

# A Digital Automatic Sliding Door with a Room Light Control System

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**Abstract:** Automatic door is an automated moving barrier installed in the entrance of a room or building to trap access, supply ease of opening a door or provide visible privacy. As a result of boost urbanization and modernization, the human nature request more relief to his life. The man endeavor ways to do things readily and which saves time. So thus, the automatic gates are one of the examples that human nature concoct to bring comfort and facility in its daily life. To this end, we sample and design an automatic slip door with a room light control system to provide the aforesaid needs. This was completed by considering some factors such as frugality, availability of components and materials, adequacy, compatibility and portability and also firmness in the design process. The execution of the system after test met design features. This system works on the precept of breaking an infrared beam of light, realized by a photodiode. It consists of two transmitting diodes and two receiving photo-diodes. The first one is for someone incoming in and the second one is for someone stepping out of the room. The photodiodes are linked to comparators, which grant a lower output when the beam is broken and elevated output when transmitting. The general process of the work and performance is following on the existence of an intruder entering over the door and how close he/she is in closer to the door.

**Keywords:** Slide Door, Room light, Control System, Automation, Electronic Circuit Design

## 1. Introduction

Our contributions to the community are times uphold by personal experience consummated by knowledge of a certain domain of study. Electronics system revise, expand or supplement human facilities and ability to monitor, perceive, transfer, remember, calculate or reason. Electronic systems are classified as either analog or digital. Analog system change their signal output linearly with the input and can be performed on a scale by means of a pointer. On the other hand, digital equipments or circuits tackled their output as two separated levels („1“ or „0“) and could show their output in a digital display either alphabetically or numerically.

Automation is usually distinguished by two major basics: (1) mechanization, i.e. machines are self-adjusted so as to meet predetermined requirements (a simple example of self-adjust can be found in the process of a thermostatically controlled furnace); (2) continuous process, i.e. production facilities are joined together, thereby merge several separate elements of the produce process into a consolidated whole [4]. Automation in the electronics, electrical and computing world has developed rapidly of which it dates back to 1940 when the first electronics computing machine was advanced [1]. This has helped humans as it essentially reduces/eliminates human interference, of which automatically force light switching system also makes theroster of automation in the electro-computing world.

## 2. System Modeling and Design

This section will discuss the designing procedure and the requisite theory of components applied for this work. The section is further split into two sub-sections as component notion and system design and analysis.

## 2.1 Component Theory

In this sub-section, we characterize and explain the theory behind the components applied in this work ranging from their basic basics of operation to their implementation in this research work. The components utilized are: opto-devices, infrared emitters, transistors, photo diode, IC timers,

### 2.1.1. Opto-Devices

Opto-devices transform light energy from one form to another. They are applied for transmission of infrared rays, resurrection of light in diverse colors (i.e. LED's), sensing of light rays of several intensity (LDR's, photo-diodes and phototransistors), and for the transformation of light to different electrical amounts like voltage and frequency. The different opto-devices are displayed below.

#### 2.1.1.1. Infrared Emitters

An infrared emitter fully like the normal light emitting diode is mostly a junction diode from the semi-conductor material, phosphide, gallium, arsenid. The Infrared action and kind of rays is dependent on the kind of semi-conductor doping used. The infra-red type when supplied with suitable voltage and current, emits infrared rays at a presented wavelength. Typically the %mm LED emits infra-red of about( 150mA at a voltage of about 1.7V D.C) forward current. The symbol for the infra-red emitter is shown in Fig.1.



Figure 1: Infra-Red Emitter

### 2.1.1.2. Photo-diode

The photo diode consists of normal P-N junctions with a transparent window over which light can enter. A photo-diode is usually operated in reverse bias and seepage current increase in ratio to the amount of light incidence on the junction. This influence is due to the semi-conductor and generating electrons and holes. Photo-diodes find fulfillment in counter circuit, scanners, remote controls receivers" etc., the schematic symbol is shown in Fig 2.

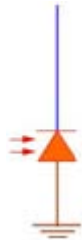


Figure 2: Schematic Symbol Photo-Diode

### 2.1.1.3. Transistors

Transistors are effective components used basically as switches and amplifiers. The two major types of transistors are. The bipolar transistors whose process depend on the flow of both majority and minority carriers, and the unipolar of field impact transistors in which current is due to plurality carriers only. The transistor works as a switch.

## 2.2. System Analysis and Design

### 2.2.1. Principle of Operation

This system action on the precept of breaking an infrared beam of light, realized by a photodiode. It consists of two transmitting diodes and receiving diodes. The first one is for someone arriving and the second one is for someone stepping out of the room. The photodiodes are linked to comparators, which award a low-output when the beam is broken and elevated output when transmitting normally. The depressed output of the comparator is utilized to trigger a mono-stable multi-vibrator, which is linked to a D-flip-flop, OR gates, AND gates, the counter and the display. The light would come ON, if the output of the up/down counter is not egalitarian to zero and OFF, if the output of the up/down counter return to zero, as the last person quit the room. The output of the comparators, also excite two timers simultaneously, but both have various time fixed. The first timer has a time fixed of 5S while the second timer has a time fixed of 10Secs. When the timers are excited by breaking the beam, the first timer drives the transistor switch that govern the opening of the door. Hence, the door unlocks in 5 Seconds. The output of the timer is fed to an only OR gate which the input into the gate is the same logic, but after the first 5Seconds, the output of the first timer is depressed, and the output of the second is yet high because it has a time fixed of 10 seconds, so the EX-OR gate switches other relay that shuts the door for 5 seconds. The door is closed by reverse the polarity of the supply to the motor. Hence the same sensors are utilized to switch the lights ON and OFF, open and close the door automatically

## 3. System Construction, Testing and Discussions

### 3.1. Construction

The construction of this system is in 2 stages, the soldering of the ingredient and the conjugation of the complete system to the envelope. The power supply stage was primarily united, and then the receiver and transmitter stage and all the other stages were united.. Each one was tested using the multi-meter to make assured that it is working duly before the next stage is done. This help to reveal mistakes and faults easily. The second stage of the system building is the casing of the soldered circuit. This system was cased in a transparent plastic glass, this makes the system look appealing, and it helps in marketing the project because the circuit has to be catchy before someone would care to know what it does. The casing has special puncture to warranty the system is not overheating.

### 3.2. Testing

The physical investigation of the system is very vital. This is where the imagination of the whole idea meets truth. After carrying out all the paper analysis, the project was perform and tested to guarantee its working ability, and was finally formed to face desired specifications. The operation of testing and application involved the use of some tools such as digital multi-meter, Oscilloscope, signal generators. The digital multi-meter basically measurement voltages, resistance, current, frequency, continuity, temperature, and transistor. The process of enforcement of the design on the board desired the measurement of parameters like, continuity, voltages, and resistance values of the components and in some statuses frequency measurement. The digital multi-meter was applied to check the diverse voltage go down at all stages in the system and most importantly the infra-red receiver stage, to help check the references in the comparator circuit. The multi-meter was utilized for troubleshooting the welding and conjugation. The oscilloscope was used to observe the behaviors of the oscillators and also in test the reliability of the input and output voltages at each stage. In some cases, weapplied the signal generators to test the flow of signals before insert the real signals produced from part of the system designed. We also employ the oscilloscope to check for the results produced by the oscillators. The Transmitter pulses the infra-red LED with a waveform from with the output voltage.

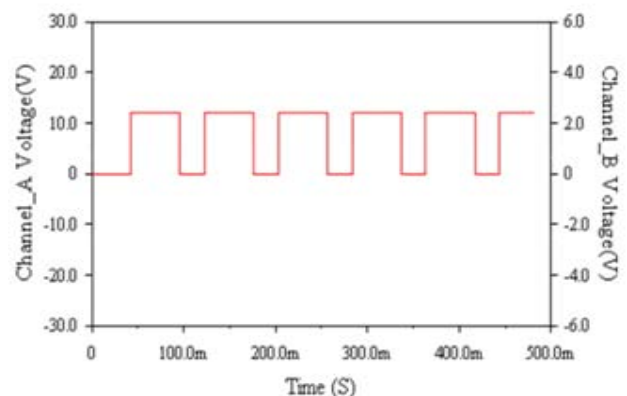


Figure 3: Waveform generated

### 3.3 Implementation

The fulfillment of this system was finished on the breadboard. The power supply derived from the bench power supply in the university laboratory to emphasize the work capability of the circuit before the power supply stage was welded. Stage by stage testing was done appropriate to the block clarification on the breadboard, before soldering of circuit start on the Vero board. The diverse circuits and stages were united in tandem to face desired workability of the system. This system was using plastic glass. The covering material being plastic glass is prepared with special perforation and slots to guarantee the system is not overheating and to hand ecstatic value. The transceiver part of the system excluding the mechanical part is as shown in fig.6 below. The electronic circuit on the Vero board was securely screwed to the inside base of the case. Finally, the, output LEDs, power switch, transmitter and receiver were put in their slots. This is what the completed work looks like:-

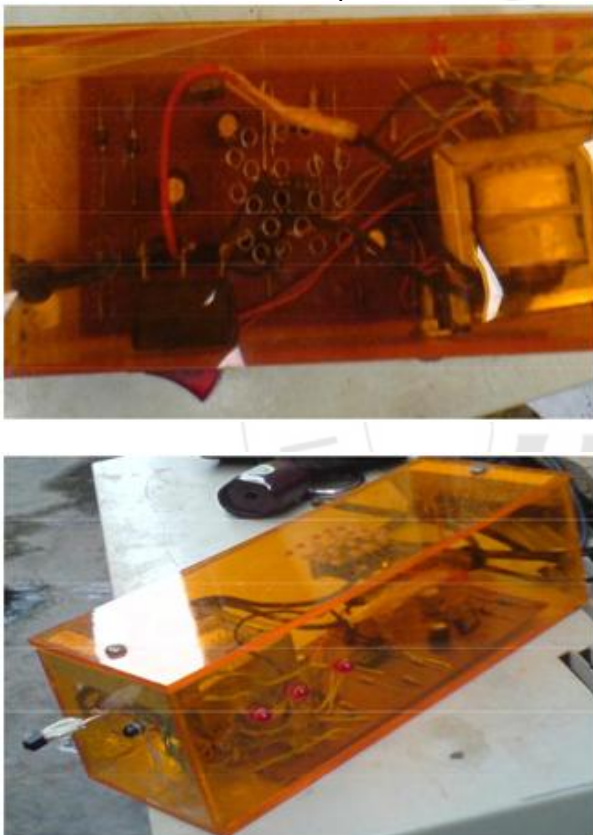


Figure 4: Real-time implementation of the system

### 4. Conclusions

The system which is the design of an automatic sliding door was designed considering some features such as frugality, availability of ingredients and research materials, compatibility, efficiency, portability and also durability. The rendering of the system after test met design features. The general operation of the system is dependent on the existence of the person coming through the door and how closer he/she is to the door. The door is intended to open automatically but in a case where there is no power supply trying to force the door open would drop the mechanical control system of the unit. Also the process is dependent on how well the soldering

is done, and the position of the components on the Vero board. The IC's were welded away from the power supply stage to prohibit heat radiation which, might happen and affect the performance of the entire system. The construction was done in such a way that it makes upkeep and repairs an easy task and cheap for the user should there be any system inactivity all components were welded on one Vero-board which makes troubleshooting easier.

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