Research Article

Electronic Voting Machine System Using Arduino

Aye Myint Thwe[1] and Thanda Aye[2]

[1]Lecturer, Department of Engineering Physics, University of Technology (Yatanarpon Cyber City), Myanmar
[2]Lecturer, Department of Engineering Physics, Technological University Toungoo, Myanmar
E-mail: [1]tthwetthwe7@gmail.com; [2]thandaaye2010@gmail.com

Abstract: Advanced electronic voting machine system is an Arduino based project which will be very much useful to count our votes at the time of general election. Our voting system will have enhanced features to store the counting again and again. In this project, Arduino Uno ATmega328 is the heart and brain of the circuit. Its controls the complete process. It will get input from the keypad and it has a possibility to show the number of counts in the LCD display. LCD display consists of five buttons which are assigned for A team, B team, C team, D team and last button is used for calculating or displaying results. When we press the master key, it will activate the Arduino Uno AT mega 328. Now this arrangement is ready to cast the vote.

Keywords: Arduino, LCD, UNO ATmega328, microcontroller.

1. Introduction

Electronic voting machine has now replaced the traditional mechanism of voting due to several advantages like security, automatic counting etc. This project presents a way to develop an electronic voting machine which displays the count of votes on a 16 x 2 LCD interface. A user can get his/her vote register through a set of switches (one for each candidate). In key pad, each key describes the one candidate. We can cast to vote our desired candidate the Arduino will increment one count for that particular candidate and also display the register in the LCD. The Arduino activates the alarm through the driver circuit for the Vote registration. After every cast of vote, the counting number can be seen on LCD.

- ✓ Arduino Uno
- ✓ Liquid Crystal Display (16x2 LCD)
- ✓ Push button
- ✓ Bread board
- ✓ Power
- ✓ Connecting wires

2. Arduino Uno ATmega328

The Arduino Uno is a microcontroller board based on the AT mega 328 (datasheet) (Figure-1). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. Arduino Uno is the most standard board available and probably the best choice for a beginner. Its biggest advantage is that we connect the board to the computer via a USB cable which does not a dual purpose of supplying power and acting as a Serial port to interface the Arduino and the computer.
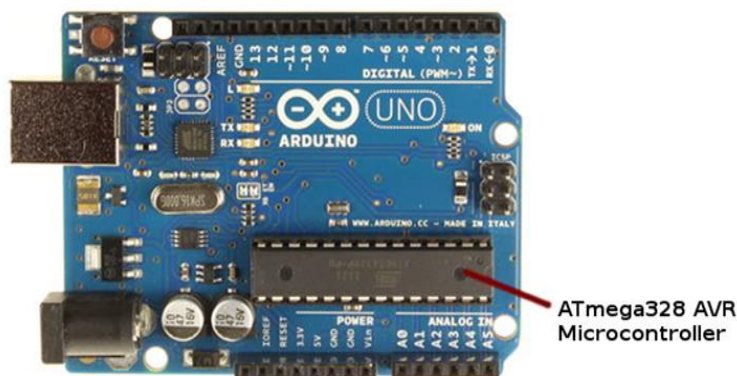
Figure 1. Arduino Uno ATmega328 microcontroller

3. Liquid Crystal Display (16x2 LCD)

A liquid crystal display (LCD) is a thin, flat electronic visual display that uses the light modulating properties of liquid crystals (LCs), LCs does not emit light directly. LCDs therefore need a light source and are classified as "passive" displays. Some types can use ambient light such as sunlight or room lighting. There are many types of LCDs that are designed for both special and general uses. They can be optimized for static text, detailed still image, or dynamic, fast- changing, video content. They are used in a wide range of application including: computer monitors, television, instrument panels, aircraft cockpit displays, signage, etc. They are common in consumer devices such as video players, gaming devices, clocks, watches, calculators, and telephones. For this project, a 16 by 2 Hitachi JHDI162A LCD display (Figure-2) is used. The LCD has up to 192 characters available including Japanese and Greek characters (5).

4. Construction of Electronic Voting Machine System

Arduino controlled E-voting system is constructed by using the Arduino Uno ATmega328 microcontroller. Today our country is walking towards the democracy so electronic voting system will be more important and useful. This circuit is supplied with a +9V battery. But actually we need a +5V dc supply fixed a 7805 voltage regulator IC is used to supply the circuit. The system is designed to control for the switch button and then to the Arduino Uno ATmega328 microcontroller. If the voter presses the switch button, the microcontroller controls the voter's desire and it switches ON the alarm system and displays "candidate 1" on the LCD module. The 1st receiving signal of voter is not used again. And then the 2nd voter presses another switch button. The complete circuit shown in (Figure-3).
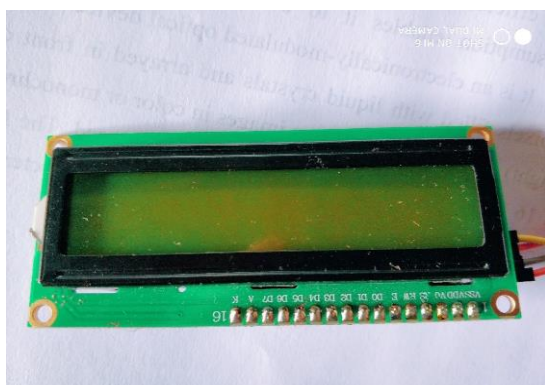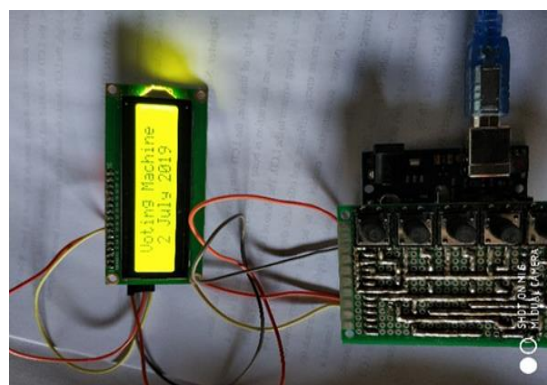

Figure 2. 16 by 2 Hitachi JHDI162A LCD display

Figure 3. Construction of Electronic Voting Machine System
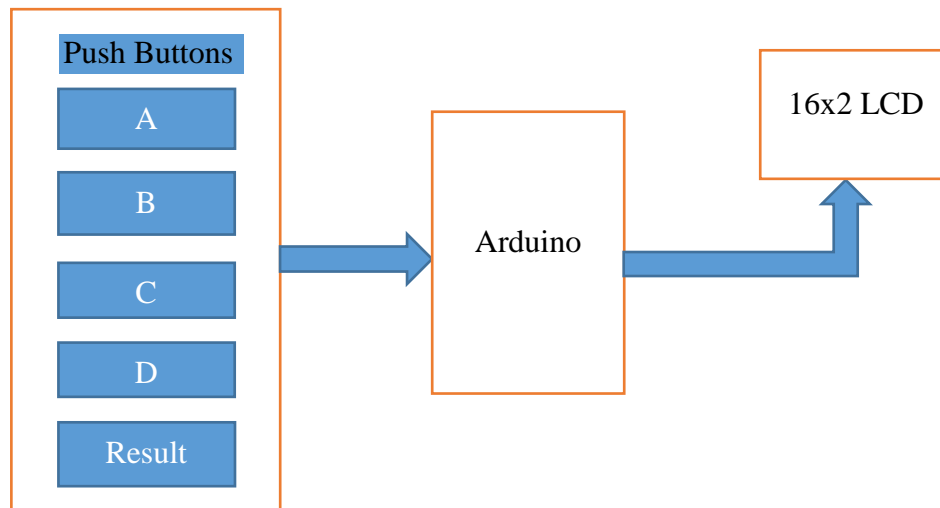
5. Block Diagram of EVM

Figure 4. Block Diagram of EVM
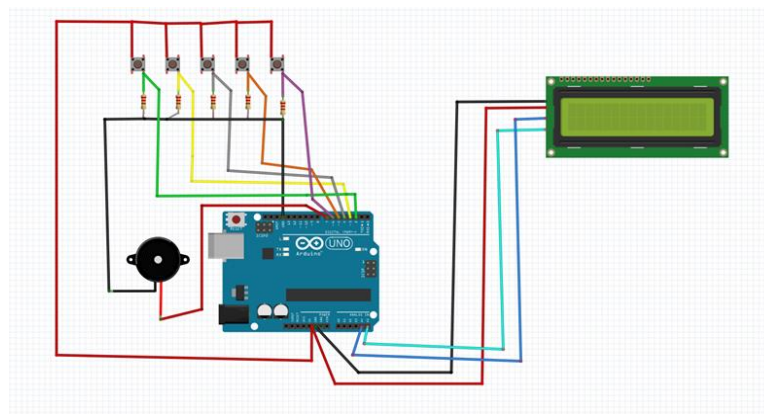
6. Circuit Diagram of EVM

Figure 5. Circuit Diagram of EVM

7. Result and Discussion

Electronic voting has been attracting the attention of governments and research groups with most work on the subject referring to the user requirements such a system should satisfy. For several cases, through, requirements identification seldom goes further than a simple narrative description of a basic set of non-functional characteristics related to security. On the other hand, governmental reports usually refer to requirements as the set of applicable laws pertaining a certain voting procedure. Both sides seem to under estimate the fact that an electronic voting system is an information system with functional, as well as non- functional, requirements.

In this paper we apply the rational Software Development Process for identifying and presenting the requirements an electronic voting system should meet. The requirements are based on a generic voting model that has been developed having in mind the European Union member states legislation, the organizational details of currently applicable voting procedures and the opportunities offered and the constraints imposed by the state of the art technology. Photo of electronic voting system is shown in figure (6).
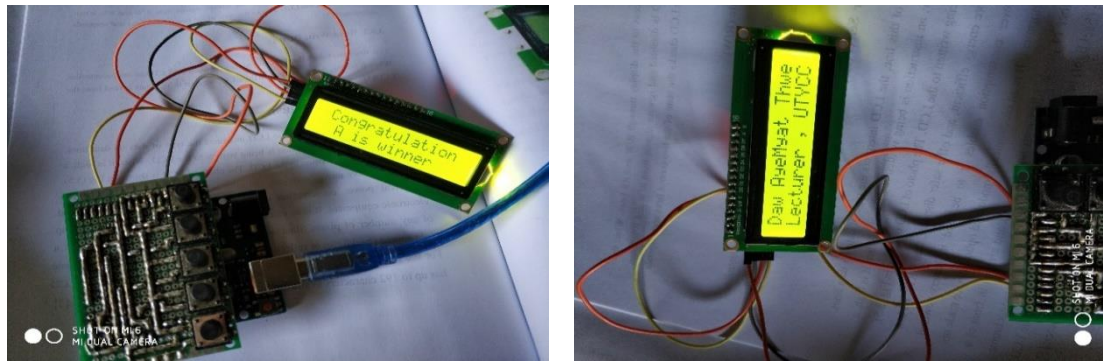
Figure 6. Result and Discussion of EVM

```
#include <LiquidCrystal_I2C.h>        //header file for LCD
LiquidCrystal_I2C lcd(0x27,16,2);     //config the LCD

int b1 = 2;                  //set pin 2 to voting button 1
int b2 = 3;                  //set pin 3 to voting button 2
int b3 = 4;                  //set pin 4 to voting button 3
int b4 = 5;                  //set pin 5 to voting button 4
int b5 = 6;                  //set pin 6 to result button
int bz = 7;
int vote1 = 0;               //declare vote1
int vote2 = 0;               //declare vote2
int vote3 = 0;               //declare vote3
int vote4 = 0;               //declare vote4

void setup() {
 pinMode(b1,INPUT);          //declare b1 as input pin
 pinMode(b2,INPUT);          //declare b2 as input pin
 pinMode(b3,INPUT);          //declare b3 as input pin
 pinMode(b4,INPUT);          //declare b4 as input pin
 pinMode(b5,INPUT);          //declare b5 as input pin
 pinMode(bz,OUTPUT);         //declare bz as output pin
 //LCD Configuration Section
 lcd.init();                 //initiate lcd
 lcd.backlight();            //enable lcd's backlight
 lcd.setCursor(0,0);         //set lcd cursor to first column
 lcd.print("Daw AyeMyat Thwe");    //print string
 lcd.setCursor(0,1);         //set cursor to second column
 lcd.print("Lecturer , UTYCC");   // print string
 delay(2000);               //set delay time for 2s
 lcd.setCursor(0,0);         //set lcd cursor to first column
 lcd.print(" Voting Machine ");   //print string
 lcd.setCursor(0,1);         //set lcd cursor to second column
 lcd.print("  2 July 2019  ");    //print string
 delay(2000);               //set delay time for 2s
 lcd.setCursor(0,0);         //set lcd cursor to first column
 lcd.print("-A- -B- -C- -D- ");   //print string
 lcd.setCursor(0,1);         //set lcd cursor to second column
 lcd.print("                ");   //print nothing

} // end of void setup

void loop() {
```

```
lcd.setCursor(0,0);              //set lcd cursor to first column
lcd.print("-A- -B- -C- -D- ");     //print string
lcd.setCursor(0,1);              //set lcd cursor to second column
lcd.print("              ");     //print nothing
lcd.setCursor(1,1);               //set lcd cursor to role 1, column 1
lcd.print(vote1);              //print vote A
lcd.setCursor(5,1);               //set lcd cursor to role 5, column 1
lcd.print(vote2);              //print vote B
lcd.setCursor(9,1);               //set lcd cursor to role 9, column 1
lcd.print(vote3);              //print vote C
lcd.setCursor(13,1);               //set lcd cursor to role 13, column 1
lcd.print(vote4);              //print vote D
if(digitalRead(b1)){                           //check if button-A is pressed
 ++vote1;                                     //add one vote to A
 digitalWrite(bz,HIGH);                          //activate buzzer
 delay(150);                              //set delay time for 150ms
 digitalWrite(bz,LOW);                           //deactivate buzzer
}
while(digitalRead(b1));
if(digitalRead(b2)){                           //check if button-B is pressed
 ++vote2;                                     //add one vote to B
 digitalWrite(bz,HIGH);                          //activate buzzer
 delay(150);                              //set delay time for 150ms
 digitalWrite(bz,LOW);                           //deactivate buzzer
}
while(digitalRead(b2));
if(digitalRead(b3)){                           //check if button-C is pressed
 ++vote3;                                     //add one vote to C
 digitalWrite(bz,HIGH);                          //activate buzzer
 delay(150);                              //set delay time for 150ms
 digitalWrite(bz,LOW);                           //deactivate buzzer
}
while(digitalRead(b3));
if(digitalRead(b4)){                           //check if button-D is pressed
 ++vote4;                                     //add one vote to D
 digitalWrite(bz,HIGH);                          //activate buzzer
 delay(150);                              //set delay time for 150ms
 digitalWrite(bz,LOW);                           //deactivate buzzer
}
while(digitalRead(b4));
if(digitalRead(b5)){                           //check if result button is pressed
 int vote=vote1+vote2+vote3+vote4;                  //sum all votes
 if(vote){                                //check if vote or no vote
  lcd.setCursor(0,0);                          //set lcd cursor to first column
  lcd.print(" Calculating  ");                    //print string
  lcd.setCursor(0,1);                          //set lcd cursor to second column
  lcd.print(" Please Wait... ");                   //print string
  digitalWrite(bz,HIGH);                         //activate buzzer
  delay(150);                             //set delay time for 150ms
  digitalWrite(bz,LOW);                          //deactivate buzzer
  delay(150);                             //set delay time for 150ms
  digitalWrite(bz,HIGH);                         //activate buzzer
  delay(150);                             //set delay time for 150ms
  digitalWrite(bz,LOW);                          //deactivate buzzer

  //Votes Checking Section
  if(vote1 == vote2 && vote1 == vote3 && vote1 ==vote4){
```

```
    lcd.setCursor(0,0);                        //set lcd cursor to first column
    lcd.print(" Same votes!!! ");              //print string
    lcd.setCursor(0,1);                        //set lcd cursor to second column
    lcd.print("                ");             //print nothing
    delay(3000);                               //set delay time for 3s
  }
  if(vote1 == vote2 && vote1 == vote3 && vote1 > vote4){
    lcd.setCursor(0,0);                        //set lcd cursor to first column
    lcd.print(" Congratulation ");             //print string
    lcd.setCursor(0,1);                        //set lcd cursor to second column
    lcd.print(" A, B and C win ");             //print string
    delay(3000);                               //set delay time for 3s
  }
  if(vote1 == vote2 && vote1 == vote4 && vote1 > vote3){
    lcd.setCursor(0,0);                        //set lcd cursor to first column
    lcd.print(" Congratulation ");             //print string
    lcd.setCursor(0,1);                        //set lcd cursor to second column
    lcd.print(" A, B and D win ");             //print string
    delay(3000);                               //set delay time for 3s
  }
  if(vote1 == vote3 && vote1 == vote4 && vote1 > vote2){
    lcd.setCursor(0,0);                        //set lcd cursor to first column
    lcd.print(" Congratulation ");             //print string
    lcd.setCursor(0,1);                        //set lcd cursor to second column
    lcd.print(" A, C and D win ");             //print string
    delay(3000);                               //set delay time for 3s
  }
  if(vote2 == vote3 && vote2 == vote4 && vote2 > vote1){
    lcd.setCursor(0,0);                        //set lcd cursor to first column
    lcd.print(" Congratulation ");             //print string
    lcd.setCursor(0,1);                        //set lcd cursor to second column
    lcd.print(" B, C and D win ");             //print string
    delay(3000);                               //set delay time for 3s
  }
  if(vote1 == vote2 && vote1 > vote3 && vote1 > vote4){
    lcd.setCursor(0,0);                        //set lcd cursor to first column
    lcd.print(" Congratulation ");             //print string
    lcd.setCursor(0,1);                        //set lcd cursor to second column
    lcd.print("  A and B win  ");              //print string
    delay(3000);                               //set delay time for 3s
  }
  if(vote1 == vote3 && vote1 > vote2 && vote1 > vote4){
    lcd.setCursor(0,0);                        //set lcd cursor to first column
    lcd.print(" Congratulation ");             //print string
    lcd.setCursor(0,1);                        //set lcd cursor to second column
    lcd.print("  A and C win  ");              //print string
    delay(3000);                               //set delay time for 3s
  }
  if(vote1 == vote4 && vote1 > vote2 && vote1 > vote3){
    lcd.setCursor(0,0);                        //set lcd cursor to first column
    lcd.print(" Congratulation ");             //print string
    lcd.setCursor(0,1);                        //set lcd cursor to second column
    lcd.print("  A and D win  ");              //print string
    delay(3000);                               //set delay time for 3s
  }
  if(vote2 == vote3 && vote2 > vote1 && vote2 > vote4){
    lcd.setCursor(0,0);                        //set lcd cursor to first column
```

```
    lcd.print(" Congratulation ");                    //print string
    lcd.setCursor(0,1);                               //set lcd cursor to second column
    lcd.print(" B and C win   ");                     //print string
    delay(3000);                                      //set delay time for 3s
   }
  if(vote2 == vote4 && vote2 > vote1 && vote2 > vote3){
    lcd.setCursor(0,0);                               //set lcd cursor to first column
    lcd.print(" Congratulation ");                    //print string
    lcd.setCursor(0,1);                               //set lcd cursor to second column
    lcd.print(" B and D win   ");                     //print string
    delay(3000);                                      //set delay time for 3s
   }
  if(vote3 == vote4 && vote3 > vote1 && vote3 > vote2){
    lcd.setCursor(0,0);                               //set lcd cursor to first column
    lcd.print(" Congratulation ");                    //print string
    lcd.setCursor(0,1);                               //set lcd cursor to second column
    lcd.print(" C and D win   ");                     //print string
    delay(3000);                                      //set delay time for 3s
   }
  if(vote1 > vote2 && vote1 > vote3 && vote1 > vote4){
    lcd.setCursor(0,0);                               //set lcd cursor to first column
    lcd.print(" Congratulation ");                    //print string
    lcd.setCursor(0,1);                               //set lcd cursor to second column
    lcd.print(" A is winner   ");                     //print string
    delay(3000);                                      //set delay time for 3s
   }
  if(vote2 > vote1 && vote2 > vote3 && vote2 > vote4){
    lcd.setCursor(0,0);                               //set lcd cursor to first column
    lcd.print(" Congratulation ");                    //print string
    lcd.setCursor(0,1);                               //set lcd cursor to second column
    lcd.print(" B is winner   ");                     //print string
    delay(3000);                                      //set delay time for 3s
   }
  if(vote3 > vote1 && vote3 > vote2 && vote3 > vote4){
    lcd.setCursor(0,0);                               //set lcd cursor to first column
    lcd.print(" Congratulation ");                    //print string
    lcd.setCursor(0,1);                               //set lcd cursor to second column
    lcd.print(" C is winner   ");                     //print string
    delay(3000);                                      //set delay time for 3s
   }
  if(vote4 > vote1 && vote4 > vote2 && vote4 > vote3){
    lcd.setCursor(0,0);                               //set lcd cursor to first column
    lcd.print(" Congratulation ");                    //print string
    lcd.setCursor(0,1);                               //set lcd cursor to second column
    lcd.print(" D is winner   ");                     //print string
    delay(3000);                                      //set delay time for 3s
   }
 } // end of vote
 else{
  lcd.setCursor(0,0);                                 //set lcd cursor to first column
  lcd.print("No Voting...   ");                       //print string
  lcd.setCursor(0,1);                                 //set lcd cursor to second column
  lcd.print("              ");                        //print nothing
  digitalWrite(bz,HIGH);                              //activate buzzer
  delay(100);                                         //set delay time for 100ms
  digitalWrite(bz,LOW);                               //deactivate buzzer
  delay(100);                                         //set delay time for 100ms
```

```
  digitalWrite(bz,HIGH);              //activate buzzer
  delay(100);                         //set delay time for 100ms
  digitalWrite(bz,LOW);               //deactivate buzzer
  delay(100);                         //set delay time for 100ms
  digitalWrite(bz,HIGH);              //activate buzzer
  delay(100);                         //set delay time for 100ms
  digitalWrite(bz,LOW);               //deactivate buzzer
  delay(100);                         //set delay time for 100ms
  digitalWrite(bz,HIGH);              //activate buzzer
  delay(100);                         //set delay time for 100ms
  digitalWrite(bz,LOW);               //deactivate buzzer
  delay(100);                         //set delay time for 100ms
  digitalWrite(bz,HIGH);              //activate buzzer
  delay(100);                         //set delay time for 100ms
  digitalWrite(bz,LOW);               //deactivate buzzer
  delay(100);                         //set delay time for 100ms
  digitalWrite(bz,HIGH);              //activate buzzer
  delay(100);                         //set delay time for 100ms
  digitalWrite(bz,LOW);               //deactivate buzzer
 }
//reset votes to zero
 vote1=0;
 vote2=0;
 vote3=0;
 vote4=0;
 } // end of void loop
}
```

Conflicts of interest: None

References

1. Iovine, J. 2004. PIC microcontroller Project Book. Second Edition, Mc Graw- Hill Books Co, Inc, USA.

2. Johnson, L. 2000. Experimenting with the PIC BASIC PRO COMPILER. Crown Hill Associates Ltd. First Edition USA, August 2000.

3. Mukhopadhyay, A.K. 1996. Microprosessor Microcomputer and Their Application. Second Revised and Enlarged Edition, Narosa Publishing House, London.

4. Predko, M. 2005. 123 PIC Microcontroller Experiments for the Evil Genius" Mcgraw-Hill Co., Inc. USA.

5. Smith, D.W. PIC IN PRACTICE, A project based Approach.

6. Voting: What is; What could Be, July 2001. httpopwww.vote.caltecadhh.edu/Reports/.

7. www.Circuit Today.com.