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Design of Preferential Electronic Voting Machine using AVR series Microcontroller

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Abstract

Advancement in technology has lead to wide acceptance of Electronic Voting Machines in different areas of application. There is a need and demand of developing advanced voting machines for variety of applications. Preferential voting is technically complex process, right from voting up to counting and deciding the result. The Preferential Electronic Voting machine has been designed and developed taking care to see to it that it is efficient, effective, useful and at the same time remains user friendly, both from the point of view of the voter and the election conducting agency. The system has been designed, constructed and tested using different combinations of trial to ensure the proper functioning and validation of the machine.

Keywords: PEVM, Preference, RISC, ISSP, ATMEGA32, EEPROM.

1. INTRODUCTION

The concept of Preferential voting is different from general voting method. Preferential voting was used for the Legislative Assembly (Lower House) of the Victorian parliament in UK. According to this system, voters number candidates on the ballot paper in a rank order of choice. On each ballot paper, voters choose the candidate they most want to elect and write 1 in the box next to their name. They write 2 next to their second choice, 3 to their third choice and so on. The system is such that it enables to choose a candidate that can build an absolute majority of support in the electorate rather than the simple majority of first past the post voting. The whole process form conducting election till counting of votes is still done manually in India. There are many clauses in counting method that makes the task very complex. As this is an era of technology, this paper aims at designing and developing an electronic voting machine that can deliver expected results in a preferential voting system. This is specially designed for elections by voting to elect members of various bodies of university. For example Senate, Academic Council (AC) etc. But this system can also be used in other elections where there is preferential kind of voting. As the electronic voting machines which are already available does not support preferential voting and the technology demands for automation, laid the basis for designing Preferential Electronic Voting Machine (PEVM).

2. METHODOLOGY

The design of PEVM is based on preferential voting governed by the rules of voting process stated in statutes of Marathwada Act 1974. The system is designed using ATMEGA32 from AVR series microcontroller. The benefit of using this microcontroller is that it is a powerful 8-bit microcontroller with RISC (Reduced Instruction Set Computing, high performance and low power consumption. It has 131 instructions, most of which are single clock cycle execution. It provides 32x8 internal registers. It consists of 32k bytes of In-System-Self Programmable (ISSP) flash memory- endurance-10,000 write/erase cycle. It operates on 4.5v to 5.5v. It has k bytes if internal SRAM and 1024 EEPROM. The write/ erase cycle: 10,000 flash /100,000 EEPROM. Data can be retained up to 20 years at 85^0 C and up to 100 years at 25^0 C. Static operation :0-16 MHz . It consists of 32 programmable I/O lines. It provides a highly- flexible and cost effective solutions to many embedded applications. The system consists of two units. One is the control unit and other is the ballot unit. The control unit is designed for controlling the operation of the ballot unit. The following is the component diagram of control unit and ballot unit respectively.

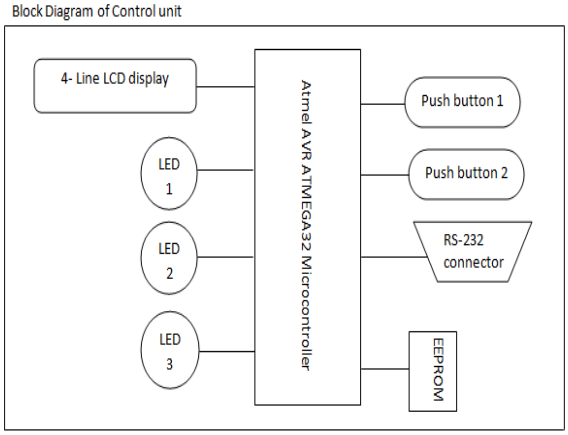

Figure1: Block diagram of Control unit

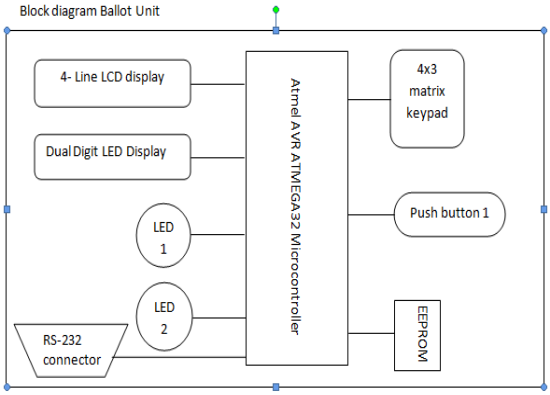

Figure 2: Block diagram of Ballot unit

The microcontroller is interfaced with a 20x4 line LCD display from HD44780 series. The information essential during the operation of the voting is shown on LCD display and dual digit LED display. For assigning the preference number a 4x3 matrix keypad is provided which contains necessary keys for the use of voters. The LCD display is connected in four bit mode to port B of atmega32 microcontroller. The key pad connections are made at port A of the ballot unit. Both the rows and columns are interfaced to the same port using upper and lower nibbles respectively. An external memory that is 24C256 is interfaced at port C of microcontroller. It is used to store information of the voting such as names of contesting candidates and voter's preferences to them etc.LED display is connected to ballot unit microcontroller using few pins of port C with the help of latch and few pins of port D. Buzzer is interfaced with control unit microcontroller at port D. LEDs and switches are connected to port D on both the units.

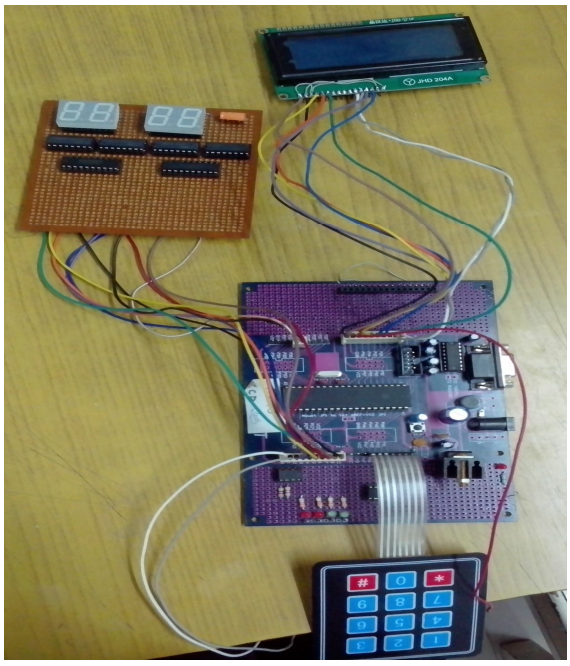

Figure 3: Ballot Unit snap

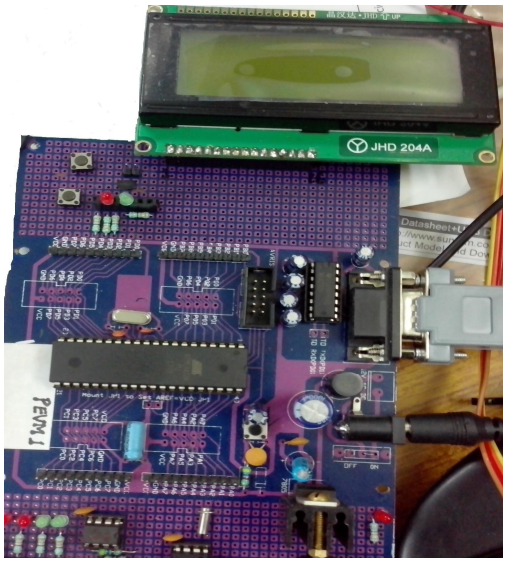

Figure 4: Control Unit snap

A general purpose PCB supporting AVR series microcontroller is used for assembling the circuit. The implementation of the preferential voting required modifying and debugging of the circuit and the controlling program from time to time, to this effect, utilizing the ISP capability of the microcontroller an ISP port was also provided on the circuit board. For the purpose of burning the firmware into microcontroller, we used an AVR-ISP programmer from Extreme Electronics, utilizing the parallel port of the computer.

3. DESIGN AND CONSTRUCTION

The PEVM is designed for preferential voting system of Dr. BAMU. Hence, it will not be used on a large scale like general assembly elections. The system is designed user friendly and the cost of maintenance is reasonable. The machine is simple operate and does not require special training of the man power. Hence time efforts and resources are saved. Data security and reliability of operation is also kept at priority. In order to accomplish the desired results of the preferential voting process, the university rules and regulations for conducting election were thoroughly examined. And suitable algorithm was developed gradually to make provision for the implementation of the voting process. Optimized program codes were written in embedded C language. All of the programming was done using AVR Studio compiler to test and make the code error free. Then the HEX file was generated and burned to the microcontroller chip using AVR-burner. When the programming is over, the system is in operation and can be tested. Various test were performed, considering different scenarios and the results were recorded. During testing, the practical issues that we found were resolved immediately.

4. SILENT FEATURES

When the power is turned on, the PEVM performs necessary initializations and is ready for the voting process. The control unit act as the master for ballot unit that is ballot unit waits for the instructions from control unit. Then as instructed, the ballot unit carries out the operations such as display the names of the candidate. Once the candidate name is displayed on the LCD display the voter can cast the vote. After all the candidates have been assigned the preference, one has to press the DONE switch to record their vote. The vote is saved in the external memory. An interface is developed in visual basic to extract voting data from the voting machine into a computer and perform further counting. System allows only one voter to cast his vote at a time. It gives voter a full freedom to make changes in the preference order before DONE switch is triggered. System also accepts skipping of one more candidates from the list. Some of the voters are not interested in reading the names of the candidate they simply want to look for candidate number and cast their vote. This need is also fulfilled by LED display on the ballot unit. No chance of any other mark except numbers. System does not accept preference number greater than number of candidates. Counting and result declaration through software. So time is saved. Invalid votes are eliminated at the time of scrutiny.

5. CONCLUSION

The system is less expensive and simple to operate. To ensure the acceptance of voting result, one has to apply an appropriate counting method to interpret the votes cast and produce a voting results that reflects the true opinion of the voters. The system has gone through various trials and the results produced during these trials found to be accurate. After various test conducted on the machine, it is found that the system meets almost all the requirement for a good voting machine. Though the machine is designed for University elections, but it can be used for other preferential voting systems. Similarly, the system can also be used for non- preferential voting system by some minor modifications.

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