ISSN (ONLINE): 2454-9762
ISSN (PRINT): 2454-9762
Available online at www.ijarmate.com

International Journal of Advanced Research in Management, Architecture, Technology and Engineering
(IJARMATE) Vol. 3, Special Issue 13, March 2017

Field Level Observation in Agriculture Terrain

(FLOAT)

D.Usha[1], K.Gomathi[2], G.Anand[3], M.Devananth[4]
[1]Assistant Professor, Department of Electronics and Instrumentation, Jerusalem College of Engineering, Ch-600100.
[234]UG scholars, Department of Electronics and Instrumentation, Jerusalem College of Engineering, Ch-600100.

***Abstract*— Agriculture is an important activity which directly and indirectly engages 70% of the population in India. Water feeding to the agricultural field has to be done regularly with continuous monitoring. Days and Nights continuously monitoring the water feeding and switching ON and OFF the motor becomes a burdensome task to the farmer. During both drought and flood conditions, crops in the field are damaged. This causes a severe decrease in the productivity of the crops and thus the farmers find difficult to manage their survival. In order to prevent the damage of crops from both drought and flood conditions, the water level in the field is continuously monitored and depending upon the area of the field and type of the crops grown, the water level is automatically controlled by the on and off of drain and supply motors. This mechanism was implemented using Arduino Microcontroller. Simultaneously the water level in the field is displayed to the farmers through LCD and LED displays using nrf wireless communication module so that they know about the current scenario of the field.**

.

Keywords*— *Arduino Microcontroller, Water level sensor, nrf module

I.INTRODUCTION

In the past few decades, monitoring and controlling the machines remotely has become an important area of research in many engineering fields. This paper is mainly focusing on two points 1) Monitoring 2) Controlling water level using Arduino microcontroller and nrf technology in agricultural fields. Agriculture in India has a significant history. India is ranking second in farm output. Monitoring and controlling the irrigation in agriculture is an important task for the farmers as they have to regularly feed water days and nights. It is very important in agricultural fields to monitor and control water level and to provide high security to keep check on them otherwise which in turn leads to damages. The proposed system is based on Arduino microcontroller, water level sensor and NRF 24l01 module which will be discussed one by one.

II.COMPONENTS USED

A. Arduino Atmega 328 micro controller

The **Uno** is a Microcontroller board based on the **ATmega328P**. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button as shown in fig 1. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. [1]

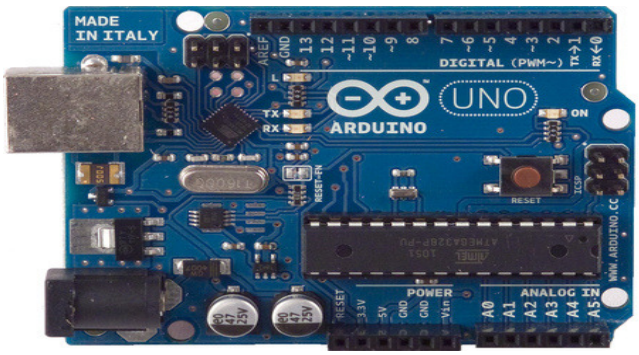


Fig 1. Arduino Microcontroller

Arduino micro controller features

- Operating voltage: 5V
- Input Voltage (recommended): 7-12V
- Digital I/O Pins: 14 (of which 6 provide PWM output)
- Analog Input Pins: 6
- DC Current per I/O Pin: 40mA
- DC Current for 3.3V pin: 50mA
- Flash Memory: 32 KB (ATmega328) of which 0.5KB used by boot loader
- SRAM: 2 KB (ATmega328)
- EEPROM: 1 KB (ATmega328)
- Clock Speed: 16 MHZ
- USB Chip CH340G

ISSN (ONLINE): 2454-9762
ISSN (PRINT): 2454-9762
Available online at www.ijarmate.com

International Journal of Advanced Research in Management, Architecture, Technology and Engineering
(IJARMATE) Vol. 3, Special Issue 13, March 2017

B. Level sensor

Water Sensor is an easy-to-use, cost-effective high level/drop recognition sensor, which is obtained by having a series of parallel wires exposed traces measured droplets/water volume in order to determine the water level as shown in fig 2. Easy to complete water to analog signal conversion and output analog values can be directly read Arduino development board to achieve the level alarm effect

Fig 2. Level sensor

Level sensor features

- Operating voltage: DC3-5V
- Operating current: less than 20mA
- Sensor Type: Analog Detection
- Area: 40mmx16mm
- Production process: FR4 double-sided HASL
- Operating temperature: 10℃-30℃ Humidity: 10% -90% non-condensing

Table 1. Output range of level sensor

Range	Sensor output(V)	Arduino output	Level in cm
Minimum	0	60	0
Maximum	4.2	650	4.2

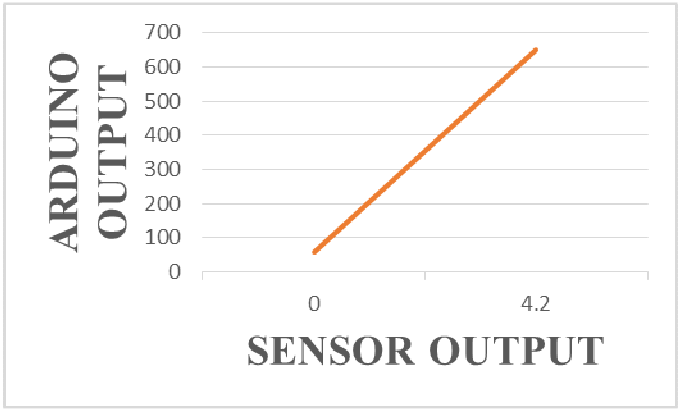


Fig 3.Sensor output VS Arduino output

C. NRF 24L01

The nRF24L01 is a highly integrated, ultralow power (ULP) 2Mbps RF transceiver IC for the 2.4GHz ISM (Industrial, Scientific and Medical) band. With peak RX/TX currents lower than 14mA, a sub µA power down mode, advanced power management, and a 1.9 to 3.6V supply range as shown in fig 3. The nRF24L01 provides a true ULP solution enabling months to years of battery lifetime when running on coin cells or AA/AAA batteries. nrf24L01 integrates a complete 2.4GHz RF transceiver, RF synthesizer, and baseband logic including the Enhanced ShockBurst hardware protocol accelerator supporting a high-speed SPI interface for the application controller. No external loop filter, resonators, or VCO varactor diodes are required, only a low cost ±60ppm crystal, matching circuitry, and antenna. [2]

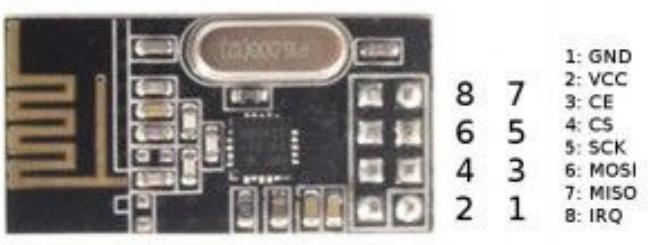


Fig 4. Nrf 24L01 module

Features of nrf 24l01

- Low cost single-chip 2.4GHz GFSK RF transceiver IC
- Worldwide license-free 2.4GHz ISM band operation
- 1Mbps and 2Mbps on-air data-rate

ISSN (ONLINE): 2454-9762
ISSN (PRINT): 2454-9762
Available online at www.ijarmate.com

- Enhanced ShockBurst™ hardware protocol accelerator
- Ultralow power consumption – months to years of battery lifetime
- On-air compatible with all Nordic nRF24L Series in 1 and 2Mbps mode
- On-air compatible with Nordic nRF24E and nRF240 Series in 1Mbps mode

D. Driver circuit

L293D IC is used as a driver circuit. A motor cannot be connected directly to the microcontroller because a micro controller cannot provide the required current for the operation of the motor. The driver circuit amplifies the current and provides it to the motor.

L293D IC features

- Can control 2 bidirectional DC motor simultaneously.
- Internal clamp diodes.
- 600mA output current capability per channel.
- Enable facility.
- 1.2A peak output current (non repetitive) per channel.
- Input voltage up to 1.5 V (high noise immunity)
- Over temperature protection.
- Supply for the IC is 5V.
- Supply for the motor ranges from 5V-36V

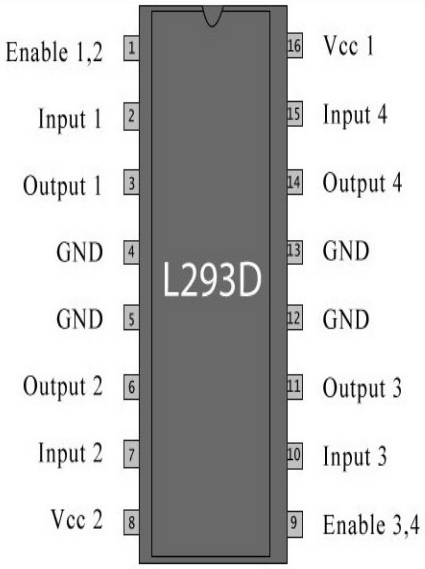


Fig 5. Pin diagram of L293D IC

Table 2. Truth table of driver circuit

EN	1A	2A	FUNCTION
H	L	H	Turn Anticlockwise
H	H	L	Turn Clockwise
H	L	L	Fast motor stop
H	H	H	Fast motor stop
L	X	X	Fast motor stop

L = low, H = high, X = don't care

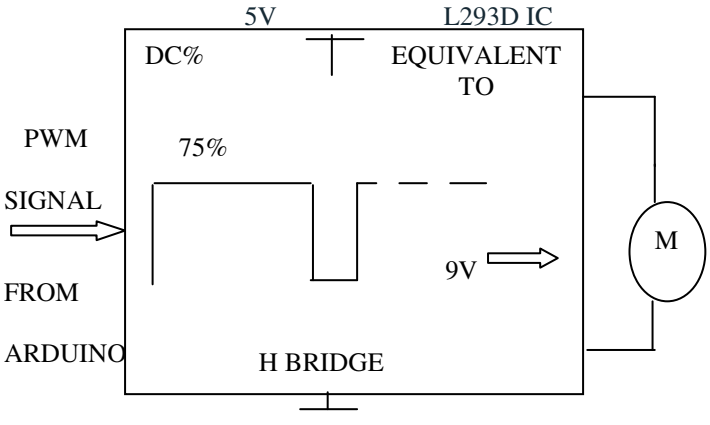


Fig 6.Pulse waveform of driver circuit

ISSN (ONLINE): 2454-9762
ISSN (PRINT): 2454-9762
Available online at www.ijarmate.com

International Journal of Advanced Research in Management, Architecture, Technology and Engineering
(IJARMATE) Vol. 3, Special Issue 13, March 2017

E. LCD (16x2):

A liquid crystal display (LCD) is a thin flat display device made up of any number of colour or monochrome pixels arrayed in front of a light source or reflector. Each pixel consists of a column of liquid crystal molecules suspended between two transparent electrodes, and two polarizing filters, the axes of polarity of which are perpendicular to each other. Many microcontroller devices use 'smart LCD' displays to output visual information. LCD displays designed around LCD NT-C1611 module, are inexpensive, easy to use, and it is even possible to produce a readout using the 5X7 dots plus cursor of the display. They have a standard ASCII set of characters and mathematical symbols. As SHOWN IN FIG 7, for an 8-bit data bus, the display requires a +5V supply plus 10 I/O lines (RS RW D7 D6 D5 D4 D3 D2 D1 D0). For a 4-bit data bus it only requires the supply lines plus 6 extra lines (RS RW D7 D6 D5 D4). When the LCD display is not enabled, data lines are tristate and they do not interfere with the operation of the Micro controller.

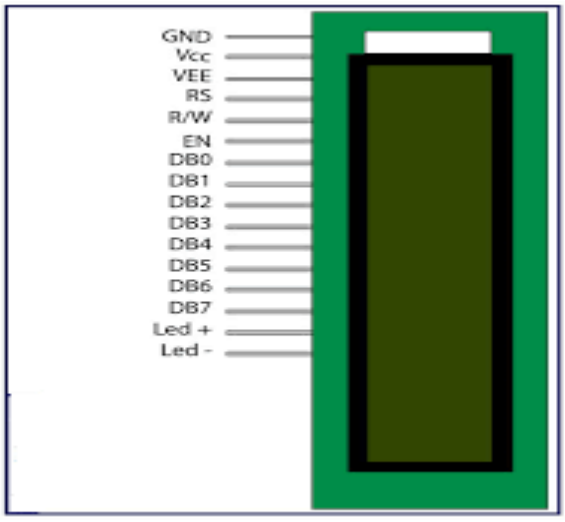


Fig 7. Pin diagram of 16x2 LCD

III. PROPOSED SYSTEM

In the proposed work, a water level sensor is placed in the agricultural field to indicate the level of the water in the field. The sensor is attached to the microcontroller. The microcontroller reads the level of the water in the field through the sensor. When the water level is increasing beyond a limit required for the proper growth of crops, the micro controller switch on the drain motor through the driver circuit to drain the water until the limit is reached. When the water level is below the limit, the microcontroller switch on the supply motor through the driver circuit to supply water to the field till the limit is reached. This irrigation system is fully automatic. Simultaneously the water level in the field is communicated through the nrf module and displayed through LCD, LED display to the farmer's house and to the agriculture department for the continuous monitoring of the field activities.[6]

IV .WATER REQUIREMENT CALCULATION

The irrigation water need is calculated using the following formula:

IN = ET crop + SAT + PERC + WL – Pe

Where, IN-Irrigation water need
ET-Evapotranspiration of crop
ET crop = ETo x Kc
ET_0- reference crop evapotranspiration
K_C-crop coefficient
SAT-amount of water needed for land preparation (200 mm)
PERC- amount of percolation and seepage losses
WL- amount of water needed to establish a water layer
Pe- effective rainfall

Table 3. Formulae for calculation of effective rainfall

:

P_e= 0.8P-25	If P>75 mm/month
P_e= 0.6P-10	If P<75 mm/month

Table 4.Irrigation requirement of rice per Acre

crop	No of days(growing period)	Total water requirement(cm)	Daily water requirement(cm)
rice	93	104.50	1.075

ISSN (ONLINE): 2454-9762
ISSN (PRINT): 2454-9762
Available online at www.ijarmate.com

International Journal of Advanced Research in Management, Architecture, Technology and Engineering
(IJARMATE) Vol. 3, Special Issue 13, March 2017

Table 5.Crop coefficient of rice

CROP	$K_{C\ INITIAL}$	$K_{C\ MID}$	$K_{C\ END}$	HEIGHT (m)
RICE	1.05	1.20	0.60-0.90	1

/

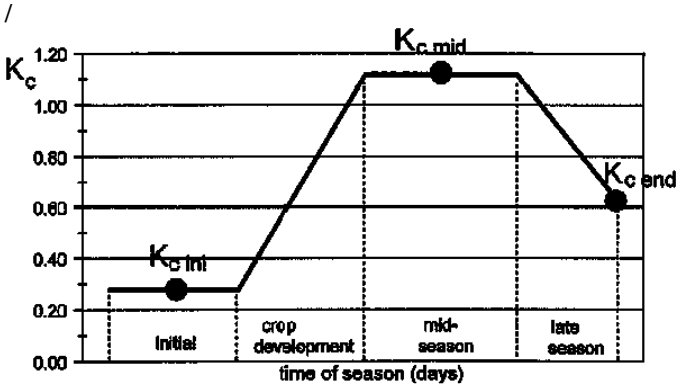
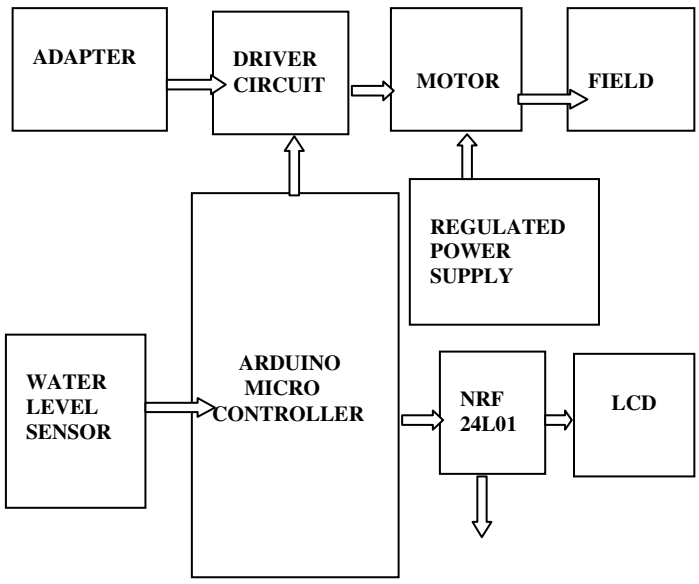


Fig 8.Crop coefficient of rice

V.BLOCK DIAGRAM



VI. IMPLEMENTATION

In the prototype of the system, an agriculture field model is taken and the water level sensor is put into it. Suction (drain) and supply motor is used as agricultural motors. The system consists of a power supply, battery, adapter, Water level sensor, Arduino microcontroller, nrf Module, LCD and LED, Motor and Motor driver circuit. The circuit is powered by 5V-DC regulated power supply. The Arduino microcontroller is connected to the water level sensor circuit, Relay driver and nrf 24l01 module. The microcontroller is programmed to perform necessary actions. The limit of the required water level for the proper growth of the crops is included during the coding of the microcontroller. When water in the field model reaches a level beyond the limit, water level sensor circuit senses the level and the microcontroller gets the signal from the sensor circuit. The microcontroller then generates a signal to the drain motor through the driver circuit and thus the motor is switched ON and the water is drained from the field till the limit is reached. Similarly, when the water level is below the limit, the microcontroller sends the signal to switch ON the supply motor, to supply the water to the field till the limit is reached. Simultaneously, the water level in the field is communicated through the nrf 24l01 module and displayed through LCD and LED to the farmer's house and to the agriculture department in order to have a continuous monitor on the activities happening in the field.

VII. CODING

Transmitter side-

```
#include <SPI.h>
#include <nRF24L01.h>
#include <RF24.h>
int w=0;
RF24 radio(7, 8);
// 7 – CE, 8 - CSN
  const byte rxAddr[6] = "00001";
void setup() {
  // put your setup code here, to run once:
Serial.begin(9600);
pinMode(A0,INPUT);
pinMode(5,OUTPUT);
pinMode(6,OUTPUT);
radio.begin();
```

ISSN (ONLINE): 2454-9762
ISSN (PRINT): 2454-9762
Available online at www.ijarmate.com
International Journal of Advanced Research in Management, Architecture, Technology and Engineering
(IJARMATE) Vol. 3, Special Issue 13, March 2017

```
radio.setRetries(15, 15);
radio.openWritingPipe(rxAddr);
radio.stopListening();
}
void loop() {
  // put your main code here, to run repeatedly:
w=analogRead(A0);
 if(w>=300)
 {
  digitalWrite(5,LOW);
  digitalWrite(6,HIGH);
 }
  else
  {
 digitalWrite(5,HIGH);
  digitalWrite(6,HIGH);
 }
 radio.write(&w, sizeof(w));

  delay(1000);
}
```

Receiver side-

```
#include <LiquidCrystal.h>
#include <SPI.h>
#include <nRF24L01.h>
#include <RF24.h>
RF24 radio(7, 8);
int j;
const byte rxAddr[6] = "00001";
LiquidCrystal lcd(10,9,5,4,3,2);
void setup() {
  // put your setup code here, to run once:
 lcd.begin(16,2);
 while (!Serial);
  Serial.begin(9600);
  radio.begin();
  radio.openReadingPipe(0, rxAddr);
  radio.startListening();
}
void loop() {
  // put your main code here, to run repeatedly:
  if (radio.available())
  {
    //char text[32] = {0};
    int j;
    radio.read(&j, sizeof(j));
   // Serial.println(j);
    lcd.setCursor(0,0);
  Serial.print("max=500");
  lcd.print("maxl=500");
  lcd.setCursor(9,0);
  Serial.print(" min=50");
  lcd.print("minl=50");
  lcd.setCursor(0,1);
  Serial.print("level=");
  Serial.println(j);
  lcd.print("level=");
  lcd.print(j);
    delay(1000);
   lcd.clear();
  }


}
```

VIII.CONCLUSION

In this paper, the water level monitoring in agricultural field and motor controlling system based on automation technology using Arduino microcontroller was implemented. An advantage of this system is very simple, more competent and low cost and fully automatic. Future work can be done by designing a system based on 3G camera for visual identification of water level from remote places. Another future work can be made by using an IOT technology, in which the field information can be communicated through internet over large distances.

IX. REFERENCES

[1] Yusuf Abdullahi Badamasi "The working principle of an Arduino"*11th International Conference on Electronics, Computer and Computation (ICECCO) 2014*

[2] Zeeshan Ali, Abid Rahim and Syed Sabeel Nawaz, "Design and Implementation of a Low Cost Wireless Sensor Network using Arduino and nRF24L01(+)",*Second National Conference on Emerging Trends in Computer Science & Engineering (NCETCSE-2016),Department of CSE, BGSIT,*

[3] G. Aranguren, L. Nozal, A. Blazquez, and J. Arias, "Remote control of Sensors and actuators by GSM", IEEE 2002, 28th Annual Conference of The Industrial Electronics Society IECON 02, vol. 3, 5-8 Nov. 2002, pp.2306 2310.

[4], B.Vidya Sagar, KLU, Vaddeswaram, "Green House monitoring and Automation using GSM"

[5] Kulkarni Amruta M, Taware Sachin S, "Embedded security system using RFID and GSM", International Journal of Computer Technology and Electronics Engineering (IJCTEE) Volume 2, Issue 1

[6] Shaik Jhani Bhasha, Shaik Mazhar Hussain Agricultural field monitoring and automationusing PIC16F877A microcontroller and GSM. *International Journal of Advanced*

ISSN (ONLINE): 2454-9762
ISSN (PRINT): 2454-9762
Available online at www.ijarmate.com

Research in Computer Engineering & Technology (IJARCET) Volume 3 Issue 6, June 2014

[7] Sirisha D1, B Venkateswaramma2, M Srikanth3 and A Anil Babu Wireless Sensor Based Remote Controlled Agriculture Monitoring System Using ZigBee *SSRG International Journal of Electronics and Communication Engineering (SSRG-IJECE) volume 2 Issue 4 April 2015*

[8] Prof C. H. Chavan, Mr.P. V.KarandeWireless Monitoring of soil Moisture,Temperature &Humidity Using Zigbee in agriculture *International Journal of Engineering Trends and Technology (IJETT) – Volume 11 Number 10 - May 2014*