Implementation of Automatic Door Opening System with Entry Counter for University Library

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The entry unit is outdoor equipped for the entry door while the exit unit is indoor equipped for the exit door. The PIR sensor senses the infrared energy produced by the human body from a considerable distance. This sensing signal is fed to a microcontroller to operate the door motor through motor driver.

Figure1.1. Block Diagram of Automatic Door Opening System with Entry Counter

ABSTRACT

Automation is the technology by which a procedure or process is performed with minimal human assistance. This paper presents the implementation of automatic door opening system with entry counter for university library. It can be used not only for automatic door opening but also for counting entry person. It consists of entry unit and exit unit. Each unit consists of Arduino Uno, PIR (Passive Infrared) sensor and LCD (Liquid Crystal Display). In entry unit, seven segment display is used as an entry counter to show the number of entry person. Welcome message and door condition are displayed on LCD. In exit unit, RTC (Real Time Clock) module shows a format of date and time on LCD. Quotes about library are also displayed on LCD.

KEYWORDS: Arduino Uno, PIR, LCD, RTC

1. INTRODUCTION
Automatic door opening system is used throughout the world. They are used in many places such as shopping malls, public buildings, airports, hospitals, theatres, etc. These systems are used to open the door when a person comes near to the entrance of the door and close after entered into the door. The automatic door opening system consists of sensing process, main controller circuit and motor. [7]

Fig.1.1 shows the system block diagram of the automatic door opening system with entry counter for university library room. In this system, the entry door and exit door are made to automatically open.

The entry unit is equipped at the entry door of library. If there is no further movement within the PIR operating range, the LCD shows welcome message. When a body approaches within the operating range of the sensor, it sends a logical command to open the door, the LCD show "Door Opened" and count the entry person. The counting result is shown on 7-segment display. And then the door automatically closes with a fixed time delay and the LCD show "Door Closed".

In the exit unit, the door is opened or closed by sensing PIR sensor. Real time format is shown on LCD according to RTC module. The quotes for library is also shown on LCD.

2. IMPLEMENTATION
The overall system can be divided into four different sections:
➢ Interfacing to PIR Sensor
➢ Interfacing to RTC module
➢ Interfacing to Counter
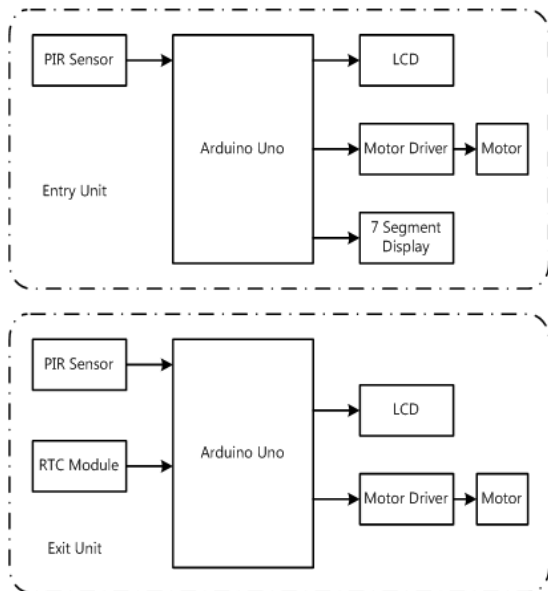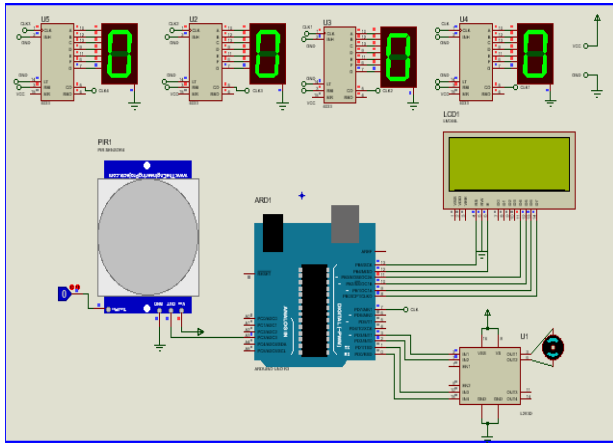➢ Interfacing to LCD
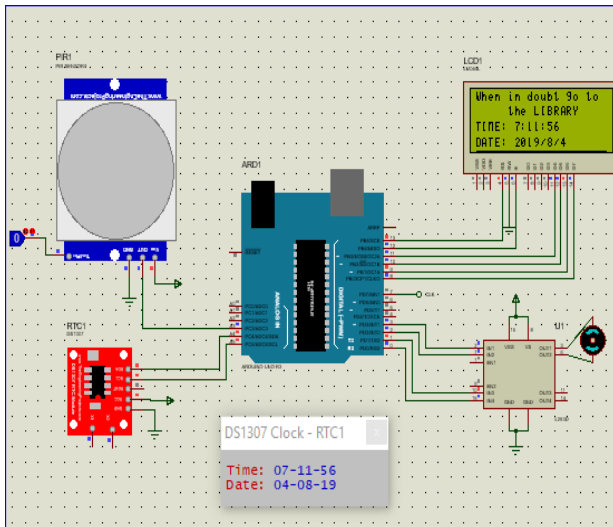➢ Interfacing to Motor Driver

Figure2.1 Entry Unit

Figure2.2 Exit Unit

The microcontroller (Arduino Uno) needs to receive supply power. Recommended power supply for Arduino Uno is from 7V to 12V. [1]

A PIR sensor is able to sense motion, and are often used to detect whether a human has moved into or out of the sensor's range about six meters. [8] The output pin of the PIR sensor is connected to pin 17 of Arduino Uno.

The DS1307 Real-time clock (RTC) counts seconds, minutes, hours, date of the month, day of the week, and year with leap-year compensation valid up to 2100. [9] The serial data (SDA) pin and serial clock (SCl) pin are connected directly to SDA and SCL pins of Arduino Uno.

CD4033 is a 5 stage Johnson decade counter which convert the Johnson code to 7-segment decoded output. Pin 5 is used to complete one cycle for every 10 clock input cycle and is connected to pin 7 of Arduino Uno.

A 20x4 LCD means it can display 20 characters per line and there are 4 such lines. [11] The data pins of LCD are connected to pin 8 to 11 of Arduino Uno.

L293D is a dual H-bridge motor driver IC that acts as a current amplifier to provide a higher-current signal. This higher current signal is used to drive the motors. [12] The input pins are connected to pin 0 and pin 1 of Arduino Uno.

3. SYSTEM DESCRIPTION
3.1 Hardware Requirements
- Arduino Uno
- PIR Sensor
- RTC Module
- LCD
- 7-segment Display
- Johnson Counter
- Motor Driver
- Motor
- 12V Power Supply for Arduino Uno and Motor Driver

3.2 Software Requirements
- Arduino Integrated Development Environment (IDE)
- Proteus Professional Software

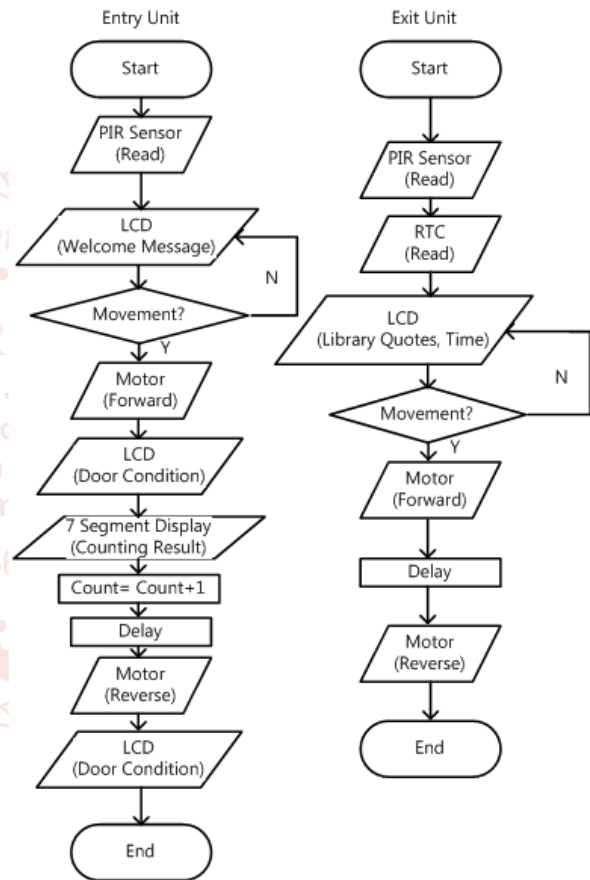### 3.3 SYSTEM FLOWCHART

Figure3.1. Flowchart of Automatic Door Opening System with Entry Counter

4. SIMULATION RESULTS AND DISSCUSSIONS
This section will discuss the simulation results of the automatic door opening system into two parts: entry unit results and exit unit results.

4.1 Entry Unit
There is no person in the PIR the sensor's range, only the welcome message will show on LCD as in Fig.4.1.

Figure4.1 Welcome Message on LCD

If a person approaches within the sensor operating area, the door will automatically open and the LCD will show the door opening condition as in Fig.4.2. After a fixed delay time, the door will automatically close and the LCD will show the door closing condition as in Fig.4.3. Fig 4.4 shows the counting result on 7-segment display for entering person.
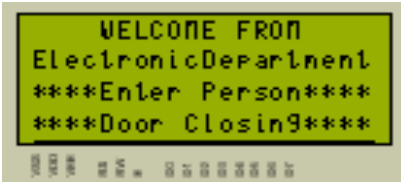

Figure4.2 Door Opened Condition Message on LCD

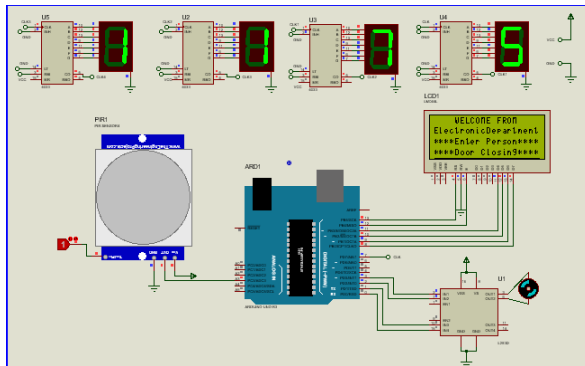**Figure4.3 Door Closed Condition Message on LCD**

Figure4.4 Counting Result

4.2 Exit Unit

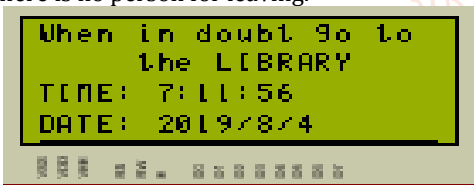The quotes for library and real time clock will show on LCD when there is no person for leaving.
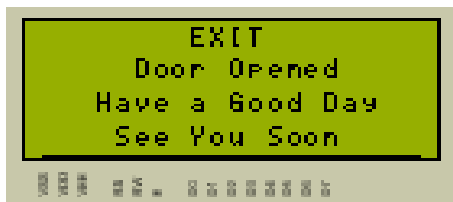

Figure4.4 Real Time Clock on LCD

Figure4.5 Door Opened Condition Goodbye Message
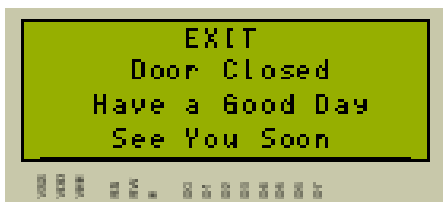

Figure4.6 Door Closed Condition and Goodbye Message

5. CONCLUSION

The Arduino based automatic door opening system with entry counter for university library was designed and simulated. To program the microcontroller, Arduino IDE was used. Proteus Professional software was used to simulate the design. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the system. In this way, the overall system has been successfully implemented.

6. ACKNOWLEDGEMENT

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