits, LCD display, relays and solenoid valves. We have used 89S52 which is a product of Atmel.

4. SYSTEM FLOWCHART

This section describes the flow of water level control and monitoring of multiple tanks project.

4.1 System Flowchart

The flowchart of system is as shown in fig

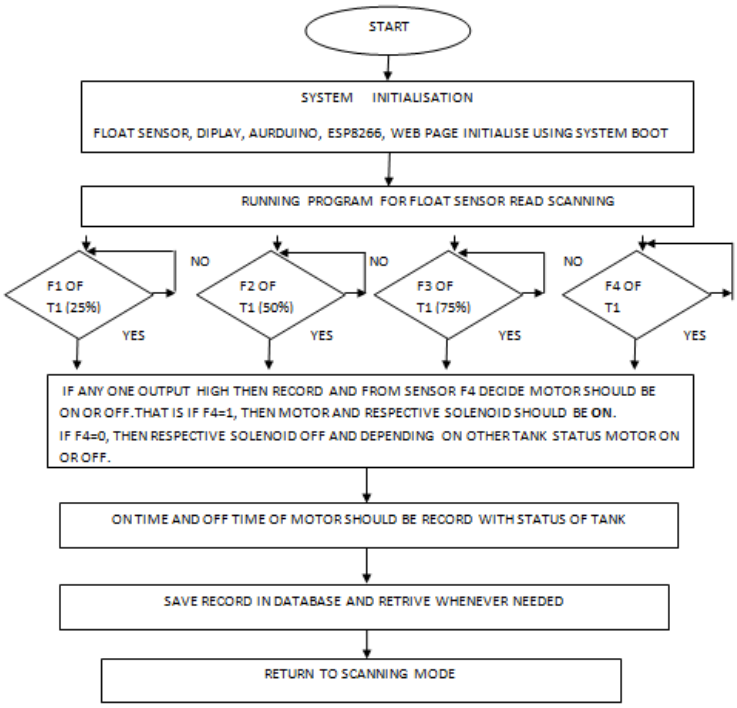

Figure2: Flow chart of system

4.2. Algorithmic Steps

1. Start
2. System Initialization
3. Float Sensors, LCD Display, ESP8266, 89S52, Pump motor initialize.
4. Run programme for float sensor read scanning.
5. If F1=25%, Off F1
6. Else
7. F1 is ON
8. Record data and update at server database
9. If F2=50%, Off F2
10. Else
11. F2 is ON
12. Record data and update at server database
13. If F3=75%, Off F3
14. Else
15. F3 is ON
16. Record data and update at server database
17. If F4=100%, Off F4
18. Turn off motor and solenoid valve.

19. Else
20. F4 is ON
21. Record data and update at server database
22. Record on time and off time of motor with tank status.
23. Save recorded data in server database.
24. Return to scan mode.
25. Stop

5. EXPERIMENTAL RESULTS

5.1 Hardware initialization:

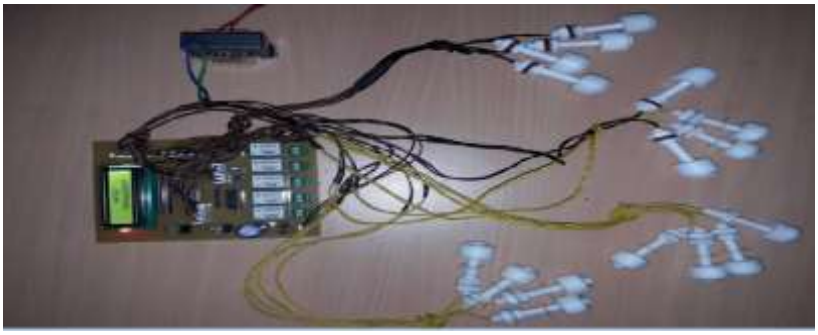

Figure 3: Hardware of system

5.2 Login to Website:

Figure 4: Login to webpage

5.3 Administartor login:

Enter the administrator login id and password, open Admin page select Automatic or Manual mode

1. **Automatic Mode:**

Figure 5: Automatic mode

2. Manual Mode

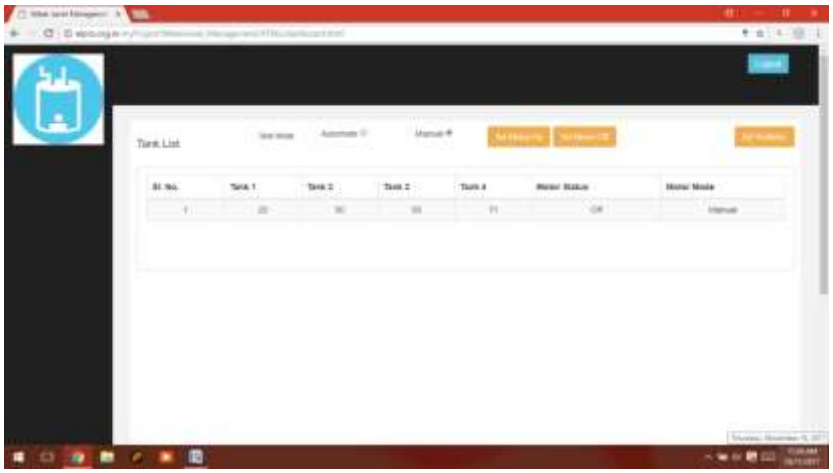

Figure 6: Manual Mode

a) Set motor On
b) Set motor Off
c) Se visibility of tank status for guest user

Guest Login: Enter the guset login id and password.

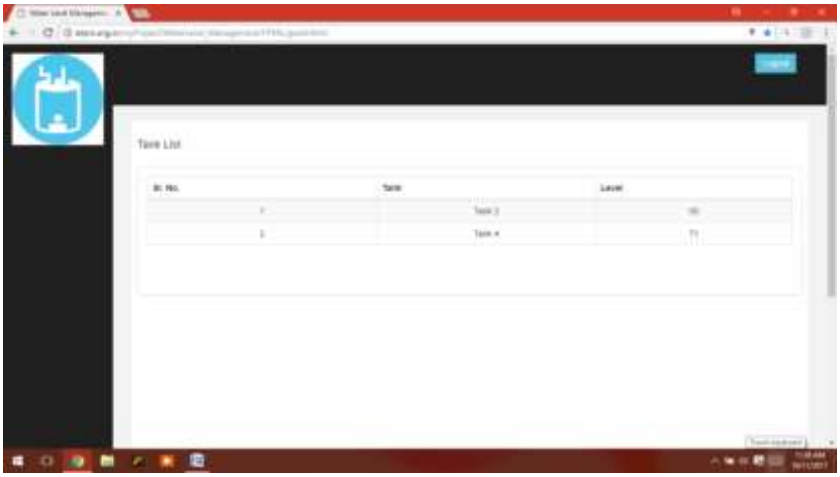

Figure 7: Guest login

5. CONCLUSION

"Multilevel Water Level Control and Monitoring of Multiple Tanks"system is successfully implemented. Thus by implementing this project the issue of monitoring and controlling of multiple tanks which are situated on terrace of multi-storied building is resolved. The manpower is reduced because only single person sitting at server room can monitor and control all the tanks. Electricity consumption is less because motor associated with each tank will be ON only when required. It has many advantages such as strong expandability, low operating cost and effective.
This system is becoming increasingly important in large cities and factories. It has real time capability. It is possible to implement the given system commercially. Upgrading the given system is very easy, this makes it more efficient.

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