Mechanical Dead Bolt Door Scheme Using Arduino

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ABSTRACT

The Automated door lock system has been previously implemented using several means and techniques. However, the purpose of this paper is to introduce yet another, but simpler technique to achieve the same result. This technique focuses majorly on the use of the Arduino microcontroller and the L293D motor driver IC as the focal points for this project.

Keywords: *Arduino, Automated, Door lock, LCD, Microcontroller*

INTRODUCTION

The automated door lock system is widely deployed in several spheres of life such as in the banks as well as home and office environments. It could be employed as a traffic regulator for controlling the inflow and outflow of individuals to and from an environment (as seen in banks) or could be used to restrict unwanted access to an environment (access control).

The motivation behind this paper stems from the unavoidable distractions which occur during academic lectures in tertiary institutions owing to the arbitrary entrance and exit of students into and from the lecture halls. Hence, the aim of this project is to assist the lecturer in establishing some form of control over the lecture hall throughout the duration of a lecture period. As a result, the lecturer gets to allow students into and out of the lecture hall at his / her own discretion.

RELATED WORKS

Ibencos discussed that the major drivers of the Arduino door lock with password are the Arduino Uno microcontroller and a servo motor to represent the opening and closing of door .

Staff, in a project stated that the major drivers of Arduino door lock using 4x4 Keypad and Servo Motor are the Arduino mega and a servo motor representing the opening and closing of the door .

Ali Hamza in the Digital Door Lock project using Arduino stated that the major drivers are the Arduino uno, Liquid Crystal Display, push pull solenoid representing the door and the TIP 120 NPN Transistor . Again, Ali

Hamza, in a project, Arduino Keyless Door Lock System with Keypad and LCD says that the major components include the Arduino Uno, a DC Lock, Relay and Liquid Crystal Display .

Hence, from previous works, there has been no attempt to employ the use of L293D motor driver and a DC motor in conjunction with a 4x4 matrix keypad and the Arduino Uno. This is a fresh concept, hence, making the setup unique.

METHODOLOGY

The system is composed of three major modules. The microcontroller module consists basically of the Arduino Uno R3 microcontroller. The keypad module serves as the input to the microcontroller, as the password required to open the door must be entered into the system via the module. The keypad module was designed from scratch for this system, using 16 push button switches and 4 resistors, since a ready-made module was not available in the market at the moment of design. The Motor driver module controls the mechanical action of the door (opening and closing). It comprises a 12Vdc motor and the L293D motor driver IC. Since the Arduino is limited to a maximum output current of 500mA on each of its output pins, driving the DC motor directly from these pins would damage them. Hence, the motor driver IC is

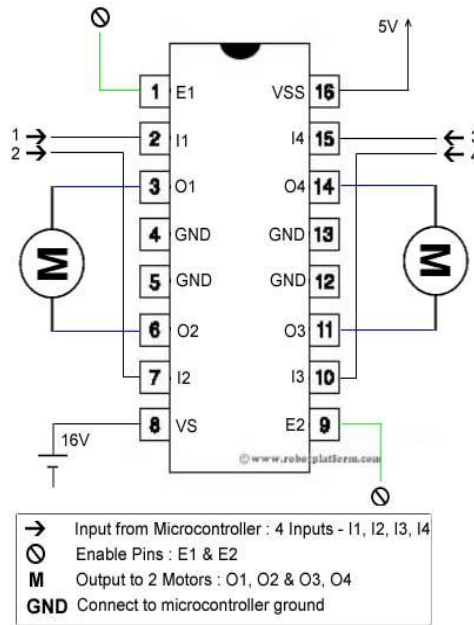employed to act as an interface between the   Arduino and the DC motor.

Figure1. *L293D Motor driver IC and operational circuitry*

In addition, an indicator circuit comprised of two LEDs is added to indicate the opening and closing of the mechanical door.
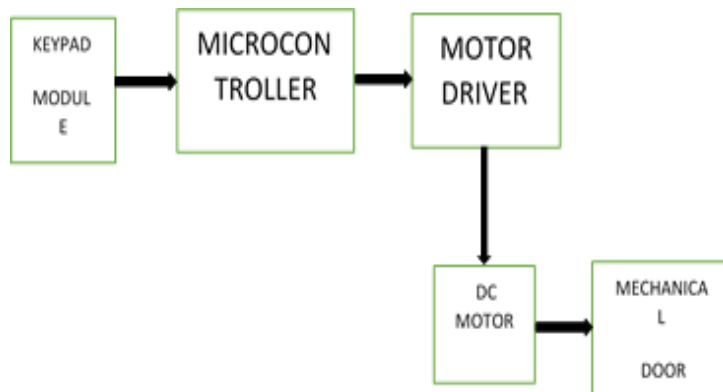

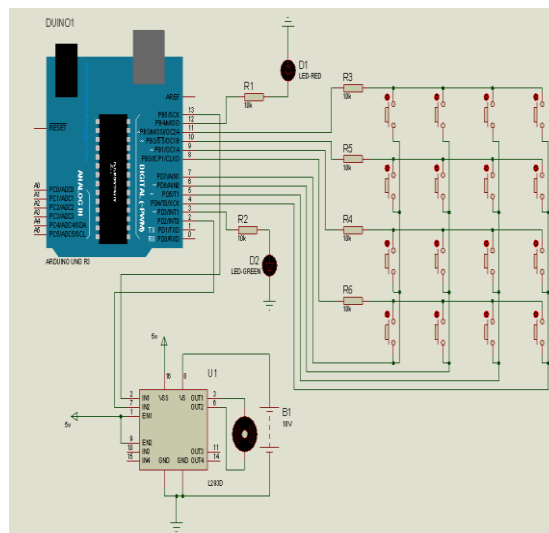**Figure2.** *Block diagram for the automated door lock system using Arduino Uno*

Figure3. *Circuit diagram for the automated door lock system*

After powering up the circuit, the door remains closed until the correct password is entered. When the password is entered, the door opens and remains opened for 30s (or as desired by the programmer), after which the door is closed again.

The automated door lock system specifications are as follows:

Table1. *Specifications.*

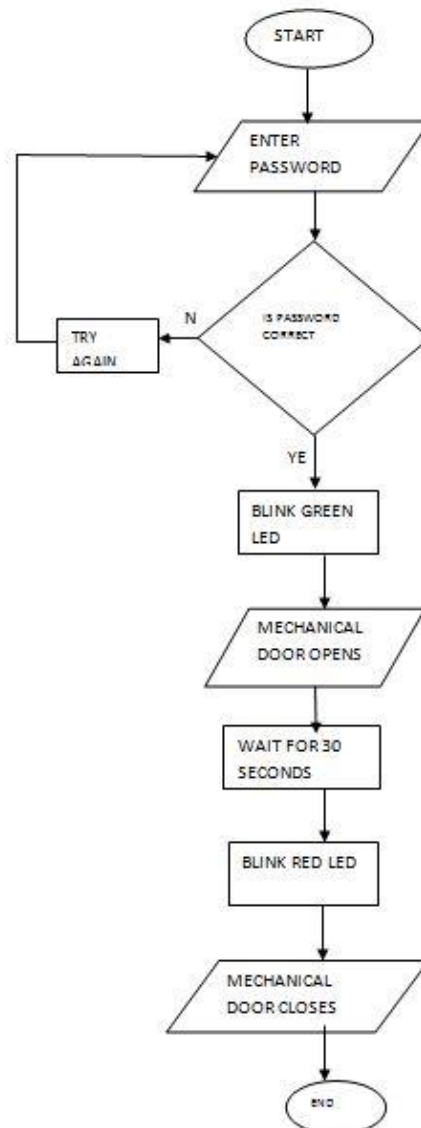| NAME	QUANTITY
Arduino Uno R3 microcontroller	1 pc
L293B H-Bridge IC	1 pc
9v Battery	3 pcs
9v Battery connector	3 pc
Resistors (1kΩ & 10kΩ)	6 pc
Jumper wires	5 yards
IC connector	1 pc
Switches	16 pcs
Glue	6 pcs
Veroboard	1 pc
Wood	1 pc
LED	2 pcs
Top Bond (Adhesive bond)	1 pc
DC Motor	1 pc

Figure4. *A 4x4 Keypad Module*

Figure5. *Circuit Flowchart*

LIMITATIONS

The major limitation of this system is its inability to automatically detect the presence of students outside the lecture hall when the door is closed.

As an improvement, motion sensors could be employed to implement this functionality.

Based on the motivation behind this project, this system could be applied as an access control mechanism in tertiary institutions like universities, polytechnics and the likes.

CONCLUSION

The use of the Arduino uno microcontroller in this project allows for design simplicity, hence, the project can be achieved in lesser time compared to other techniques previously employed.

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