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The Development and Assembly of an Electronic Voting Device Based on the Arduino Uno Microcontroller

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ABSTRACT

A detailed implementation of an electronic voting machine that is based on a microcontroller was provided in this study. To facilitate an easier voting process during elections, the microcontroller, Arduino, which is based on smart cards, electronic voting machine, and LCD are utilised. voting machines are the total combination of mechanical, electromechanical, or electronic equipment (including software, firmware, and documentation required to program control, and support equipment), that is used to define ballots; to cast and count votes; to report or display election results; and to maintain and produce any audit trail information. The first voting machines were mechanical, but it is increasingly more common to use electronic voting machines.

Keywords: Voting Machine, Smart Card, Arduino Uno, 16F877A Microcontroller.

INTRODUCTION

Electronic voting machines (EVMs) are modern devices that allow voters to cast votes using only a smart card. EVMs replaced the previous ballot box and paper voting system. Users can cast their ballots easily, and the digital method ensures precise counting.

The Electronic Voting Machine (EVM) keeps all the characteristics of voting by ballot paper while making polling much more efficient. The EVM is quick and dependable, saving time, money, and manpower. And, of course, it contributes to ultimate voting secrecy by eliminating the need for ballot papers. The EVM is 100% tamper-proof. Traditionally, a voting machine has been defined by the mechanism the system uses to cast votes and further categorized by the location where the system tabulates the votes.

Voting machines have different levels of usability, security, efficiency and accuracy. Certain systems may be accessible to all voters, or not accessible to those voters with certain types of disabilities. They can also influence the public's ability to oversee elections.

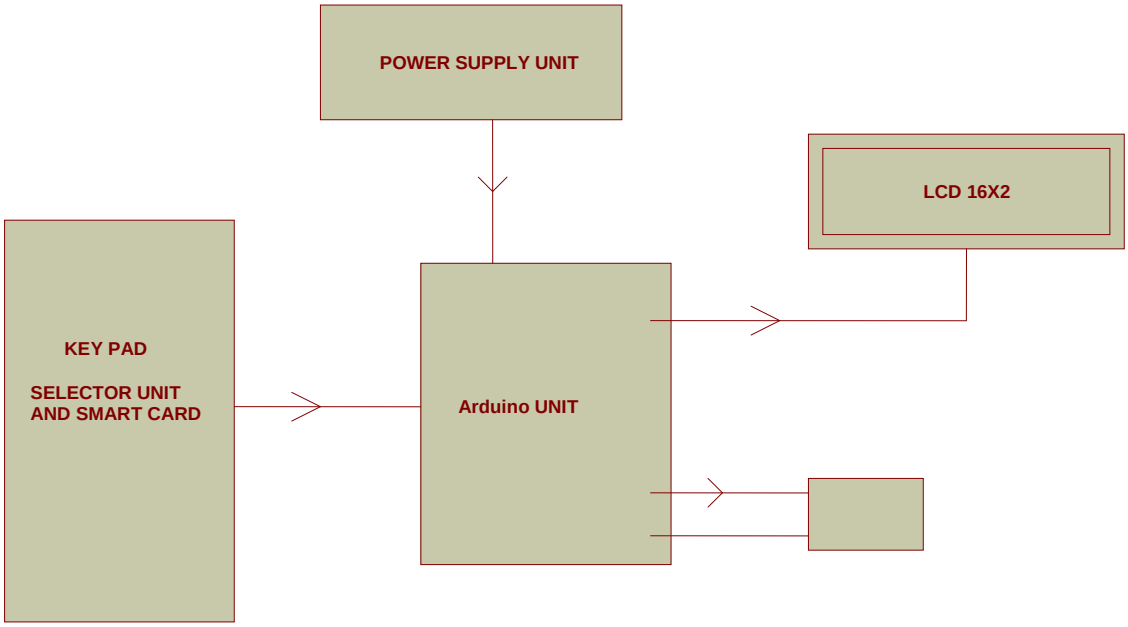
AIM AND OBJECTIVES

The project's purpose is to create a microcontroller-based smart card electronic voting machine that uses Arduino and an LCD to make it easy to vote during an election.

The objectives consist of the following:

- Build a power supply unit.
- Design a keypad and smart card unit.
- Create a microcontroller and display device.
- Design and build an alarm system.

METHODOLOGY



: BLOCK DIAGRAM OF ELECTRONIC VOTING MACHINE

The Figure above illustrates the block diagram of the project. Upon activation, the LCD displays "vote now." To cast a vote, one must press the button adjacent to the preferred party name using a smart card (as illustrated above). Upon detection of the smart card by the designated voter, and subsequent pressing of the key to select a candidate, a microcontroller identifies the pressed button, increments the corresponding variable by one, and stores the result in EEPROM, ensuring data retention even in the event of power loss. The device then automatically locks internally to prevent subsequent voting by the same user.To facilitate the next vote, the admin must press the button (switch) once. Once more, the identical occurrence transpires; the LCD displays 'vote now.' Upon casting the vote, it indicates 'vote cast,' followed by an audible beep, and subsequently becomes internally locked. The EVM device features several buttons on its top for casting votes, as well as other buttons within the device's top panel for checking results, erasing results, and resetting, among other functions.

PROJECT DESCRIPTION

Electronic voting machine has now adays become an effective tool for voting. It ensures flawless voting and thus has become more widespread. It ensures people about their vote being secured. It avoids any kind of malpractice and invalid votes. Also, such kind of system becomes more economical as consequent expenditure incurred on manpower is saved. It is also convenient on the part of voter, as he must just press one key whichever belongs to his candidates.

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A voting system includes the practices and associated documentation used to identify system components and versions of such components; to test the system during its development and maintenance; to maintain records of system errors or defects; to determine specific changes madeafter initial certification; and to make available any materials to the voter (such as notices, instructions, forms, or paper ballots).

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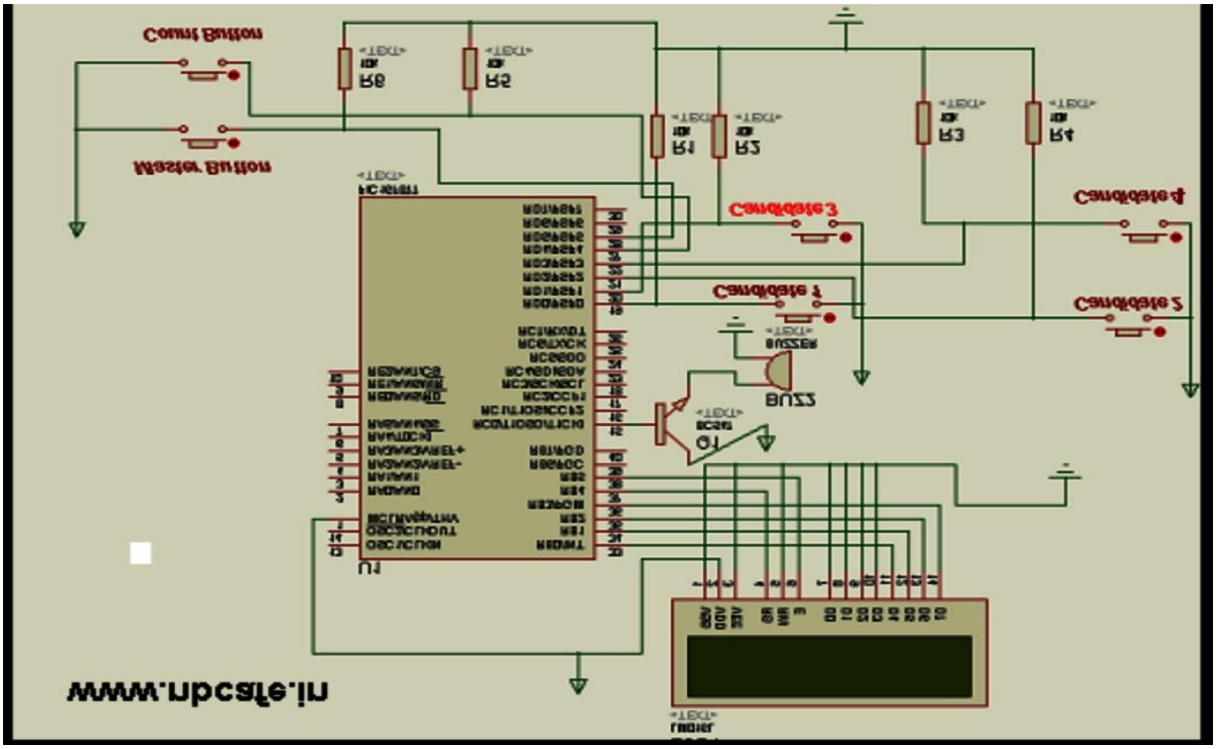

Fig 3.2 Circuit Diagram Of Electronic Voting Machine

DESIGN AND ANALYSIS

Power Supply Unit

In this unit the battery 9V served to supply dc voltage to the regulator IC 7805 and the output of the regulate the voltage at 5V for the digital circuit shown in figure 3.2

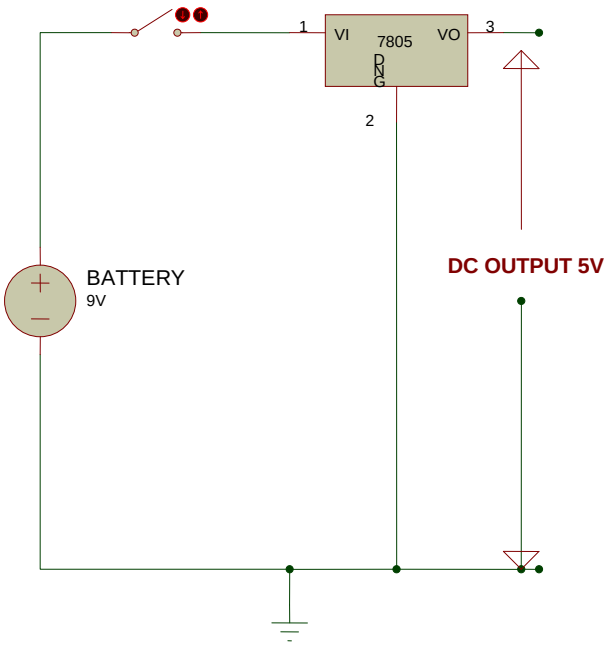

Figure 4.1 power supply unit circuit.

Smart Card Accessing Unit

A. RFID Tag IPC80 passive RFID tag operating at a frequency of 125KHz is issued to the user. The tag transmits information to the reader in ASK format each smart card have a IP address number to access by the reader

B. RFID Reader IP10 proximity card reader with operating frequency of 125KHz and reading distance up to 4 inches is used. The reader can be access using smart card, provides the tag information serially in RS232 format and is suitable for indoor as well as outdoor operations [11]. Three such readers are installed for hostel security: hostel entrance gate, hostel exit gate and mess entrance gate.

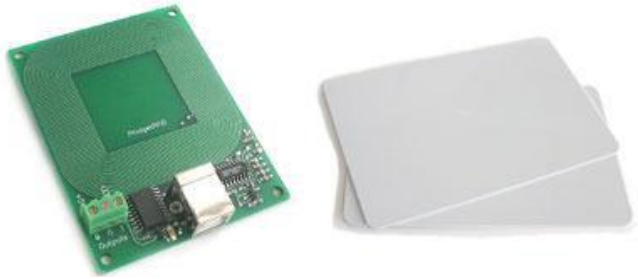

Figure 4.2 RFID reader tag and reader

KEY BUTTONS MODE OF SELECTION UNIT

Voting Mode: When toggle switch is in voting mode "Voting mode" is displayed followed by "Please vote". After a vote being given, "Please wait for authority switch" is displayed and again enable for voting after Control switch being pressed by the voting Authority.

Counting Mode: When toggle switch is in counting mode "Counting mode" in displayed on the screen, and total number of votes to respective candidate can be displayed on the screen by pressing the respective key assigned to them.

Clear mode: Press clear switch when all entries are required to be erased. Clear switch should be pressed before voting procedure.

Controller switch: This switch is provided for enabling the keypad in voting mode. This switch is under the control of voting authority.

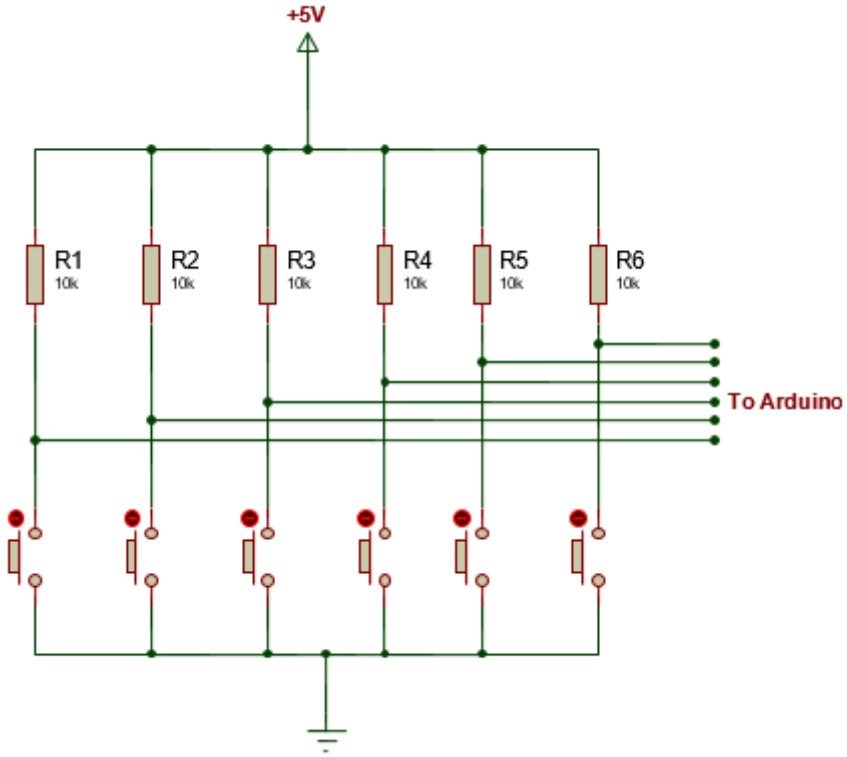

Fig 4.3 Switches

ARDUINO UNO BOARD:

It is open-source electronics prototyping platform based on bendable, easyto-employ hardware and software. It is proposed for artistsdesigner, hobbyists & anyone interested in generatingvarious design for objects or environmental purpose.Arduino UNO is a board based on ATmega328microcontroller. It consists of 14 digital input/output pins,six

analogue inputs, a USB link for programming the on-boardmicrocontroller, power jack, an ICSP header & areset button. It is work due to 16MHz crystal oscillator &contains everything needed to support the microcontroller.It is easier to use as the user simply needs to connect it to a computer with a USB cable or power it with an AC-to-DCadaptor or battery to get in progress. The microcontrolleron the board is programmed using Arduino programming language & Arduino development environment.

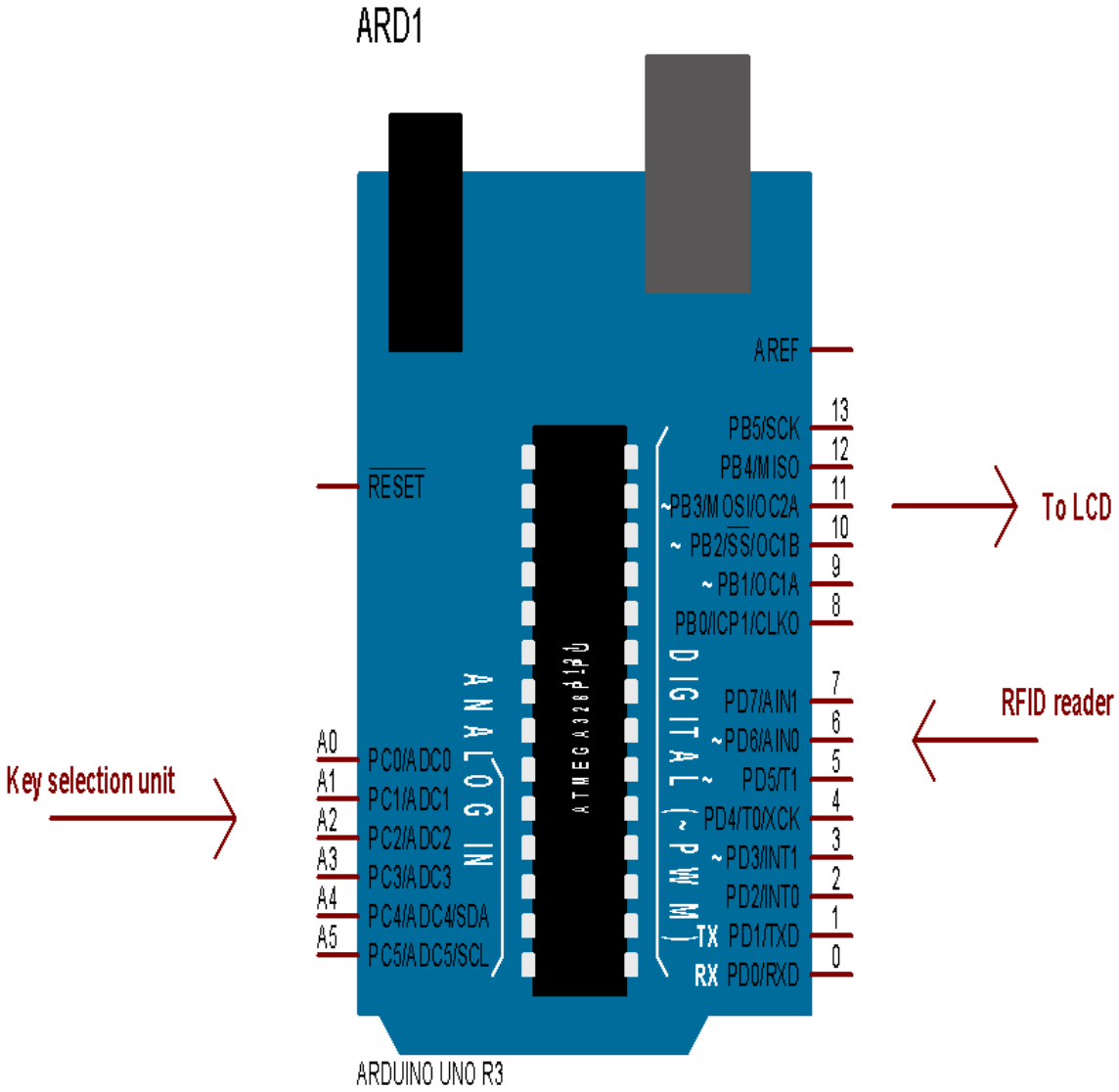

Fig 4.4 A MICRO CONTROLLER

DISPLAY UNIT

This unit used to display the project information by the used of LCD 16x2 characters, like card detected, Number voters casted etc

Depending on how many lines are used for connecting an LCD to the microcontroller, there are 8-bit and 4-bit LCD modes. The appropriate mode is selected at the beginning of the operation in the process called 'initialization'. The 4-bit LCD mode uses outputs D4- D7 to transfer data as explained on the previous page.

The main purpose of the 4-bit LCD mode is to save valuable I/O pins of the microcontroller. Only 4 higher bits (D4-D7) are used for communication, while others may be left unconnected. Each piece of data is sent to the LCD in two steps- four higher bits are sent first (normally through the lines D4-D7), then four lower bits. Initialization enables the LCD to link and interpret received bits correctly.

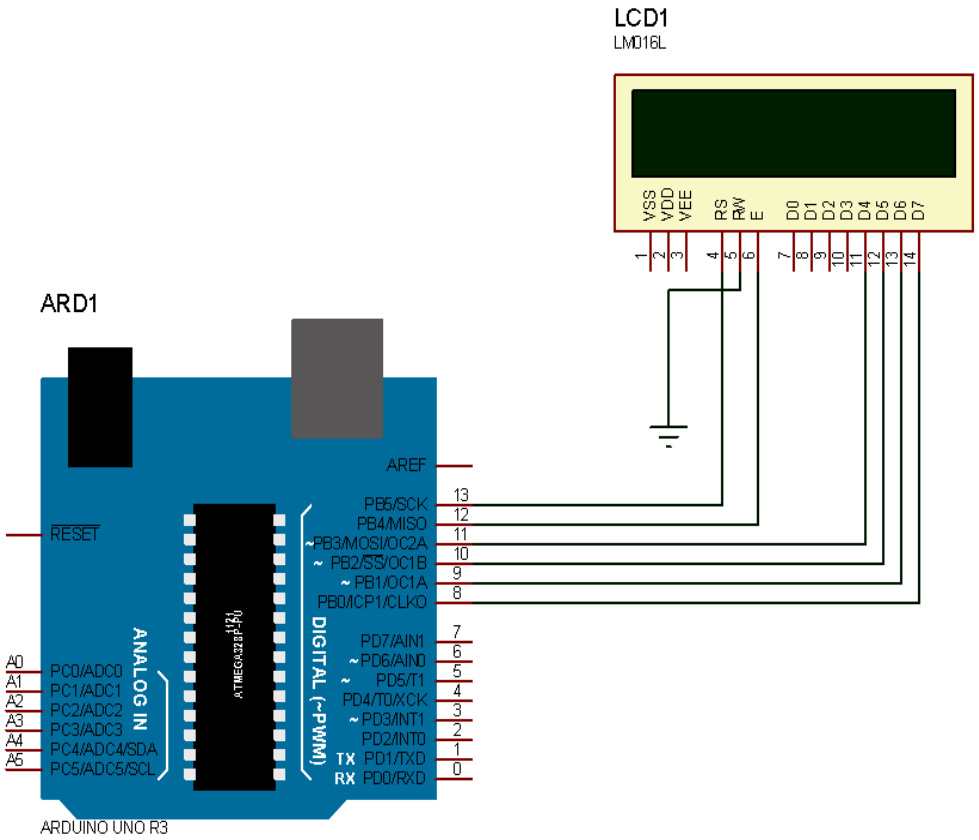

Fig 4.5 A MICRO CONTROLLER CONNECTED TO LCD

TESTING AND RESULT

The entire circuit was constructed and evaluated for six hours, functioning as specified, using a current of 7.5mA at 5V from the 9V regulated power source. Initially, it was developed on a testing board, where it was determined to function effectively; the test was subsequently performed multiple times,yielding satisfactory results.

The testing system was determined to function properly with minimal or no errors and shown excellent reliability. This indicates that the project fulfils its aims and requirements.

CONCLUSION AND RECOMMENDATION

The objective has been accomplished, as the design and building of electronic voting devices have been successfully completed, and the project has been tested and is functioning optimally, as indicated by the results presented in chapter four.

The project can be modified by include additional parties for the voters to expand the candidate pool; the LCD can also be altered to utilise 20x4 characters for displaying results from numerous parties. The GSM module can also be added to transmit the total number of votes cast.

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