Automatic Door Sliding Control System

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ABSTRACT: ***Describes in this paper about "automatic door sliding machine control." The analysis of automatic door system offers practical advantages in the field of electrical and electronic engineering which cannot be ignored. In many Automatic door control system a better quality of life and convenience for all is automatically opened or closed. This device can be convenient for in and out, barrier-free busy parents with children traveling in arms with their suitcases, users of wheelchairs, people with walking aids and fully assembled shoppers. The automatic door sliding system can nowadays be used for high density areas such as hospitals, hotels / motels, shopping malls, airports, government buildings, apartment buildings, and office buildings. When someone enters in or out of the room in front of the sensors, the module circuit receives the signal and regulates the sliding of the door through the motor. These systems also generate an alarm whilst opening or closing the door. If this system's auto operation is wrong, or cannot function properly, it can also be manually operated. Automatic door sliding control device is developed and tested using 16F877 microcontroller Peripheral Interface Controller (PIC).***

KEYWORDS: ***Door Sliding System, DC Motor, Motor Driver, PIC, Convenience, Safety measures.***

INTRODUCTION

Worldwide, automatic door opening system is used. They are working in locations such as shopping malls, public buildings, airports, hospitals, theatres, and so on. These systems are used when a person comes in to open the door near the doorway, and close after entering the house. The automatic door opening feature, key controller, consists of sensing mechanism circuit, and the pump. Automatic doors are doors that open automatically when someone enters, and not need to be opened manually with a door handle or lock [1].

Automatic open and closed doors are driven, a door fitted with a spring to close is not an automatic door. Automatic door is the application of advanced sensor technology, computer programmable control for opening and closing a door automatic door system via the PLC and AC variable speed control system PLC power electro mechanical actuators. Automatic doors emerged in the 20th century, between 30 and 40 years, primarily used for military warehouses, an important fire factory, bulletproof and simple to open doors [2].

Automatic door designs are complex. Many slide open while others consist of panels that fold as people go in or out while some swing in or out like traditional doors. The doors are fitted with a motion sensor that can detect people when entering, and the sensor sensitivity can be changed as needed. Automatic doors are an enormous blessing for people in wheelchairs and other people with disabilities, because automatic doors can be very difficult to deal with. It may be difficult to open a traditional door while sitting in a wheelchair or, for example, walking with crutches, and traditional doors may pose a significant challenge for people with disabilities in their hands and arms. Automatic doors provide handicapped access to public premises.

These doors require electricity to work, with the motor driving electricity that opens the doors. Most automatic doors have a manual override, so that the doors can still be opened in case of a power failure or mechanical problem. Also, the doors are built to be immune to obstacles in the doorway, so they won't close on anyone or anything that happens to be in the middle of the door lane. Such safety measures ensure automatic doors in a variety of situations are safe [3].

Sliding door is a type of door that opens by sliding horizontally, whereby the door is either mounted on or suspended from a board. Sliding door forms include pocket doors, doors to the Arcadia and doors to bypass. Sliding doors are normally shower doors, glass doors, screen doors, wardrobes and the system can also be rendered and installed in school building, hall, auditorium, banks, shopping malls, various departmental buildings and can be extremely useful in a wide variety of environments.

Automation is the art of self-acting or self-moving systems or devices, it also refers to the technique of making a system, computer, process or method more completely automatic, it is a self-controlling or self-moving operation. Automation has evolved rapidly in the field of electrical, electronics and computing, from which it dates back to the 90's when the first computing machine was created. It has benefited humans as it basically reduces / eliminates human interference, of which automatic sliding door even makes the list of automation in the world of electrical computing.

AUTOMATIC SLIDING SYSTEM

Automatic sliding doors have flat panels with a number of configurations, which slide horizontally and linearly. As shown in Fig.1, the automatic sliding system consists of the sensing mechanism, main controller circuit and motor. The circuit module is used as the key controller for automatic door sliding system. Sensors are used to detect the person moving near the sliding doors. To achieve the appropriate location motors are used to rotate forward or backward direction. The module circuit has two activators (sensors): the first is outside the room and the second is inside the room. When the door is reached by the limit switches, it is either fully opened or closed. When the machine has a malfunction or an error in programming, it can be manually run. When a individual reaches outside the room in front of the activator, the operation starts.

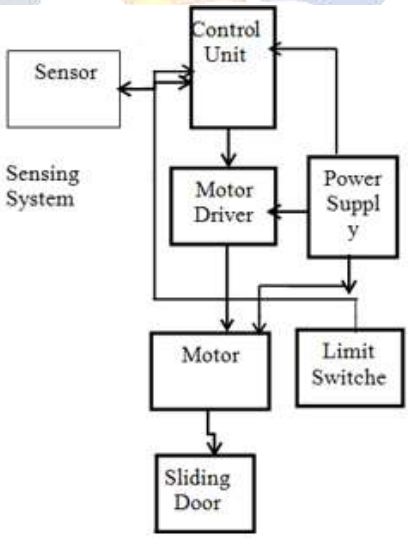

Fig.1: Block Diagram of Automatic Door Sliding System.

Sensors such as photodiode, phototransistor, light based resistor (LDR) that are detected to operate the control system are used for automatic sliding doors. Depending on the service, there are two types of sensors; activation sensor and protection sensor for the presence. Activation sensor opens the door on approach by a customer. Presence protection sensor senses interference, and if there is a pedestrian in the way, prevents the door opening or closing.

Limit Switch

A mechanical limit switch interlocks an electric circuit with a mechanical motion or location. The most common limit switch is the single-pole contact block with one contact set NO (normally Opened) and one NC (normally Closed). Limit switches are also available with time-delayed contact shift. Limit switches are typically used as input devices to indicate the presence or absence in a system or process being monitored and/or regulated of a specific condition. A limit switch is designed to detect when the element of a system has moved to a given location. Limit switches are commonly used in various industrial applications, and they are able to detect an article's motion cap. The limit switches are designed to track a mechanical part movement. In industrial control applications, limit switches are usually used to automatically track and show if the travel limits of a given system have been exceeded. The limit switch is located underneath the lifter in this study. When the limit switch underneath the table is pressed, the robot places the tray on the table and goes backwards when it hits the operator [4].

COMPONENTS USED

The main components of the system are:

- PIC Microcontroller,
- Sensor,
- Liquid Crystal Display,
- Motor
- Motor Driver,
- Power Supply

PIC 16F887 Microcontroller

PIC16F887 Microcontroller is an 8-bit microcontroller equipped with RSIC CPU technology, helping the microcontroller achieve maximum output with less power. It has a total of 40-pins and all of these pins come in different packages to address the limited and modern circuit requirements. Packages of 44 QFN pins and TQFP are also available. PIC16F887 provides the developers with all the current protocol and, due to its many pins, the most protocol can be followed simultaneously without affecting others. Owing to its various A / D channels and internal clock, the PIC has many uses with the industry and at commercial level [5].

The features of PIC 16F887 are:

- Program Memory (Flash) : 14 kB
- Architecture : 8 bit
- RAM : 368 byte
- EEPROM : 256 byte
- Pin : 40 (Pin I/O : 36)
- Max. CPU frequency : 20 MHz (5MIPS)
- Internal Oscillator : 8 MHz, 32 kHz
- 10-bit 14channel Analog-to-Digital(A/D) Converter
- 2 Analog Comparator modules

Parameter Name	Value
Program Memory Type	Flash
Program Memory (KB)	14
CPU Speed (MIPS)	5
RAM Bytes	368
Data EEPROM (bytes)	256
Digital Communication Peripherals	1-UART, 1-A/E/USART, 1-SPI, 1-I2C1-MSSP(SPI/I2C)
Capture/Compare/PWM Peripherals	1 CCP, 1 ECCP
Timers	2 x 8-bit, 1 x 16-bit
ADC	14 character, 10-bit
Comparators	2
Temperature Range (C)	-40 to 125
Operating Voltage Range (V)	2 to 5.5
Pin Count	40
Cap Touch Channels	11

Table 1: Key Features of the PIC 16F877.

Light Dependent Resistor

In the circuit design a simple light-dependent resistor (LDR) or photo-resistor is used. An LDR is an electronic component whose resistance diminishes as incident light intensity increases. This can also be referred to in Fig.10 as a light-dependent resistor or photoconductor. A photo-resistor is made of a semiconductor with high resistance. If light falls on the system of sufficiently high frequency, photons absorbed by the semiconductor give enough energy to the bound electrons to leap into the conductive band. The resulting free electrons conduct electricity, and thus that resistance [6].

Liquid Crystal Display

In this paper, to display different messages, the 16×2 LCD display is used. The LCD can be controlled in two separate modes,: 4-bit mode and 8-bit mode. In 8-bit mode, the LCD pins 7-14 are connected to eight microcontroller I/O pins; while in 4-bit mode, the LCD pins 11-14 are connected to four microcontroller I/O pins [7]. The benefit of working in 8-bit mode is that programming is much easier, so data can be changed faster. Saving four I / O pins on the PIC microcontroller is the obvious explanation for working in 4-bit mode [8].

No.	Name	Function
1	VSS	Ground
2	VDD	+ V Supply
3	VEE	Contrast
4	RS	Register Select
5	R/W	Read/Write
6	E	Enable
7	DB0	Data bit 0
8	DB1	Data bit 1
9	DB2	Data bit 2
10	DB3	Data bit 3
11	DB4	Data bit 4
12	DB5	Data bit 5
13	DB6	Data bit 6
14	DB7	Data bit 7
15	BL1	Backlight (V+)
16	BL2	Backlight (Ground)

Table 2: Input Outpu Pins Of LCD.

L293 Motor Driver

The L293 is an integrated monolithic circuit in a kit of 15-Multi Watt lead and Power SO20. It is a high voltage dual full-bridge driver with high current designed to accommodate regular TTL logic rates and drive inductive loads such as relays, solenoids, DC motors and moving motors. There are two activated inputs to make or disable the system independently of the input signals. The emitters of each bridge 's lower transistors are wired together, and the corresponding external terminal can be used for an external sensing resistor contact. There is an additional supply input to ensure the logic operates at lower voltage. The motor driver L293 is used in this paper to run the motor forward or reverse. Fig.12 displays the L293 Motor Driver pin relation [9].

Bridge Rectifier

Fixed voltage power supply is needed for getting fixed means no voltage fluctuation. The output of any circuit depends entirely on the input voltage supply and it should be a constant voltage regulator to regulate the voltage supply that maintains a constant supply. Here bridge rectifier is used to convert 220/230v AC power supply to 5/12v DC supply [10].

OPERATION OF AUTOMATIC DOOR ACCESS CONTROL SYSTEM

The operating mode is first selected before the system power is switched on. There are two choosing modes. They are: (1) Power Manual Mode, and (2) Auto Control Mode. Fig.14 displays the key Door Access Control Feature flowchart. In this circuit, the motor is stopped by two edge detector switches and two sensors are used to detect the human. Firstly, the program initializes door opening inputs , outputs, and variables. Upon activation of the 'Front Sensor' or 'Back Sensor' or both, the motor will run the forward direction to open the door. The door is automatically reclosed, as though both are not working during opening. The motor ceases when the switch is closed as 'Edge detector for door opening' (door is open position). The sensors will be detected to

the individual after the motor has stopped. When both sensors are not working, the engine resumes the door to close. As if to close the door the motor is going the opposite direction. The 'Edge detector switches' function to stop the engine. When 'Front Sensor' or 'Back Sensor' or both sensed someone at near, the door reopened automatically

Operation For Manual Control Mode

If the machine is not running, it can be controlled by manual mode. You should add the two way add to the manual. The manual control process flowchart is shown at Fig.16. When the user clicks the 'open' button to open the door, the motor will run in the direction of forward. When the door is completely opened the engine stops by pressing the 'stop' button. By pressing the 'close' push button switch the user may reclose the door. The motor runs in reverse direction when the user clicks the 'close' button. So then when the 'stop' button is pushed, the motor slows.

Opeartion Of Sensors

This paper uses LDR (Light Dependent Resistor) as sensors to sense the human. Light-dependent resistor also known as LDR, photo-resistor, photo-conductor, or photocell, is a resistor that increases or decreases its resistance depending on the light intensity brace. LDRs (Light Dependent Resistors) in a light / dark circuit are a very useful device. Automatic sliding door control device, sensors are usually used to detect the person. Sensors detect the individual as they walk towards the entrance. When opening about 2 m wide and 2.5 m height from the entrance, it should start sliding smoothly. Push 0.57 ms-1 over the screen. The door opens until the 'Edge Detector' is pushed. The sensor should be completely opened, and functioning. If no individuals are detected in the sensor area, the door will open again.

CONCLUSION

Many parts of the physical IC are located inside the PIC microcontroller. The sensors are used as input instruments for sensing and switches. Outputs in this system are both LCD monitor and motor operation. The circuit diagram is quite plain, and complexity is not present. The architecture of this device needs only knowledge of the microcontroller and the concept of programming. The door can be opened and closed with different part forms, such as the solenoid valve and the motor. DC motor driven by L293 Motor driver is used in this thesis article. L293 can control the DC motor drive with bidirectional control. Edge detection switches limit the motor on / off. Software program can control motor processes in the forward, reverse and stop processes. Details about the output is shown on the LCD display screen. Single slide door is designed using glass. The area of the door is 2 m,2.5 m. The door is driven by a motor with 100 W DC. The PIC 16F877 microcontroller is used to power these motors. The general functioning of the device and efficiency depends on the person entering through the door and how near he / she is to the door. The door is supposed to open automatically but in a situation where no power supply attempts to force the door open would damage the unit 's mechanical control system.

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