Electronic Voting Machine(EVM) Using 8051 Microcontroller

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Declaration

I declare that the project ”Electronic Voting Machine (EVM) Using 8051 Microcontroller” is based on our own work carried out during the course of our study under the supervision of Dr. Wasiq Ali and Engr. Irum Shehzadi.
I assert the statements made and conclusions drawn are an outcome of my research work. I further certify that

1. The work contained in the report is original and has been done by us under the general supervision of my supervisors.

2. The work has not been submitted to any other Institution for any other degree/diploma/certificate in this university or any other University of Pakistan or abroad.

3. We have followed the guidelines provided by the university in writing the report.

4. Whenever we have used materials (data, theoretical analysis, and text) from other sources, we have given due credit to them in the text of the report and giving their details in the references.

Dedication

First and foremost we offer our sincerest gratitude to our course instructor, Dr.Wasiq Ali, and Lab instructor, Engr. Irum Shehzadi, Who encouragement, guidance and support from the initial to the final level enabled us to develop an understanding of the subject. Without his guidance and persistent help this project would not have been possible.

To our parents, we would like to thank to them for supporting us in our daily lives, for going to school every day, and having them by our side to guide us always, their prosperity and love for us.

Acknowledgements

Thanks to ALLAH (s.w.t), the Greatest, the most Merciful and the most Gracious, Whose countless blessings bestowed upon me kind, talented and wise teachers, who provided me sufficient opportunities, and enlighten me towards this research work.

I would like to extend my deepest thanks to our project supervisors, Dr.Wasiq Ali, and Engr. Irum Shehzadi for giving us the opportunity of undertaking this project under his determined directions. His support, dedication, encouragement, excellent supervision and guidance are what made this thesis possible.

Thanks to my beloved family, whose prayers, dedication, support and love are the most precious assets, I had (and I have), during the course of my Engineering work and for all of my endeavors.

I am very thankful to the administration and faculty of COMSATS University Islamabad, Attock Campus for providing me a great environment that helped me a lot in conducting our project related activities.

Thank You!

Abstract

We can experience fast and sudden changes in the life of human being due to the information technology (IT). Information technology is used individually as well as in business then how it could be exception for election. Information technology is useful in preparing voters list, proper voting and prediction of which candidate will be winner etc[1]. EVM stands for Electronic voting Machine. This makes polling much fast and is more reliable than ballot papers, by preventing bogus voting to a great extend. The EVMs saves considerable time, money, and manpower. It also helps in maintaining the secrecy of individual voting. At the end of polling, just press a button and there you have the result.

Electronic Voting Machine(EVM) is a simple electronic device used to record votes in place of ballot papers and boxes which were used earlier in conventional voting system. Fundamental right to vote or simply voting in elections forms the basis of democracy. All earlier elections be it state elections or centre elections a voter used to cast his/her favorite candidate by putting the stamp against his/her name and then folding the ballot paper as per a prescribed method before putting it in the Ballot Box. This is a long, time-consuming process and very much prone to errors. This situation continued till election scene was completely changed by electronic voting machine. No more ballot paper, ballot boxes, stamping, etc.

All this condensed into a simple box called ballot unit of the electronic voting machine. Because biometric identifiers cannot be easily misplaced, forged, or shared, they are considered more reliable for person recognition than traditional token or knowledge based methods. So the Electronic voting system has to be improved based on the current technologies viz., biometric system [2].

Due to EVM following points become possible:

- Fast counting of voting
- Accurate counting of voting
- Avoidance of misbehavior/misconduct

Contents

Chapter 1

Introduction

It is very critical and important to cast and count votes, the electronic voting is a term used to describe the act of voting using electronic systems. Electronic Voting Machine (EVM) is an electronic device used for recording votes. An Electronic Voting Machine consists of two Units first is Control Unit and second is Balloting Unit that are joined by a 5 meter cable. The candidate names and symbol are programmed in the control unit of EVM. The polling officer in-charge of the control unit will release a ballot instead of issuing a ballot paper by pressing the ballot button on the control unit. This mechanism will enable the voter to cast his vote by pressing the blue button on the balloting unit against the candidate and symbol of his choice. [1]

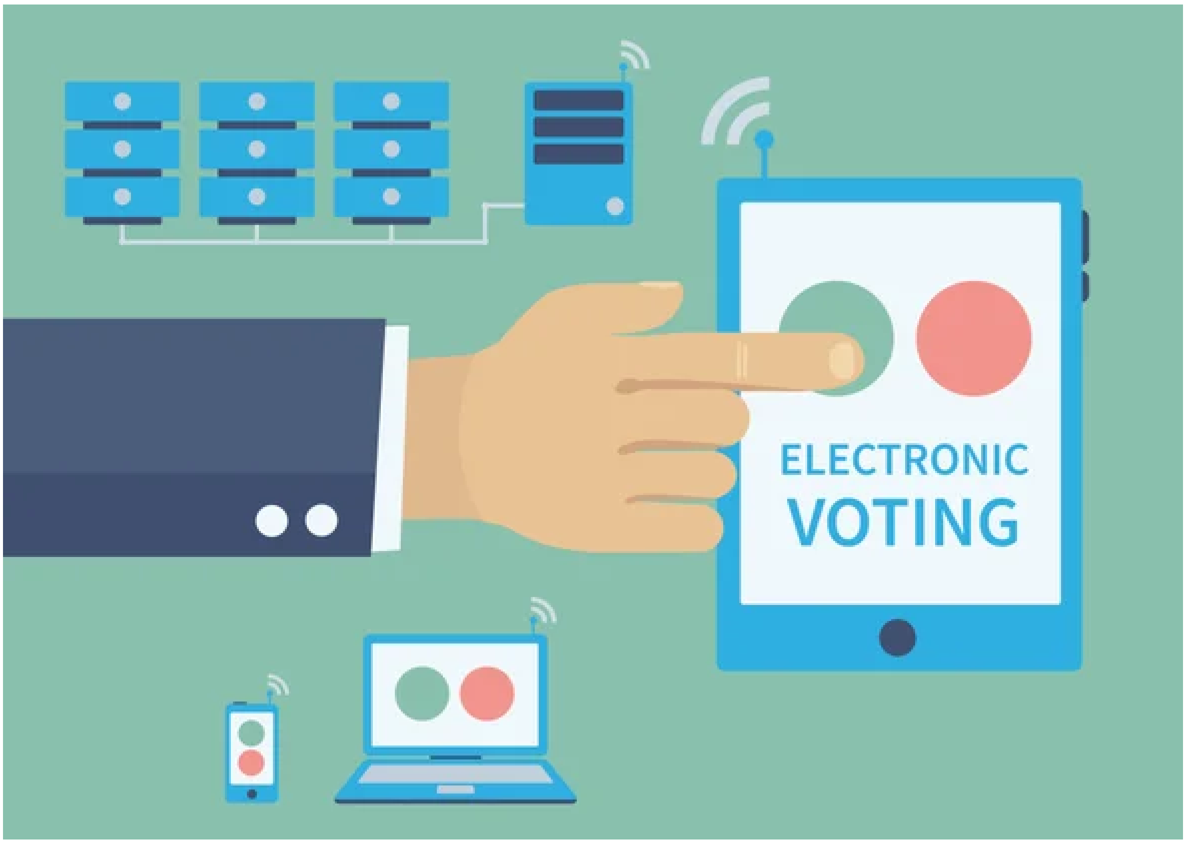


Figure 1.1: Electronic Voting Machine (EVM)

1.1 Objectives

The objectives of this project are:

1. To make elections time efficient and cost efficient.
2. To eliminate the chance of rigging in the elections.
3. To automate the elections.

1.2 Introduction

Elections allow the people to choose their representatives and express their preferences for how they will be governed. Naturally, the integrity of the election process is fundamental to the integrity of democracy itself. The election system must be sufficiently robust to withstand a variety of fraudulent behaviors and must be sufficiently transparent and comprehensible that voters and candidates can accept the results of an election. Electronic voting refers to the use of computers or computerized voting equipment to cast ballots in an election. Sometimes, this term is used more specifically to refer to voting that takes place over the Internet[2].

The design of a good voting system, whether electronic or using traditional paper ballots or mechanical devices, must satisfy a number of sometimes competing criteria.

- The anonymity of a voters ballot must be preserved
- both to guarantee the voters safety when voting against a malevolent candidate
- guarantee that voters have no evidence that proves which candidates received their votes

Figure 1.2: EVM

The voting system must also be tamper-resistant to thwart a wide range of attacks, including ballot stuffing by voters and incorrect tallying by insiders. Another factor, as shown by the so-called butterfly ballots in the Florida 2000 presidential election, is the importance of human factors. A voting system must be comprehensible to and usable by the entire voting population, regardless of age, infirmity, or disability. Providing accessibility to such a diverse population is an important engineering problem and one where, if other security is done well, electronic voting could be a great improvement over current paper systems. Flaws in any of these aspects of a voting system, however, can lead to indecisive or incorrect election results.[3]

1.3 E-Voting Systems

It is also known as e-voting is a term encompassing several different types of voting, embracing both electronic means of casting a vote and electronic means of counting votes. Electronic voting technology can include punched cards, optical scan voting systems and specialized voting kiosks (including self-contained direct-recording electronic voting systems, or DRE). It can also involve transmission of ballots and votes via telephones, private computer networks, or the Internet. And, of course, EVM helps maintain total voting secrecy without the use of ballot papers. And, at the end of the polling, just press a button and there you have the results.[2]

1.4 Challenges

The challenges are even harder because there is little or no training available for voters. The first time most voters ever touch the voting system is the moment they vote. And once they start voting, there is tremendous social pressure to do it without help. With people watching, inadequately trained poll workers, busy people waiting on line, the social importance of voting, and the value placed on secrecy, voters may become anxious and afraid to ask for help. Finally, the systemic issues of how voting machines get purchased and evaluated are problematic as well. State or county purchasers are usually more concerned about cost than usability. And once the systems are purchased, the public has no access to the machines for evaluation. Election workers who design ballots tend not to have experience in usability and screen design. Poll workers who deploy the voting systems have minimal training to cope with the inevitable problems. Electronic voting systems offer promise as well from the opportunity to change font size and language on demand, to offering disabled users customized access, to accurate and fast recording and tabulation of votes. But there are many issues that add up to the risk that voters may become disenfranchised. And this is especially true for the elderly and citizens at the margins of society.[4]

1.4.1 Accountability and Verifiability

Traditionally, votes were cast on paper and counted by hand. Voters were confident that the marks they made on ballots reflected their intended vote. Voting machines that used levers and punch card systems also provided voters with a high degree of confidence that they cast their votes as intended. In 2000, the U.S. presidential election was particularly contentious because the outcome was extremely close. This resulted in a close examination of the voting and tabulation systems that were used. Many problems were found, especially with one ballot design which became known as the butterfly ballot. This ballot required voters to draw line connecting a candidate with a circle. This was confusing because the circles didn't align well with the candidates and in addition, the circles were shared between two columns of candidates.

The ensuing melee brought a popular awareness of the complexities and flaws in voting systems and there were general calls for reform. Many questions have since been raised. Because they are paperless, systems raise the question:

1. How can one know that when a voter chooses a particular candidate on the screen?

2. Is a vote for that candidate is recorded?

A simple solution to this problem is to provide the user with a printed record of the votes electronically recorded. Before leaving the polling place, the voter would be required to certify the contents of the paper record and place it into a ballot box. The printed records could then be manually counted in the event of a challenge, and this procedure would foil any attempt at falsifying votes internally to the voting system. This approach, however, has not been implemented in any commercial systems that we are aware of[4].

1.5 Report Break Down

The major focus of this report is on the findings of the proposed project i.e. Electronic Voting Machine(EVM) Using 8051 Microcontroller.

This Report is organized as follows:

In chapter 2, literature review is provided in detail about the work which is already been done on Electronic Voting Machine(EVM) Using 8051 Microcontroller and will give a brief details about the articles, papers and literature review.

In Chapter 3, Proposed Methodology is presented in which you will be able to see the method we will work on the designing of a complete project source code to the diagrams.

In Chapter 4, Result and Simulations are being discussed, in which you will see all kind of finding related to the Electronic Voting Machine(EVM) Using 8051 Microcontroller.

In Chapter 5, we have concluded and summarized the project work and also presented few new research ideas for future studies.

Chapter 2

Literature Review

In the chapter 1 we have given the introduction of our project, objectives and a thesis break down. Our introduction chapter is giving a complete overview of this project report. This chapter is about the work which is already been done on Electronic Voting Machine and will give a brief details about the articles, papers and literature review.

2.1 Literature Review

Researchers in the electronic voting field have already reached a consensus pack of following core properties that an electronic voting system should have[2]:

2.1.1 Accuracy

1. It is not possible for a vote to be altered.
2. It is not possible for a validated vote to be eliminated from the final tally.
3. It is not possible for an invalid vote to be counted in the final tally.

2.1.2 Democracy

1. It permits only eligible voters to vote.
2. It ensures that eligible voters vote only once.

2.1.3 Privacy

1. Neither authorities nor anyone else can link any ballot to the voter who cast it.
2. No voter can prove that he voted in a particular way.

2.1.4 Verifiability

1. Anyone can independently verify that all votes have been counted correctly.

2.1.5 Availability

1. The system works properly as long as the poll stands
2. Any voter can have access to it from the beginning to the end of the poll.

2.1.6 Resume Ability

1. The system works properly as long as the poll stands
2. the system allows any voter who had interrupted his/her voting process to resume it or restart it while the poll stands.

2.2 Features

Following are some of the features which an electronic voting machine should have.

- There are no external communication paths hence it is difficult for the hackers to hack the machine and tamper the count numbers, in most of the advanced version of electronic voting machines.
- Electronic voting machines with touch base screen are proven to be advantageous for the physically challenged people. In a paper ballot, these physically challenged people were not able to cast their votes in private. However, with the new EVM in place, even handicapped people can use their right to vote in private.
- Electronic voting machines are cost effective and economical. In the paper ballot, the amount of raw material used is higher. It directly impacts the environment as paper ballot uses papers to cast votes. However, the cost associated with holding elections with EVMs is considered to be negligible.
- One of the advantages of the electronic voting machine is to save the time. EVM machines can cast and count the votes within very less time.
- Bogus voting can be avoided through electronic voting machines hence are quite effective against the bogus votes. Electronic voting machines are programmed to capture a maximum of five votes in a minute, due to which a single vote cannot cast fake votes. In advanced electronic voting machines, a sound of beep comes after one casts their vote which lets the officer on duty know that the vote has been cast by an individual. Electronic voting machines are designed in a way that they keep a track of number and details of votes recorded. The election commission can even save the data for a longer period of time which might be helpful for referencing in future.
- Electronic voting machines are easier to carry and transport from one place to another without any hassle. One single machine can record several votes captured through that machine. Few electronic voting machines also come with a voice support to assist the visually impaired voter. In such cases, the visually challenged person can cast their vote without any problem.
- One can see all the symbols and names in electronic voting machines of the candidates together which makes it easier for the voter to choose among the many and cast their votes.

2.3 Limitations

Following are the problems, error, and challenges of implementing Electronic Voting Machine(EVM)[1].

1. With recent elections in the United States, many software programmers have claimed that the electronic voting machines are vulnerable to malicious programming and if it gets affected then any hacker can hack the machine and can tamper the vote counts easily.

2. The touch base screen is not efficient enough to capture the vote accurately for many physically challenged people as they have complained that. Therefore sometimes it leads to the voter ending up voting for someone else unintentionally.

3. Although it takes the time to count votes that were captured using paper ballot but people fully trust the process as high technology are also vulnerable to hackers attack.

4. The electronic voting machines which were used during the elections are susceptible to damage which will result in loss of data. Therefore biggest change with technology is that no matter how much data it records but a single virus can destroy the entire data storage.

5. The highly humid area and those areas which receive frequent rainfall are not suitable for casting votes using electronic voting machines. As machines are prone to damage due to high humidity level thus usage of electronic voting machines are not advisable in such areas.

6. Most of the electronic voting machines used in the country were foreign manufactured, which means the secret codes that control the electronic voting machines are in foreign hands and they can be used to influence the election results.

7. Fake display units could be installed in the electronic voting machines which would show manipulated numbers but originally fake votes could be generated from the back end. This process does not need any hacker to hack the software. Such fake display units are easily available in the market.

8. Most of the electronic voting machines used in the country do not have any mechanism by which the voter can verify their identity before casting the vote due to which fake voters can cast numerous fake votes.

It is concluded that voting through electronic voting machine is need of time as all developed countries are making use of it. Researchers have been suggested an algorithm and are of opined that if suggested algorithm is strictly followed then there will not be any error in electronic voting procedure, and we will tackle all the mentioned above problems/issues[1].

Chapter 3

Proposed Methodology

In the previous chapter, we have discussed the theories that support this research related to the Electronic Voting Machine . In this chapter we will proposed our methodology for this project.

3.1 Block Diagram

Let us look at the simplified block diagram in Figure 3.1, which illustrates the main components involved in Electronic Voting Machine(EVM) Using 8051 Micro-controller. Switches are used to make choices, resister, capacitor, and oscillator are being used to work the micro-controller properly on the circuits with the help of connecting wires.

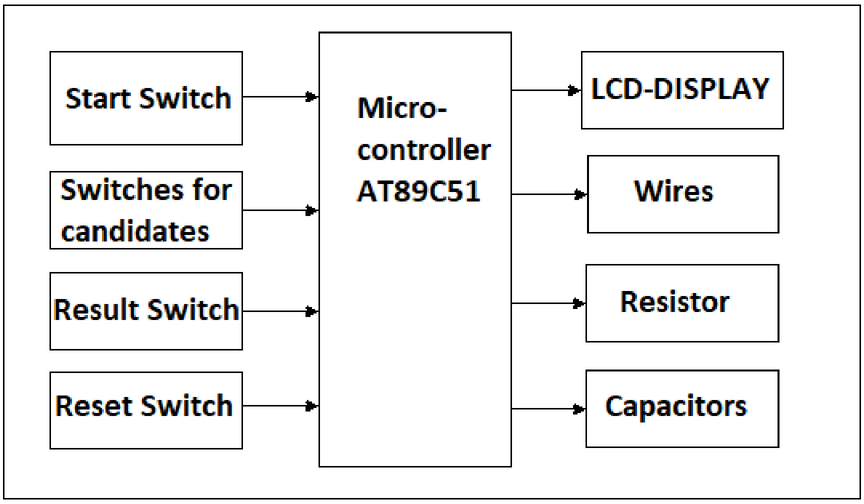


Figure 3.1: Simplified Block Diagram of Electronic Voting Machine(EVM) Using 8051 Microcontroller

3.2 About Microcontroller 8051

The 8051 Microcontroller was designed in the 1980s by Intel. Its foundation was on Harvard Architecture and was developed principally for bringing into play Embedded Systems. At first, it was created using NMOS technology but as NMOS technology needs more power to function therefore Intel re-intended Microcontroller 8051 employing CMOS technology and a new edition came into existence with a letter C in the title name, for illustration: 80C51. These most modern Microcontrollers need a fewer amount of power to function in comparison to their forerunners. There are many applications with an 8051 microcontroller.

The AT89C51 is a CMOS 8-bit microcomputer with 4K bytes of Flash programmable and erasable read only memory (PEROM). The on-chip Flash allows the program memory to be reprogrammed in-system or by a ordinary nonvolatile memory programmer. Atmel AT89C51 is a powerful microcomputer/microcontroller (as they are used inter-changeably) which provides a highly-flexible and cost-effective solution to many embedded control applications.

3.2.1 Features of AT89C51

Following are some of the main feature of the used microcontroller i.e, AT89C51:

1. 8-bit CPU through two Registers A and B.
2. 8K Bytes Internal ROM and it is a flash memory that supports while programming the system.
3. 256 Bytes Internal RAM where the first RAM with 128 Bytes from 00H to 7FH is once more separated into four banks through 8 registers in every bank, addressable registers -16 bit & general-purpose registers 80.
4. The remaining 128 bytes of the RAM from 80H to FFH include Special Function Registers (SFRs).
5. These registers control various peripherals such as Serial Port, Timers, all I/O Ports, etc.
6. Interrupts like External-2 & Internal-3
7. Oscillator & CLK Circuit.
8. Control Registers like PCON, SCON, TMOD, TCON, IE, and IP.
9. 16-bit Timers or Counters -2 like T0 & T1.
10. Program Counter 16 bit & DPRT (Data Pointer).
11. I/O Pins 32 which are arranged like four ports such as P0, P1, P2 & P3.
12. Stack Pointer (SP) 8bit & PSW (Processor Status Word).
13. Serial Data Tx & Rx for Full-Duplex Operation
14. a five vector two-level interrupt architecture
15. a full duplex serial port, on-chip oscillator and clock circuitry

3.3 Detailed Block Diagram - 8051

Following is the detailed block diagram of the 8051.

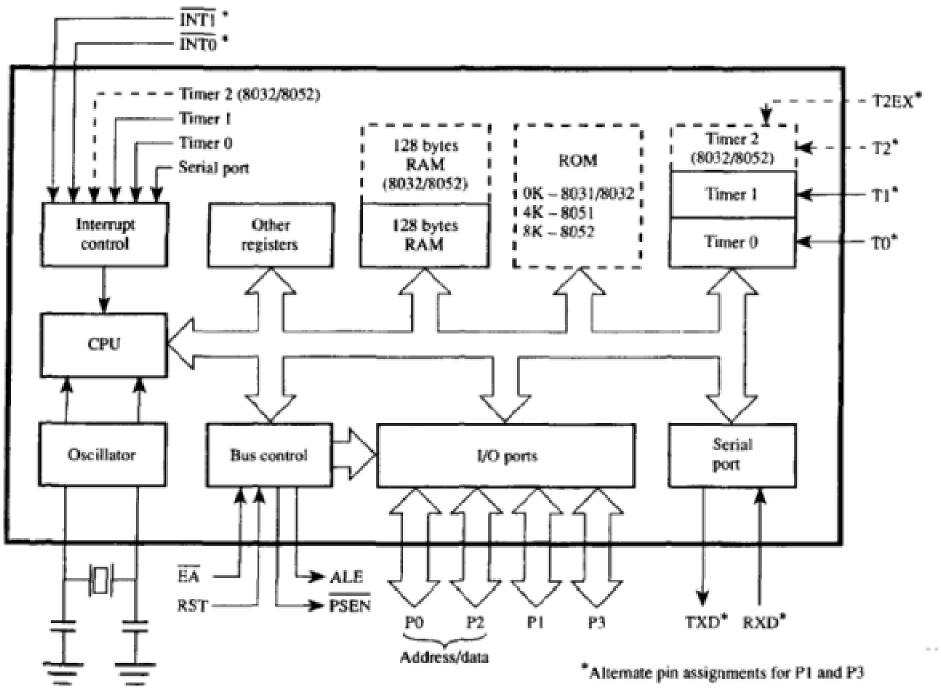


Figure 3.2: Detailed Block Diagram of 8051 Microcontroller

3.3.1 Central Processor Unit (CPU)

CPU is the brain of any processing device. It monitors and controls all operations that are performed in the Microcontroller. User has no control over the work of CPU. It reads program written in ROM memory and executes them and do the expected task.

3.3.2 Interrupts

Interrupt is a subroutine call that interrupts Microcontroller's main operation or work and causes it to execute some another program which is more important at that time. The feature of Interrupt is very useful as it helps in cases of emergency. Interrupts gives us a mechanism to put on hold the ongoing operation , execute a subroutine and then again resumes normal program execution The Microcontroller 8951 can be configured in such a way that it temporarily terminates or pause the main program at the occurrence of interrupt. When subroutine is completed then the execution of main program starts as usual. There are five interrupt sources in 8951 Microcontroller. 2 of them are external interrupts, 2 timer interrupts and one serial port interrupt.

3.3.3 Input/output Port

Microcontroller is used in embedded systems to control the operation of machines. Therefore to connect it to other machines, devices or peripherals we require I/O interfacing ports in Microcontroller. For this purpose Microcontroller 8951 has 4 input output ports to connect it to other peripherals. Timers/Counters: Microcontroller 8951 has 2 16 bit timers and counters. The counters are divided into 8 bit registers. The timers are used for measurement of intervals, to determine pulse width etc.

3.3.4 Oscillator

Microcontroller is a digital circuit device, therefore it requires clock for its operation. For this purpose, Microcontroller 8951 has an on-chip oscillator which works as a clock source for Central Processing Unit. As the output pulses of oscillator are stable therefore it enables synchronized work of all parts of 8951 Microcontroller.

3.3.5 Bus

Basically Bus is a collection of wires which work as a communication channel or medium for transfer of Data. These buses consist of 8, 16 or more wires. Thus these can carry 8 bits, 16 bits simultaneously. Buses are of two types:

- Address Bus
- Data Bus

Address Bus

Microcontroller 8051 has a 16 bit address bus. It used to address memory locations. It is used to transfer the address from CPU to Memory.

Data Bus

Microcontroller 8051 has 8 bits data bus. It is used to carry data.

3.4 Pin Description 8051

Following is the pin description diagram of the 8051

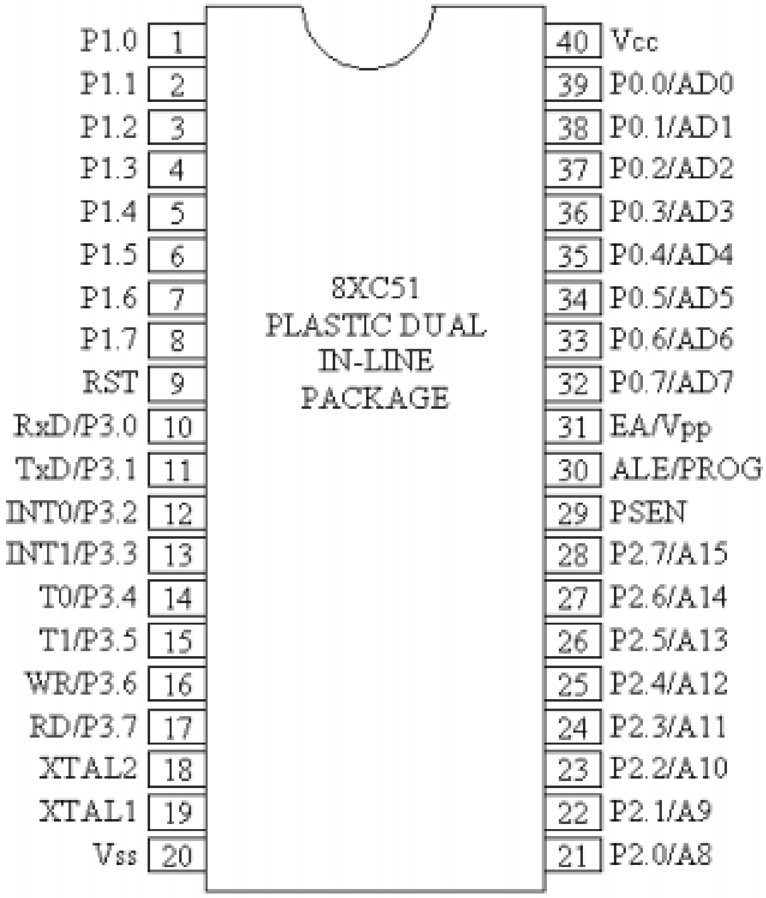
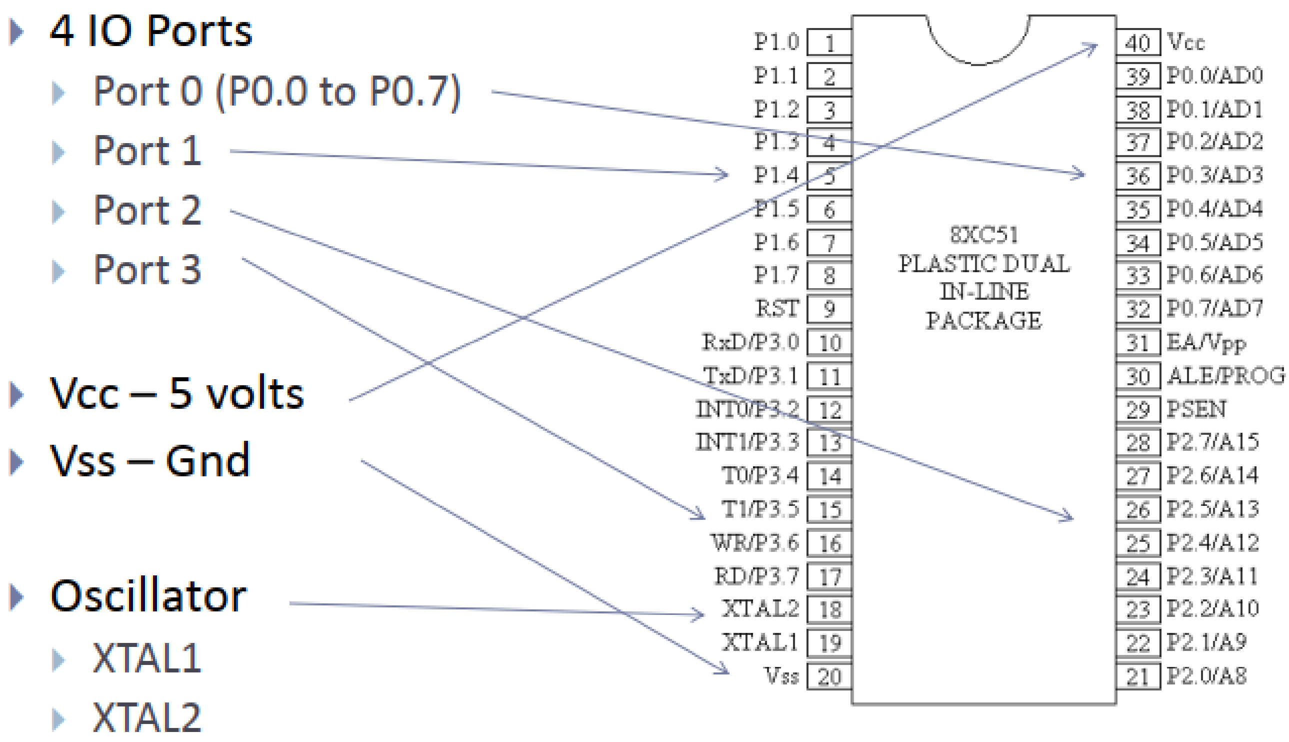
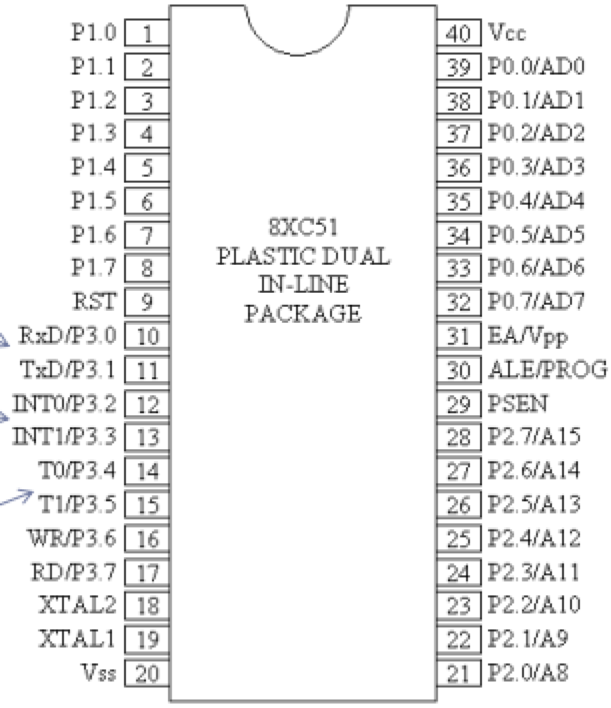


Figure 3.3: Pin Diagram of 8051 Microcontroller



Alternate Functions - Port 3

- Serial Port
  - P3.0 : Serial Input (RXD)
  - P3.1 : Serial Output (TXD)
- External Interrupt
  - P3.2 : External Interrupt 0 (INT0)
  - P3.3 : External Interrupt 1(INT1)
- Timers / Counters
  - P3.4 : Timer 0 External Input
  - P3.5 : Timer 1 External Input



Pins/Signal	Descriptions
P0.7 - P0.0	Port-0 input/output pins.
P1.7 - P1.0	Port-1 input/output pins.
P2.7 - P2.0	Port-2 input/output pins.
P3.7 - P3.0	Port-3 input/output pins.
$\overline{RST}$	Reset input
XTAL1, XTAL2	Pins for crystal connection. The signal at XTAL2 can be used as clock signal for peripherals.
$\overline{PSEN}$	Program store enable. Used as read control or enable for external program memory.
ALE/$\overline{PROG}$	Address Latch Enable or program pulse input during EPROM/ ROM programming
$\overline{EA}/V_{PP}$	External Access or Programming voltage.
V_{CC}	Power supply (+5V)
V_{SS}	Power supply ground (0V)

Figure 3.4: Signals of 8031/8051 microcontroller of 8051 Microcontroller

Port pins	Alternate signal	Description
P0.7 - P0.0	AD7 - AD0	Multiplexed low byte address/data.
P2.7 - P2.0	A15 - A8	High byte address
P3.7	$\overline{RD}$	External memory read control signal
P3.6	$\overline{WR}$	External memory write control signal
P3.5	T1	External input to timer 1
P3.4	T0	External input to timer 0
P3.3	$\overline{INT1}$	External interrupt 1
P3.2	$\overline{INT0}$	External interrupt 0
P3.1	TxD	Serial data output
P3.0	RxD	Serial data input

Figure 3.5: Alternate functions of port pins of 8051 Microcontroller

3.4.1 Ports: (pin 1 to 8, pin 10 to 17, pin 21 to 28 and pin 32 to 39)

- The 8031/8051 microcontroller has 32 I/O pins and they are organized as four numbers of 8-bit parallel port.
- The ports are denoted as port-0, port-1, port-2 and port-3. Each port can be used as either 8-bit parallel port or 8 numbers of 1-bit ports.
- The ports behave as latches during output operation and behave as buffers during input operation.
- Port-1 can be used only for I/O operation
- When external memory is employed, the port-0 function as multiplexed low byte address or data lines, and port-2 function as high byte address lines. Therefore for accessing external memory the microcontroller uses 16-bit address and access the memory in bytes. Hence the addressable memory space is 64 kb (216 = 64kb).
- The 8031/8051 allows the external memory to be organized as two banks of 64 kb. One is program/code memory and the other is data memory.

3.4.2 PSEN (low signal): pin 29

- The signal PSEN (low) is used as read control/enable for program memory. RD (low signal) and WR (low signal): pin 17 and pin 16
- The port pin P3.7 function as read control and the port pin P3.6 function as write control for data memory.

- When two external memory banks are not desirable, the PSEN (low) and RD (low) should be externally ANDed to provide a single read control signal. In such cases the controller will access a common memory space (of maximum capacity 64 kb) for program and data.
- ALE is used to demultiplex the low byte address or data using an external latch.

3.4.3 EA (Low)/Vpp : pin 31

- When the microcontroller access program from external memory, then this pin is low. ie. EA (low) is enabled.
- When the microcontroller access program from internal memory, then this pin is high. At that time this pin is used to supply programming voltage +12V to EPROM/ROM.

3.4.4 XTAL 1 AND XTAL2: PIN 19 AND PIN18

- The XTAL 1 and XTAL2 pins are provided for external quartz crystal connection, in order to generate the required clock for the microcontroller. The maximum frequency of quartz crystal that can be connected to 8031/8051 microcontroller is 12 MHz.

3.4.5 RST (low): pin 9

- The RST(low) signal is used to reset the microcontroller in order to bring the controller to a known state.

3.4.6 INTERRUPTS: pin 12 to 15

- The 803 1/8051 has five interrupts.
- In this two interrupts are external interrupt as INT0 (Low), INT1 (Low) and the remaining three are internal interrupts as timer-0, timer-1 and serial port.
- All interrupts are maskable and vectored interrupts.

3.5 Components Selection

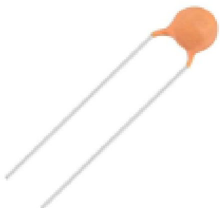
3.5.1 Hardware Components

Following is the components which we have used to implement Electronic Voting Machine(EVM) Using 8051 Microcontroller.

1: AT89C51 Microcontroller

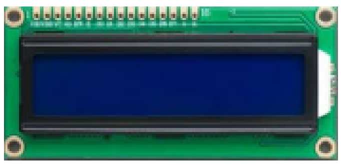
2: Capacitor (10µF)

3: 9V Battery

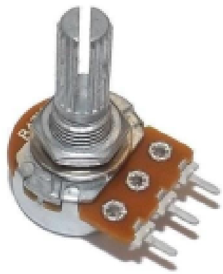


4: Capacitor (33p)

5: Oscillator (11.0592)

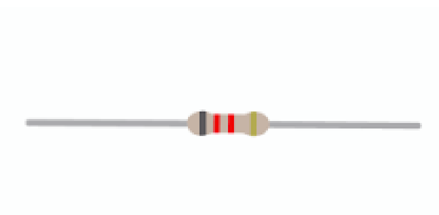


6: Display(LM016L)



7: Variable Resister

8: Switches

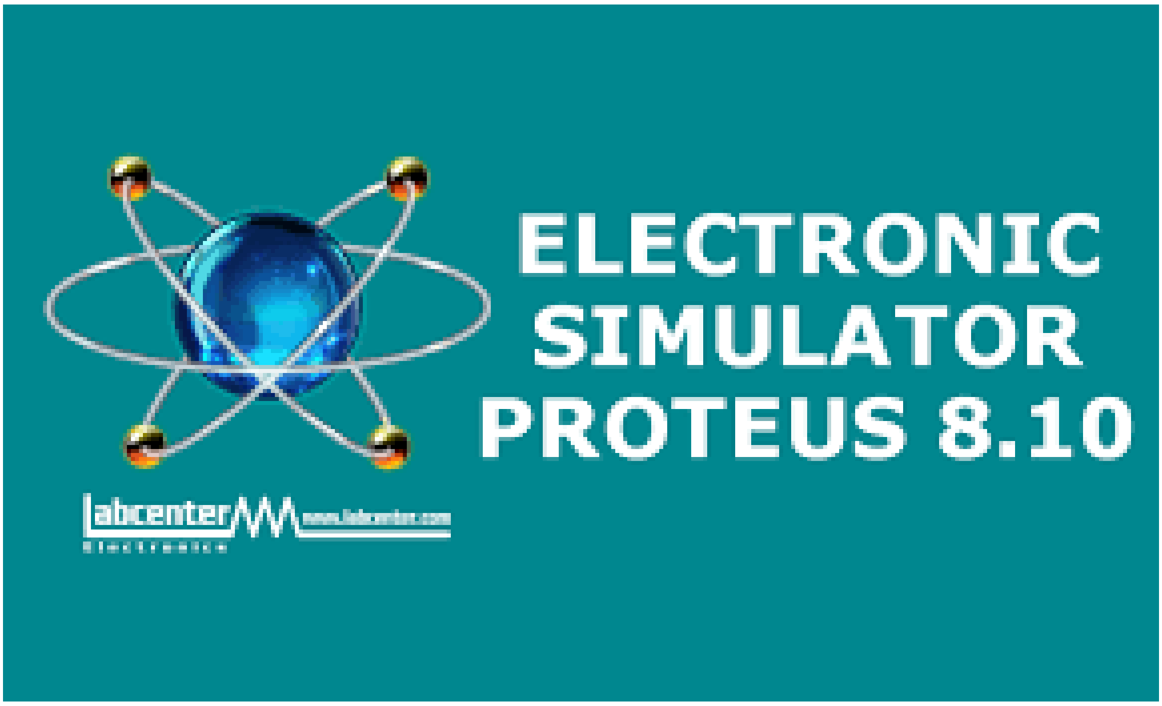


9: Resister

10: Connecting Wires

3.5.2 Software Selection

To simulate our project, we have used proteus, the Proteus Design Suite is a proprietary software tool suite used primarily for electronic design automation. The software is used mainly by electronic design engineers and technicians to create schematics and electronic prints for manufacturing printed circuit boards.



Chapter 4

Simulation and Results

In the previous chapter, we have discussed about our methodology for this project while giving details about block diagram, components selection of this project. In this chapter, we will provide source code, and simulation and results of the project.

4.1 Simulation Results

As discussed in the previous chapter in the section of software selection, we have used Proteus to simulate our project.

4.2 Circuit Diagram

Figure 4.1 shows circuit diagram of the project, which illustrates the main components involved in Electronic Voting Machine(EVM) Using 8051 Micro-controller. Switches are used to make choices, resister, capacitor, and oscillator are being used to work the micro-controller properly on the circuits with the help of connecting wires.

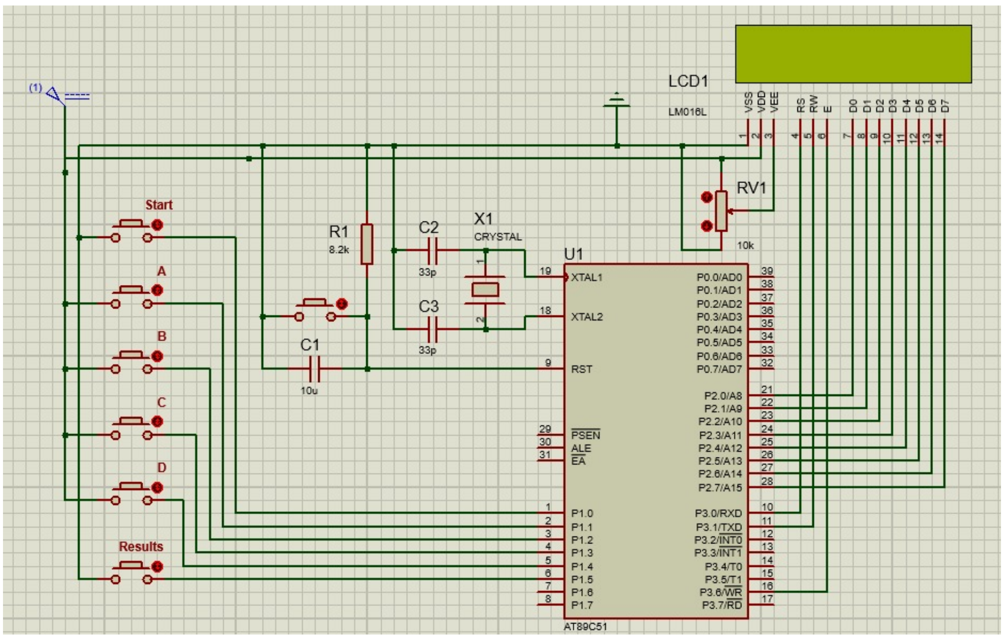


Figure 4.1: Circuit Diagram of Electronic Voting Machine(EVM) Using 8051 Micro-controller

4.3 Source Code

```
#include<reg51.h>
#define msec 50
#define lcd_data_str_pin P2
sbit rs = P3^0;                    //Register select (RS) pin rs=0 command mode, rs=1 datamode
sbit rw = P3^1;                    //Read write(RW) pin rw=0 write mode, rw=1 read mode
sbit en = P3^6;                    //Enable(EN) pin



sbit ini_pin = P1^0;                    // Start voting pin
sbit stop_pin = P1^5;                // Stop voting pin
sbit candidate_1=P1^1;                    //Candidate1
sbit candidate_2=P1^2;                  //Candidate2
sbit candidate_3=P1^3;                    //Candidate3
sbit candidate_4=P1^4;                 //Candidate4



int max = 0;
int carry = 0;
int arr[4];             //arry ofsize 4

int vote_amt[3],j;
unsigned int vote_1,vote_2,vote_3,vote_4;

void delay(int delay_time)                              // Time delay function
{

int j,k;
for(j=0;j<=delay_time;j++)
for(k=0;k<=1275;k++);
}

void lcd_cmd(unsigned char cmd_addr)                                //Function to send command to LCD
{
lcd_data_str_pin = cmd_addr;
en = 1;
rs = 0;
rw = 0;
delay(1);
en = 0;
return;
}
```

```
void lcd_data_str(char str[50])                                   //Function to send string
{
int p;
for (p=0;str[p]!='\0';p++)
{
lcd_data_str_pin = str[p];
rw = 0;
rs = 1;
en = 1;

delay(1);
en = 0;
}
return;
}

void lcd_data_int(unsigned int vote)    //Function to send 0-9 character values
{
char dig_ctrl_var;
int p;
for (j=2;j>=0;j--)
{
vote_amt[j]=vote%10;
vote=vote/10;
}

for (p=0;p<=2;p++)
{
dig_ctrl_var = vote_amt[p]+48;
lcd_data_str_pin = dig_ctrl_var;
rw = 0;
rs = 1;
en = 1;
delay(1);
en = 0;

}
return;
}

void vote_count()                                                      // Function to count votes
{
while (candidate_1==0 && candidate_2==0 && candidate_3==0 && candidate_4==0);
if (candidate_1==1)
```

```
{
while (candidate_1 == 1);
{
vote_1 = vote_1 + 1;
}
}

if (candidate_2==1)
{
while (candidate_2 == 1);
{
vote_2 = vote_2 + 1;
}
}

if (candidate_3==1)
{
while (candidate_3 == 1);
{
vote_3 = vote_3 + 1;
}
}

if (candidate_4==1)
{
while (candidate_4 == 1);
{
vote_4 = vote_4 + 1;
}
}
}

void lcd_ini()
{
lcd_cmd(0x38);          //5x7 matrix 2 lines
delay(msec);
lcd_cmd(0x0E);                    //cursor on
delay(msec);
lcd_cmd(0x01);                 //clear screen
delay(msec);
lcd_cmd(0x81);                  //cursor position to 1st
delay(msec);
lcd_data_str("welcome here");
delay(100);
lcd_cmd(0x01);             //clear
delay(msec);
lcd_cmd(0x80);               //cursor position to 0 of line 1
delay(msec);
lcd_data_str( "you" );
delay(msec);
```

```
lcd_cmd(0x14);                    //space between
delay(msec);
lcd_data_str("can now");
delay(msec);
delay(msec);
lcd_cmd(0xC0);                    // second line
delay(msec);
lcd_data_str("cast your");
delay(msec);
lcd_cmd(0x14);                    // space
delay(msec);
lcd_data_str("vote");
delay(100);
lcd_cmd(0x01);                    //clear lcd
delay(msec);
lcd_cmd(0x80);                    //cursor position to 0 of line
    1
delay(msec);
lcd_data_str("A");
delay(msec);
lcd_cmd(0x84);                   // 4th col
delay(msec);
lcd_data_str("B");
delay(msec);
lcd_cmd(0x88);                   // 8th col
delay(msec);
lcd_data_str("C");
delay(msec);
lcd_cmd(0x8C);                    // 12 col
delay(msec);
lcd_data_str("D");
delay(msec);
vote_count();
lcd_cmd(0x01);                  //clear lcd
delay(msec);
lcd_cmd(0x83);                 //ist line 3rd col
delay(msec);
lcd_data_str("thank");
delay(msec);
lcd_cmd(0x14);                    //space
delay(msec);
lcd_data_str("you");
delay(100);
}

void results()                     // Function to show results
{
int i;
carry = 0;
lcd_cmd(0x01);                               //clear lcd
```

```
delay(msec);
lcd_cmd(0x80);                              //cursor position to 0 of line 1
delay(msec);
lcd_data_str("results");
delay(msec);
lcd_cmd(0x14);                              //space
delay(msec);
lcd_data_str("are");
delay(msec);
lcd_cmd(0x14);                              //space
delay(msec);
lcd_data_str("out");
delay(msec);
lcd_cmd(0x01);                              //clear lcd
delay(msec);
lcd_cmd(0x80);                              //cursor position to 0 of line 1
delay(msec);
lcd_data_str("A");
delay(msec);
lcd_cmd(0x84);                              //4th col
delay(msec);
lcd_data_str("B");
delay(msec);
lcd_cmd(0x88);                              // 8th col
delay(msec);
lcd_data_str("C");
delay(msec);
lcd_cmd(0x8C);                              // 12th col
delay(msec);
lcd_data_str("D");
delay(msec);
lcd_cmd(0xC0);                          //second line
delay(100);

lcd_data_int(vote_1);
delay(msec);
lcd_cmd(0xC4);                            //jump to 2nd line 4th row
delay(msec);
lcd_data_int(vote_2);
delay(msec);
lcd_cmd(0xC8);                            // 2nd line 8th row
delay(msec);
lcd_data_int(vote_3);
delay(msec);
lcd_cmd(0xCC);                          // 2nd line 12th row
delay(msec);
lcd_data_int(vote_4);
```

```
delay(300);

arr[0] = vote_1;                    //arry ofsize 4
arr[1] = vote_2;
arr[2] = vote_3;
arr[3] = vote_4;

for( i=0; i<4; i++)
{
if(arr[i]>=max)
max = arr[i];
}

if ( (vote_1 == max) && ( vote_2 != max) && (vote_3 != max)&&
    (vote_4 != max) )
{

carry = 1;
lcd_cmd(0x01);            //clear lcd
delay(msec);
lcd_cmd(0x80);              //cursor position to 0 of line 1
delay(msec);
lcd_data_str("congratulations");
delay(50);
lcd_cmd(0xC4);         //jump to 2nd line 4th col
delay(msec);
lcd_data_str("A");
delay(msec);
lcd_cmd(0x14);               //space
delay(msec);
lcd_data_str("wins");
delay(msec);
}

if ( (vote_2 == max) && ( vote_1 != max) && (vote_3 != max)&&
    (vote_4 != max) )
{
carry = 1;
lcd_cmd(0x01);      //clear lcd
delay(msec);
lcd_cmd(0x80);            //cursor position to 0 of line 1
delay(msec);
lcd_data_str("congratulations");
delay(50);
lcd_cmd(0xC4);                          //jump to 2nd
   line 4th col
delay(msec);
lcd_data_str("B");
delay(msec);
lcd_cmd(0x14);                //space
```

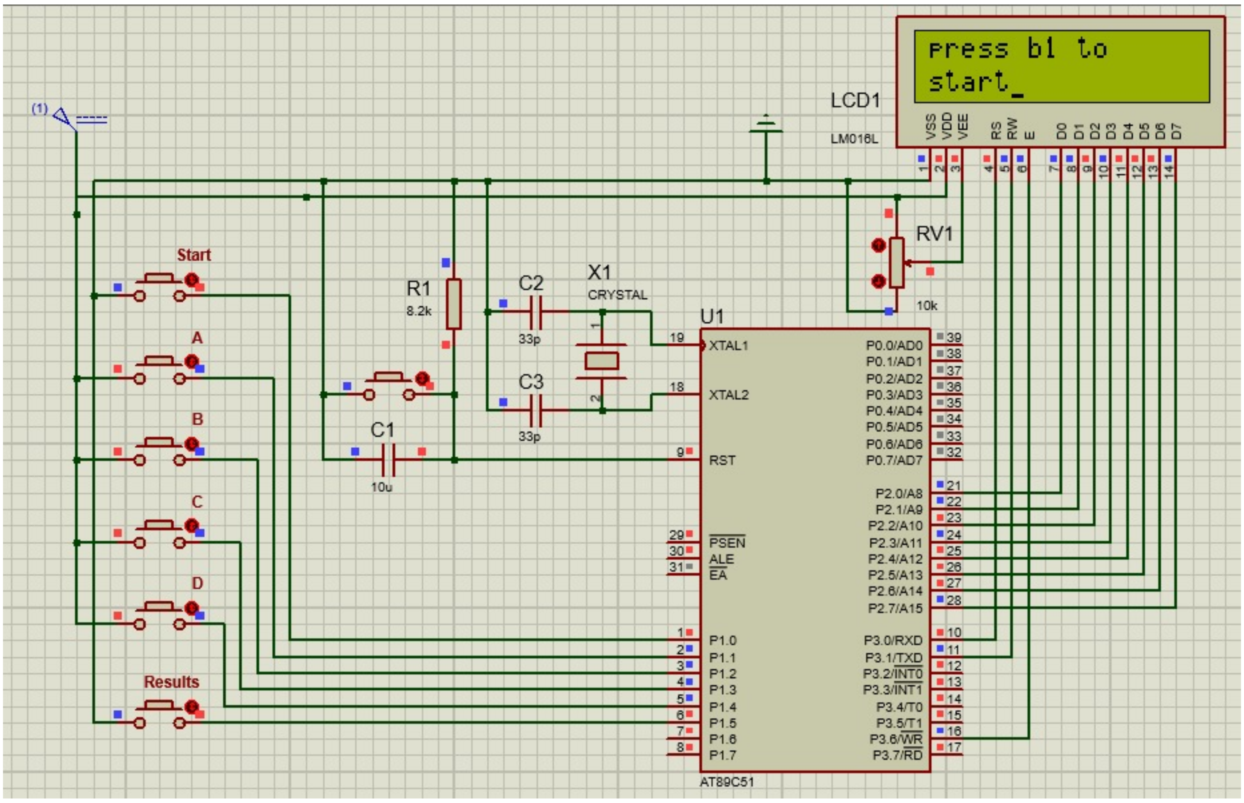
```
delay(msec);
lcd_data_str("wins");
delay(msec);
}

if ( (vote_3 == max) && ( vote_2 != max) && (vote_1 != max)&& (vote_4 != max) )
{
carry = 1;
lcd_cmd(0x01);                    //clear lcd
delay(msec);
lcd_cmd(0x80);                                  //cursor position to 0 of line 1
delay(msec);
lcd_data_str("congratulations");
delay(50);
lcd_cmd(0xC4);                                    ////jump to 2nd line 4th col
delay(msec);
lcd_data_str("C");
delay(msec);
lcd_cmd(0x14);                       //space
delay(msec);
lcd_data_str("wins");
delay(msec);
}

if ( (vote_4 == max) && ( vote_2 != max) && (vote_3 != max)&& (vote_1 != max) )
{
carry = 1;
lcd_cmd(0x01);         //clear lcd
delay(msec);
lcd_cmd(0x80);                                   //cursor position to 0 of line 1
delay(msec);
lcd_data_str("congratulations");
delay(50);
lcd_cmd(0xC4);                               //jump to 2nd line 4th col
delay(msec);
lcd_data_str("D");
delay(msec);
lcd_cmd(0x14);                       //space
delay(msec);
lcd_data_str("wins");
delay(msec);
}

if (carry==0)
```

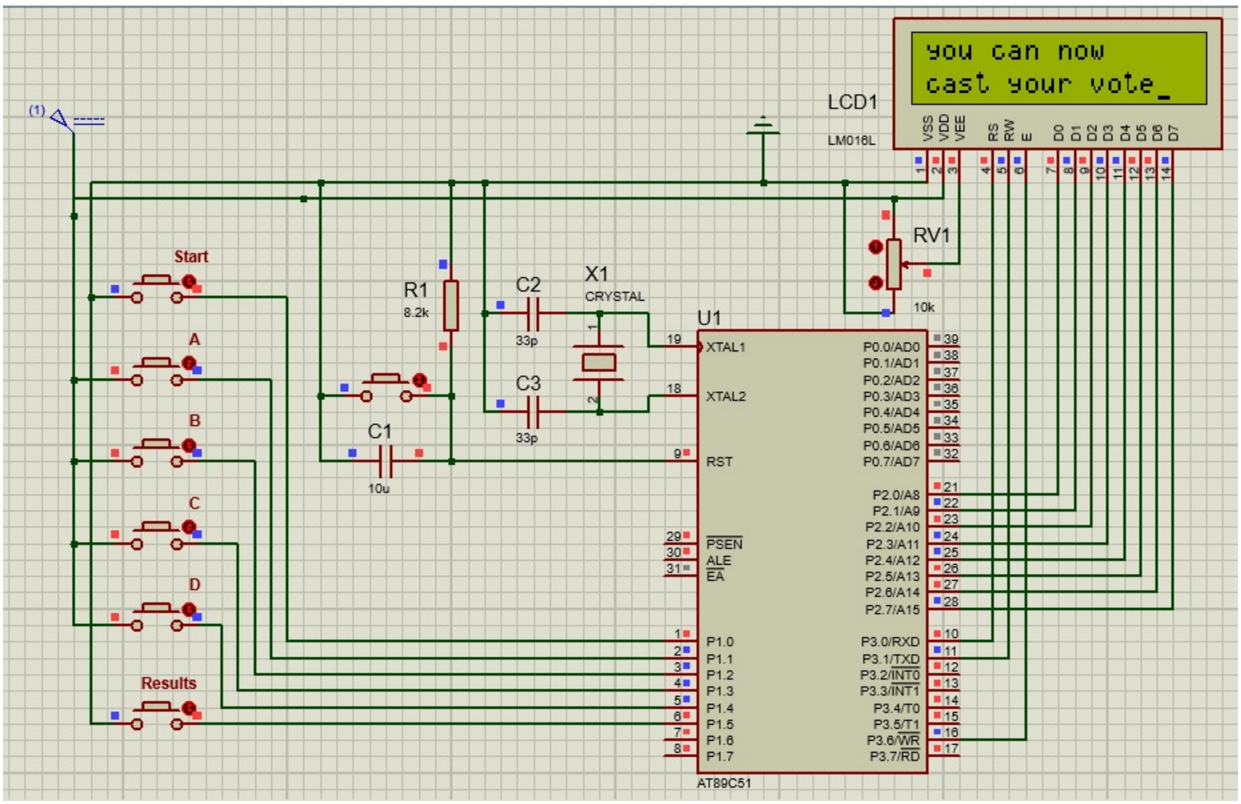
```
{
lcd_cmd(0x01);                    //clear lcd
delay(msec);
lcd_cmd(0x82);                   //ist line 2nd col
delay(msec);
lcd_data_str("clash");
delay(50);
lcd_cmd(0x14);                  //space
delay(msec);
lcd_data_str("between");
delay(50);
if(vote_1 == max)
{
lcd_cmd(0xC2);                 //2nd line 2nd col
lcd_data_str("A");
delay(50);
}
if(vote_2 == max)
{
lcd_cmd(0xC5);                     //2nd line 5th col
lcd_data_str("B");
delay(50);
}
if(vote_3 == max)
{
lcd_cmd(0xC9);                         //2nd line 9th col
lcd_data_str("C");
delay(50);
}
if(vote_4 == max)
{
lcd_cmd(0xCD);                             //2nd line 12th col
lcd_data_str("D");
delay(50);
}
}
}

void main()
{
ini_pin = stop_pin = 1;
vote_1 = vote_2 = vote_3 = vote_4 = 0;
candidate_1 = candidate_2 = candidate_3 = candidate_4 = 0;
lcd_cmd(0x38);                  //5x7 matrix 2 lines
delay(msec);
lcd_cmd(0x0E);                  //cursor on
delay(msec);
lcd_cmd(0x01);                    //clear lcd
delay(msec);
```

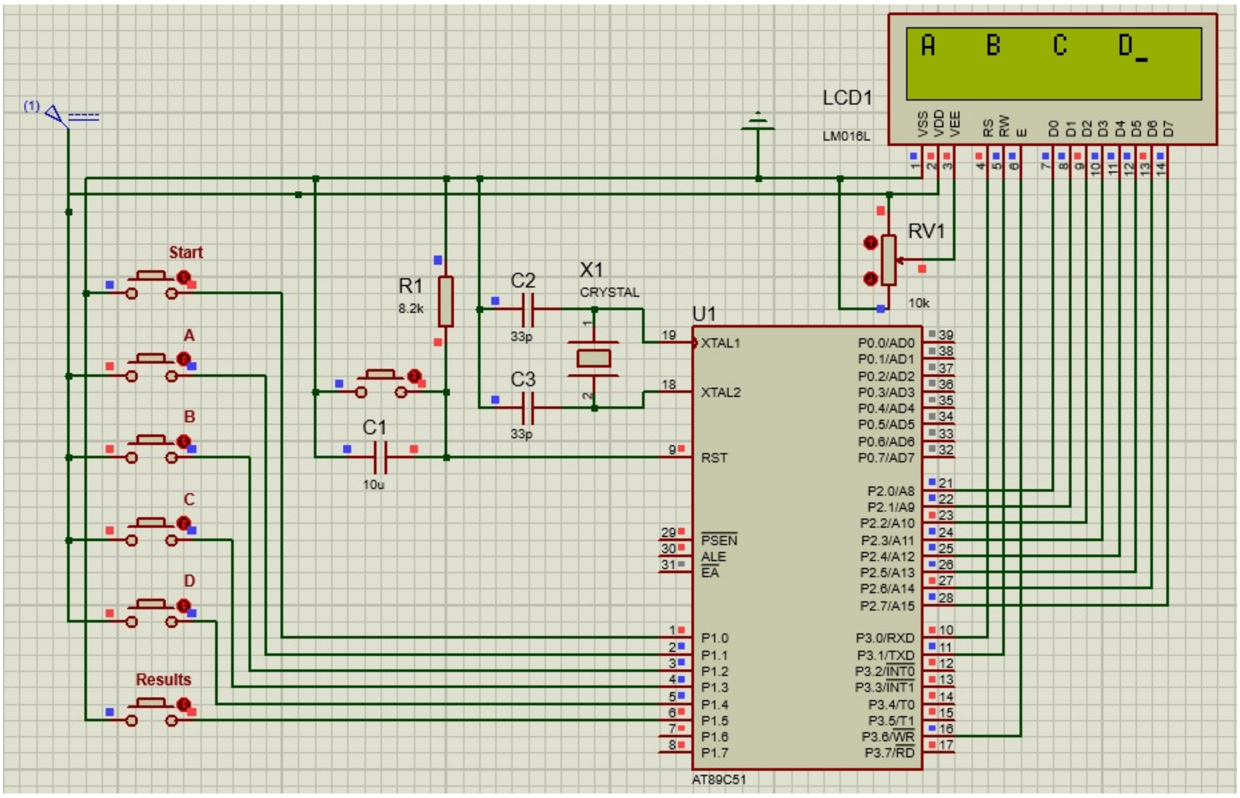
```
lcd_cmd(0x80);                      //cursor to fisrt pos
delay(msec);
lcd_data_str( "press b1" );
delay(msec);
lcd_cmd(0x14);                       //sapce
delay(msec);
lcd_data_str("to");
delay(msec);
lcd_cmd(0xC0);                         // second line
delay(msec);
lcd_data_str("start");
delay(100);
while(1)
{
while(ini_pin != 0)
{
if (stop_pin == 0)
break;
}
if (stop_pin == 0)                   //result pin
{
break;
}
lcd_ini();
}

while(1)
{
results();
}
}
```

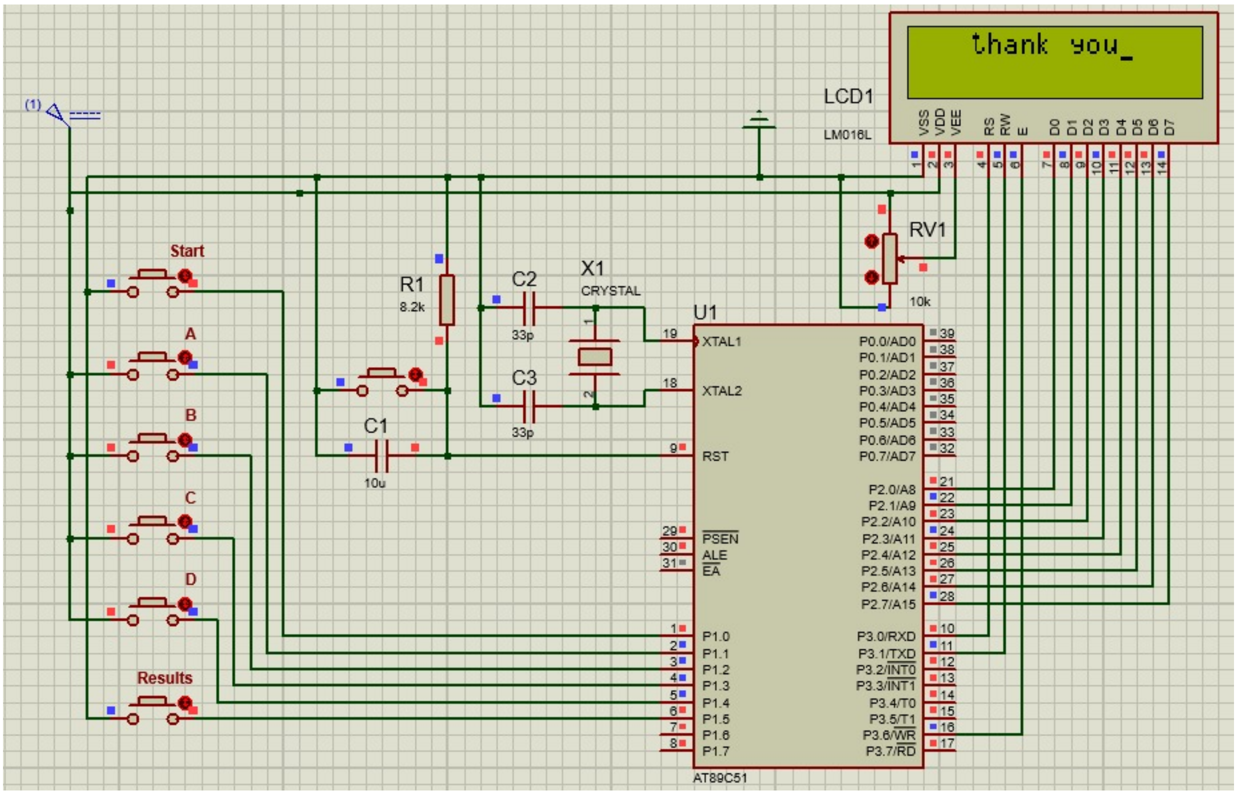
4.4 Results

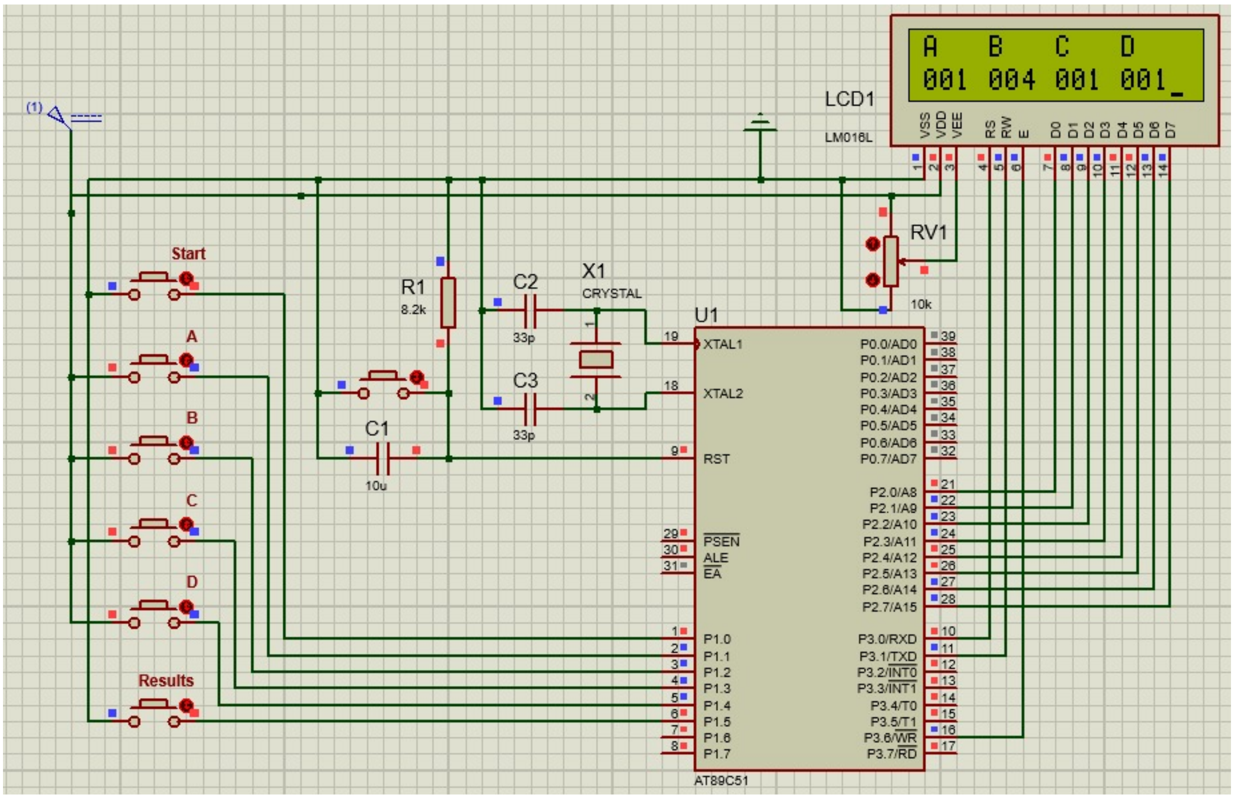
Following screen shot will show the step wise results which showed up as we run the project.

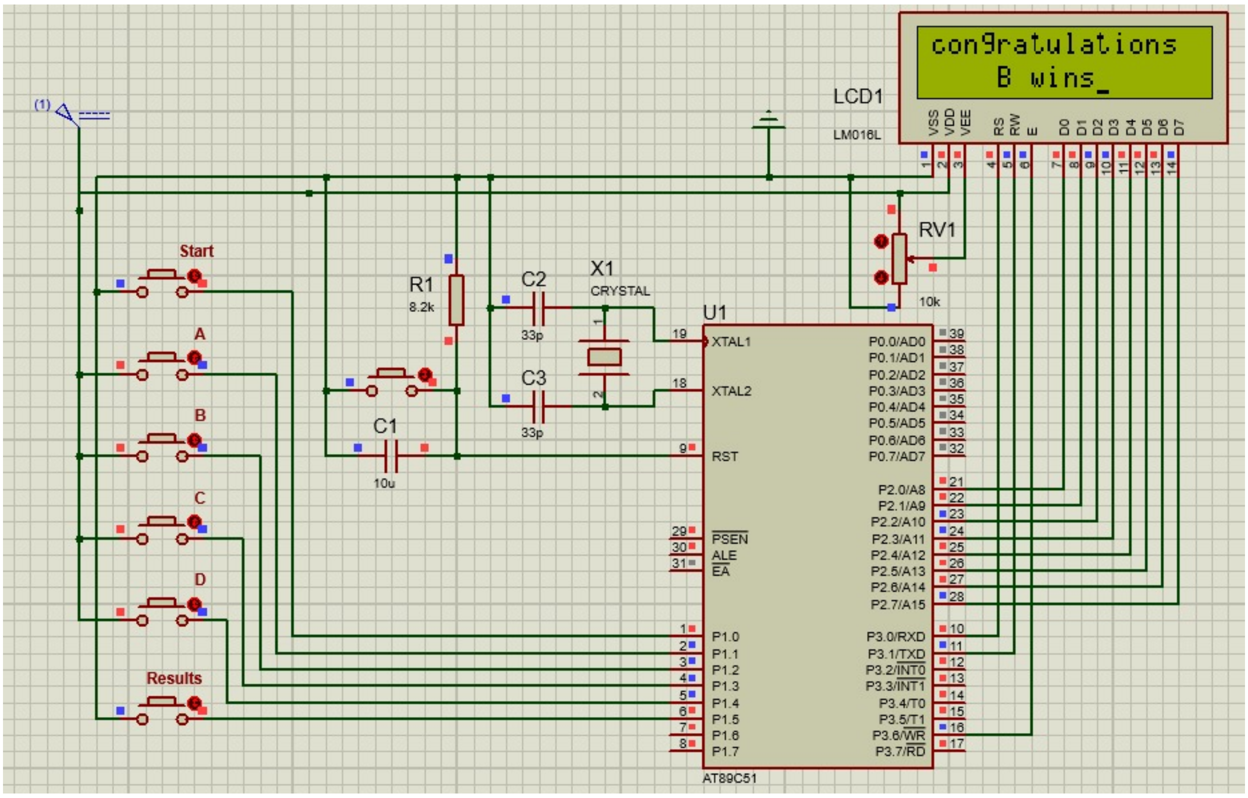


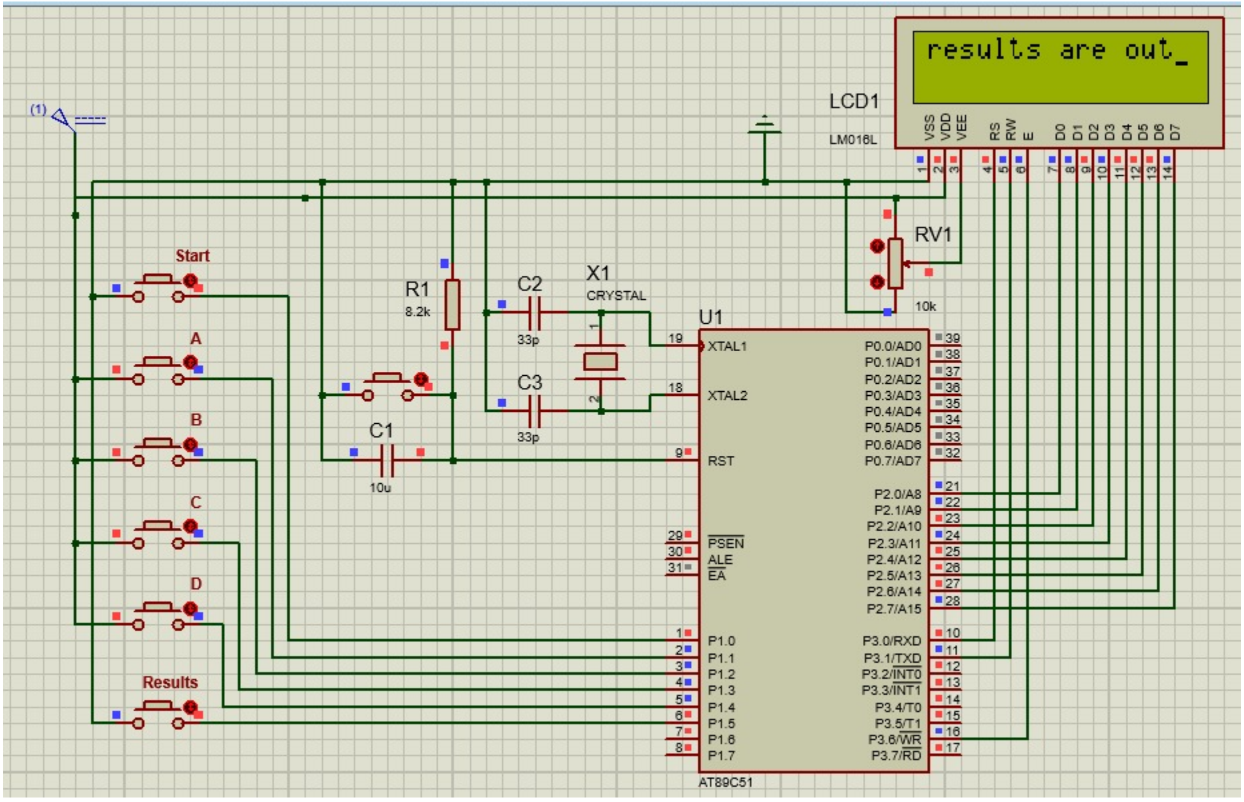



A B C D_
LCD1
LM016L
VSS
VDD
VEE
RS
RW
E
D0
D1
D2
D3
D4
D5
D6
D7
RV1
10k
Start
A
B
C
D
Results
R1
8.2k
C1
10u
C2
33p
C3
33p
X1
CRYSTAL
U1
XTAL1
XTAL2
RST
PSEN
ALE
EA
P1.0
P1.1
P1.2
P1.3
P1.4
P1.5
P1.6
P1.7
P0.0/AD0
P0.1/AD1
P0.2/AD2
P0.3/AD3
P0.4/AD4
P0.5/AD5
P0.6/AD6
P0.7/AD7
P2.0/A8
P2.1/A9
P2.2/A10
P2.3/A11
P2.4/A12
P2.5/A13
P2.6/A14
P2.7/A15
P3.0/RXD
P3.1/TXD
P3.2/INT0
P3.3/INT1
P3.4/T0
P3.5/T1
P3.6/WR
P3.7/RD
AT89C51


thank you_
LCD1
LM016L
VSS
VDD
VEE
RS
RW
E
D0
D1
D2
D3
D4
D5
D6
D7
RV1
10k
Start
A
B
C
D
Results
R1
8.2k
C1
10u
C2
33p
C3
33p
X1
CRYSTAL
U1
XTAL1
XTAL2
RST
PSEN
ALE
EA
P1.0
P1.1
P1.2
P1.3
P1.4
P1.5
P1.6
P1.7
P0.0/AD0
P0.1/AD1
P0.2/AD2
P0.3/AD3
P0.4/AD4
P0.5/AD5
P0.6/AD6
P0.7/AD7
P2.0/A8
P2.1/A9
P2.2/A10
P2.3/A11
P2.4/A12
P2.5/A13
P2.6/A14
P2.7/A15
P3.0/RXD
P3.1/TXD
P3.2/INT0
P3.3/INT1
P3.4/T0
P3.5/T1
P3.6/WR
P3.7/RD
AT89C51


A B C D
001 004 001 001_
LCD1
LM016L
VSS VDD VEE RS RW E D0 D1 D2 D3 D4 D5 D6 D7
RV1
10k
Start
A
B
C
D
Results
R1
8.2k
C2
33p
C3
33p
X1
CRYSTAL
C1
10u
U1
XTAL1
XTAL2
RST
PSEN
ALE
EA
P1.0
P1.1
P1.2
P1.3
P1.4
P1.5
P1.6
P1.7
P0.0/AD0
P0.1/AD1
P0.2/AD2
P0.3/AD3
P0.4/AD4
P0.5/AD5
P0.6/AD6
P0.7/AD7
P2.0/A8
P2.1/A9
P2.2/A10
P2.3/A11
P2.4/A12
P2.5/A13
P2.6/A14
P2.7/A15
P3.0/RXD
P3.1/TXD
P3.2/INT0
P3.3/INT1
P3.4/T0
P3.5/T1
P3.6/WR
P3.7/RD
AT89C51


con9ratulations
B wins_
LCD1
LM016L
VSS VDD VEE RS RW E D0 D1 D2 D3 D4 D5 D6 D7
RV1
10k
Start
A
B
C
D
Results
R1
8.2k
C2
33p
C3
33p
X1
CRYSTAL
C1
10u
U1
XTAL1
XTAL2
RST
PSEN
ALE
EA
P1.0
P1.1
P1.2
P1.3
P1.4
P1.5
P1.6
P1.7
AT89C51



4.5 Hardware Implementation

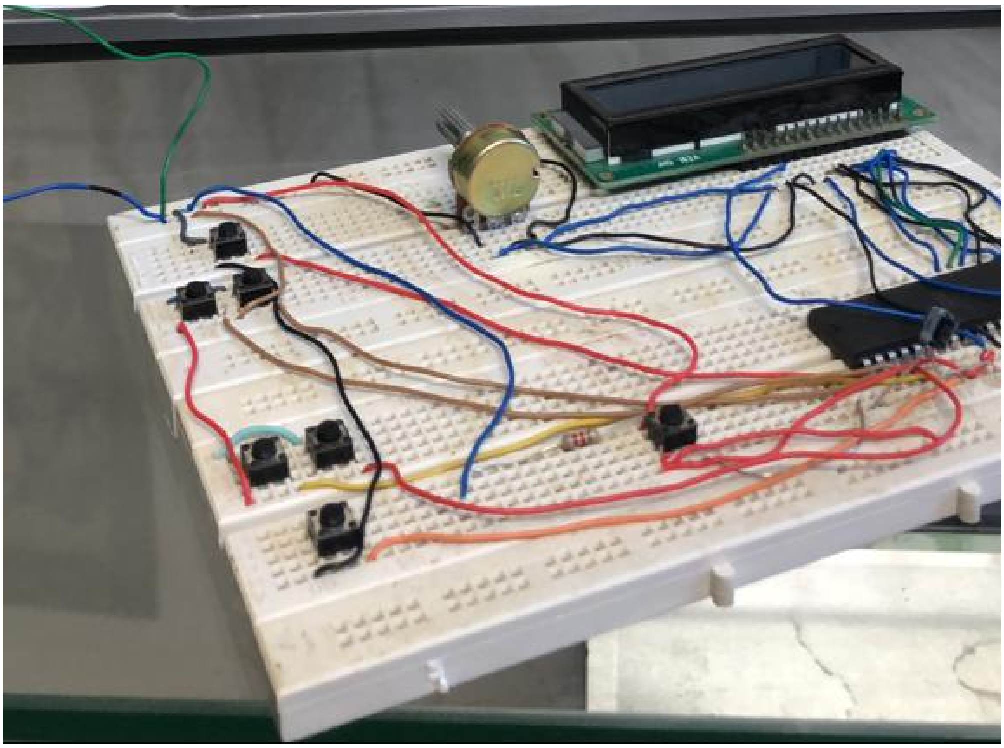


Figure 4.2: Hardware Implementation of Electronic Voting Machine(EVM) Using 8051 Microcontroller

Chapter 5

Conclusion and Future Work

In the previous chapter, we have shown all the simulation and results of our proposed project from introduction, literature review, proposed methodology, result and simulations. In this chapter, we will conclude our project and will give some future works recommendations.

5.1 Conclusion

This work describes the working of Electronic Voting Machine. We have:

1. Lesser chance of rigging in the elections
2. From Ballot paper now elections will be automated
3. The elections will be now time efficient and cost efficient

5.2 Future Work

Electronic Voting Machine can be done in many other ways and the current method-/project can be improve in many ways. Following are the some of the things we can try to improve this system:

1. Different microcontroller can be used to improve it.
2. Can work on this to improve the system accuracy.
3. Can use fingerprint, or face recognition technique to better person identification.

Bibliography

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