Research Paper

SOLAR BASED MULTITANK MONITORING AND LEVEL CONTROLLING USING RF SIGNAL

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Water crisis is the main problem in this scenario. The common problem we faced in our day to day life is one has to switch on the motor when the tank is empty and switch off the motor when the tank is filled. Due to busy scheduled it is impossible to notice the tank so it can overflows when it is filled and completely drained when it is use for domestic and gardening purpose. This project consists of pic microcontroller for controlling purpose and we use radio frequency signal to transmit the information regarding the level of water in multitank.This project is purely replace the manual work and partially used solar supply. We are going to monitor the level of water using water level sensor component and according to the level ofwater the motor can operate. With this project we are going to use the tank water for gardening purpose for measuring thelevel of moisture in the garden .It helps to manage the tank water for domestic usage and gardening purpose.

Keywords: Multitank, Solar panel, Pic microcontroller, Radiofrequency, Encoder, Decoder

INTRODUCTION

Management of water resources in residential home, apartments, hotelsetc, is the major problem in our day to day life. The problem is mainly related to poor water allocation, lack of water management for irrigation and inefficient usage. Inhotels, apartment it is impossible to monitor the tank water manually. When the tank fills it become overflow.Inevery apartment, hotels, colleges there will be a garden set in that area. Once the garden is placed it is necessary to watering the plant twice the day. when the gardener irrigate the water to the garden without knowing the level of the water result in water usage problem among the apartment, colleges, etc. The people who are in such a situation should wait for a while until the tank gets filled. We are not having as much patient to wait for the tank get filled since we are in the robotic fast moving world. In order to prevent such condition we are going to sense the moisture content of soil in garden and level

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of the water in the tank using solar energy. If the moisture level is low and the tank water is in particular level then the controller gives the pulse to the relay to operate solenoid valve and motor for irrigationand fill the tank automatically according to the need. It prevents the wastage of water and completely replaced the manual work.We cannot provide individual controller to each tank. Itbecome more complicated and cost will be high. In order to overcome the problem we are going to design the project for multitank control.

BLOCK DIAGRAM

This project is designed for two tanks, It consist of two metallic strip as a sensor component. These strips consist of four rods which is used to indicate the level of water. It is kept inside the tank. When the water level reaches the top of the tank the metallic strip is fully immersed, the other end of the strip is fed to the base of the transistor. When the transistor does not get sufficient voltage (i.e., the water is in below the level of strip). It disconnect the triggering pin 2nd of the 555 timer. The output of the timer goes high so it enable the encoder output. The main purpose of the encoder is to convert the parallel output to serial input. Once the enable pin is active then the sensing signal is transmitted to the receiver side. The signal will be received by decoder, when the encoder address match with the decoder address. It decodes the signal and fed the original signal to the pic microcontroller. It provides the high bit to relay circuit to operate the motor to fill the tank. When the tank is filled then the timer reset based on flip flop condition. It blocks the enable pin. So, no more transmitted signal is takes place. This makes the motor to off. When the moisture in the soil goes low and the tank

Figure 1: Block Diagram
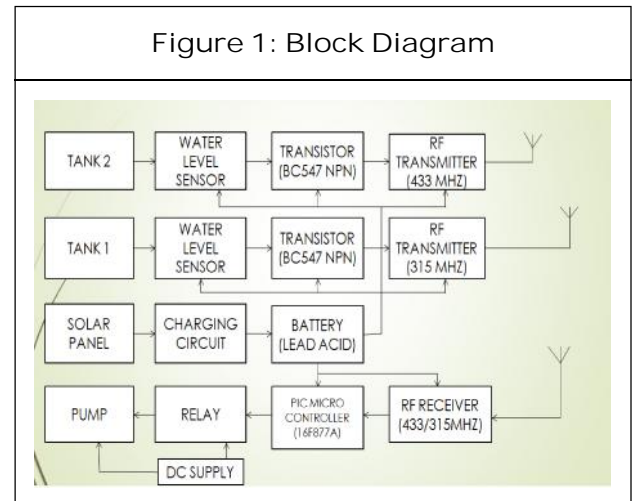
level is in high then it provide the high pulse to the solenoid coil to make the valve open and close to irrigate the water for garden.

COMPONENT DISCRIPTIONS

The major components used in this project is PIC 16F877A microcontroller, Sensorcomponent, Battery, RF module HT12E Encoder, HT12D Decoder, Solenoid coil, Relay.

SENSOR

It consists of metallic strip fitted inside the tank. The metallic strip consists of four rods. Each rod indicates corresponding level. One end of the metallic strip immersed in the tank and other end is fed to the transistor circuit. When the water is below the level of the metallic strip there will be no power supply so it indicate the water level in the tank is low and vice versa.

POWER SUPPLY

It is the Mono Crystalline Solar panel having more efficient. We are using 10W, 12V mono crystalline panel made up of the single silicon. Main advantage of using mono crystalline panel is High temperature tolerance and having Long life time.

BATTERY

It consists of lead acid battery as a power supply for the circuit. It has the range of 12V, 4A. It provides a supply to the transmitter side. The sub circuits are Encoder, Transistor and ANDgatecomponent with Relay circuit, this battery is fitted with voltage regulator in order to provide continues power supply. It is provided with adopter circuit in order to charging the battery without causing damage using solar panel or by using 230V AC supply.

RF BASED WATER LEVEL INDICATOR

The system consists of water level sensor component as a metallic strip. The water level sensing section senses the level of the tank and sends the signal to the receiversection. The receiver section connected to the controlling section. It process the received information and controls the operation of motor whenever it required. The sub circuit consist of encoder, decoder, amplitude shift keying and antenna. When the water level is sensed, it transmit the signal to the RF sub circuit (encoder (HT12E) and ask) at the receiver side this signal is decoded and fed to the microcontroller. The decoder (HT12D)accepts the signal from the transmitted antenna when the address of the encoder matches with the address of the decoder. We can transmit the signal with the frequency range of 433/315 MHZ. The transmission range of ASK module is about 30 meters.

HT12E ENCODER

This circuit senses, encoding and transmitting the level of water to the receiver and controller part. HT12E Encoder IC will convert 2 bit parallel data given to pin D0, D1 to serial data


Figure 2: Encoder
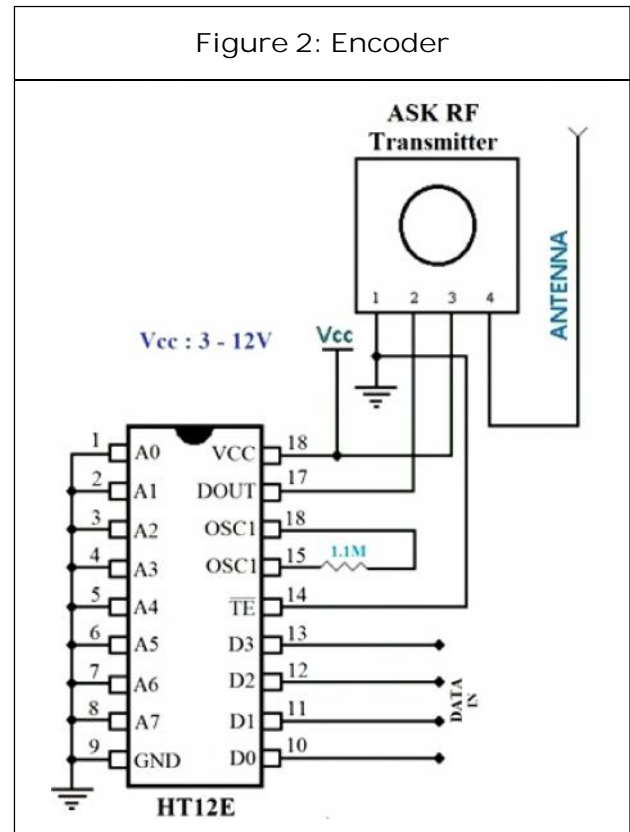
and will be available at DOUT. This serial output data is given to ASK (Amplitude Shift Keying) RF transmitter. Address input A0-A7 can be used to provide security and it can be connect to zero or open. Here we are going touse two pin A0 and A1.

HT12D DECODER

This circuit receives and decodes the data sent from the encoder and transmitter circuit at 433 MHZ frequency. Ask (Amplitude Shift Keying) RF receiver receives the transmitted data. HT12D decoder converts the received serial data to 2 bit parallel data D0 and D1. The address pin A0 and A1 should match with the address pin in HT12E at the transmitter for the transmission of data. The LED connected to the above circuit glows when valid transmission data occur from transmitter to receiver. This circuit needs +5V.
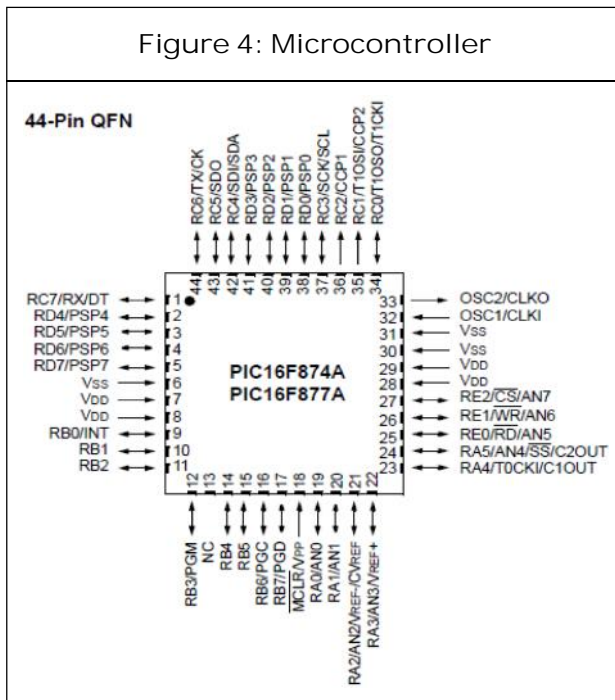
Figure 3: Decoder
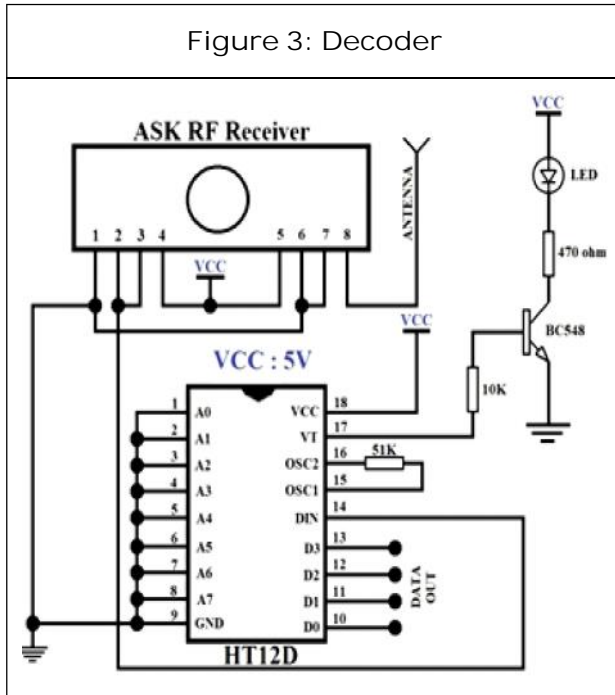
MICROCONTROLLER

Programmable Interface Controller 16F877A having the operating frequency of 20 MHZ. It has 14 KB of program memory. They have 368 bytes of RAM, 256 bytes of EEPROME (data memory). It has 8 kilo bytes of flash memory. It

Figure 4: Microcontroller

consistsof 5 I/O port (port A, B, C, D, E) and 10 bit multi-channel A/D converter. Main advantage of using this pic microcontroller is fast response.

Program

```
sbit T1_hi at RD7_bit;

sbit T1_lo at RD6_bit;

sbit T2_hi at RD5_bit;

sbit T2_lo at RD4_bit;

sbit soil1 at RD3_bit;

sbit soil2 at RD2_bit;

sbit mtr1 at RC0_bit;

sbit mtr2 at RC1_bit;

sbit valve1 at RC2_bit;

sbit valve2 at RC3_bit;

void main()

{

 PORTC = 0;        // set PORTC to 0

 TRISC = 0;        // designate PORTC
pins as output

 PORTD = 255;

 TRISD = 255;      // configure PORTD pins
as input

 Delay_ms(1000);

 while(1)

 {

if(T1_hi==1 && T1_lo==0)

{ mtr1=0; }

else

{ mtr1=1; }

if(T2_hi==1 && T2_lo==0)
```

```
{ mtr2=0; }
else
{ mtr2=1; }
if(soil1==1)
{ valve1=0; }
else
{ valve1=1; }
if(soil2==1)
{ valve2=0; }
else
{ valve2=1; }
 }
}
```

RELAY CIRCUIT

It consists of solid state relay which is normally open type relay. It requires 50 to 100 mA supply to operate. Output of the microcontroller does not provide sufficient voltage to operate relay so it can be interface with transistor to get sufficient voltage. Purpose of the relay is to operate the pump to fill the tank and to operate
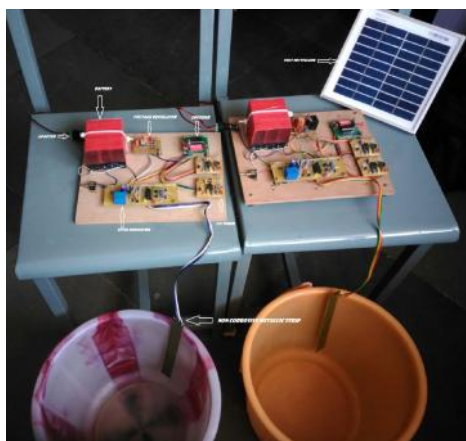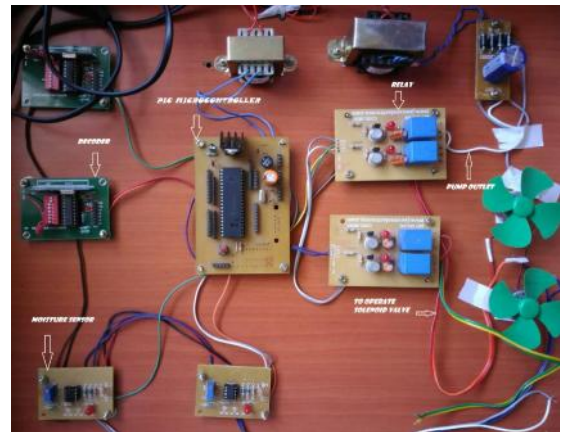
Figure 5: Transmitter

Figure 6: Receiver

the solenoid to open and close the valve of the pipe.

CONCLUSION

This paper shows the design and methodology to control the level of multitank in hostel, colleges, apartment, etc., implement of low cost and easy maintenance wireless system play a vital role in forth coming year. Wireless network nearly covers 30 meters. It is the most advantageous project. This project helps to manage the level of water for domestic usage as well as gardening purpose.

FUTURE SCOPE

Presently, we are doing our project for water irrigation and also for gardening purpose. We implemented our project with solar on transmitter side only.

In future, this project can be implemented in various application is as follows:

1. It is possible to implement our project for whole domestic purpose.

2. It is possible to implement with fully solar so that, it is a blooming technology for electricity.

REFERENCES

1. Ejiofor Virginia Ebere and Oladipo Onaolapo Francisca (2013), "Microcontroller Based Automatic Waterlevel Control System", *International Journal of Innovative Research in Computer and Communication Engineering*, Vol. 1, No. 6, pp. 1390-1396.

2. Govinda K, Anupreetham D and Sri Sai Vivek C (2014), "Online Reservoir Water Level Indicator – Design and Applications", *IJSRD - International Journal for Scientific Research & Development*, Vol. 2, No. 03, pp. 599-601.

3. HOLTEK 212 Series of Decoders Datasheet, 15th Mar'96, from www.eleinmec.com/datasheets/ds_holtek_ht12d.pd, retrieved on 7-11-2014.

4. HOLTEK 212 Series of Encoders Datasheet, 15th Mar'96, www.eleinmec.com/datasheets/ds_holtek_ht12d.pd, retrieved on 7-11-2014.

5. Khaled Reza S M, Shah Ahsanuzzaman Md. Tariq and Mohsin Reza S M (2010), "Microcontroller Based Automated Water Level Sensing and Controlling: Design and Implementation Issue", Proceedings of the World Congress on Engineering and Computer Science, pp. 220-224.

6. Microchip IC16F882/883/884/886/887 Datasheet, 28/40/44-Pin, Enhanced Flash-Based 8-BitCMOS Microcontrollers with NanoWatt Technology, 2009, Microchip Technology Incorporated.

7. RWS-371 RF MODULE Series Wireless Hi SensitivityReceiver Module (RF ASK) data sheet,http://www.wenshing.com.tw; http://www.rf.net.tw, retrieved on 7-11-2014.