Smart Office during Post Covid-19 World

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Abstract : Automatic door is an automated movable barrier installed in the entry of a room or building to restrict access, provide ease of opening a door or provide visual privacy. As a result of enhanced civilization and modernization, the human nature demands more comfort to his life. The man seeks ways to do things easily and which saves time. So thus, the automatic gates are one of the examples that human nature invent to bring comfort and ease in its daily life. To this end, we model and design an automatic sliding door with a room light control system to provide the mentioned needs. This was achieved by considering some factors such as economy, availability of components and research materials, efficiency, compatibility and portability and also durability in the design process. The performance of the system after test met design specifications. This system works on the principle of breaking an infrared beam of light, sensed by a photodiode. It consists of two transmitting infrared diodes and two receiving photodiodes. The first one is for someone coming in and the second one is for someone going out of the room. The photodiodes are connected to comparators, which give a lower output when the beam is broken and high output when transmitting normally. The general operation of the work and performance is dependent on the presence of an intruder entering through the door and how close he/she is in closer to the door. The door is meant to open automatically but in a case where there is no power supply trying to force the door open would damage the mechanical control system of the unit. The overall work was implemented with a constructed work, tested working and perfectly functional.

I.INTRODUCTION

Our contributions to the society are times fueled by personal experience complemented by knowledge of a particular field of study. Electronics system refines, extend or supplement human facilities and ability to observe, perceive, communicate, 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 represented on a scale by means of a pointer. On the other hand, digital instruments or circuits represent their output as two discrete levels ('1' or '0') and could show their output in a digital display either numerically or alphabetically. The need for automation has come to stay and this date back to 1500 years when the first water pump for metal working rolling mills for coinage strips was developed [1] from then till date the automation world has continued to grow tremendously. Automation is the art of making processes or machines self-acting or self-moving, it also pertains to the technique of making a device, machine, process or procedure more fully automatic, it is a self-controlling or selfmoving processes [2, 3]. Automation is usually characterized by two major principles: (1) mechanization, i.e. machines are self-regulated so as to meet predetermined requirements (a simple example of self-regulation can be found in the operation of a thermostatically controlled furnace); (2) continuous process, i.e. production facilities are linked together, thereby integrating several separate elements of the production process into a unified whole [4]. Automation in the electrical, electronics and computing world has grown rapidly of which it dates back to 1940 when the first electronics computing machine was developed [1]. This has aided humans as it basically reduces/eliminates human intervention, of which automatic light switching system also makes the list of automation in the electro-computing world. Switch which is one part of this work may be the most ubiquitous mechanical devices in our technological society. Most every machine needs to be turned on or turned off at some point, and that's typically done by activating a switch. There are an incredible variety of switches. The most basic electrical switch completes or breaks a circuit depending upon what position it is in. Back in time we recall constructing science systems or experiments that required us to build a small electrical circuit that included a battery and a flashlight bulb. When the simple switch was moved, it completed the circuit and the

bulb would glow. More complex switches work in the same basic manner. In addition to turning the machines on, they can change the speed of the motor or the strength of the lighting. Some switches work automatically, incorporating a tiny microprocessor that turns the machine on (or off) according to preset instructions. An example of a low-tech (pre-digital age) automatic switch is the thermostat used to maintain a set temperature in a home or building. These switches used a small glass vial containing a drop of mercury. When the temperature indicator moved beyond a certain level, the drop of mercury would move into contact with metal contact points that extended into the glass vial. Being a metal itself, the liquid mercury would complete the circuit and activate the furnace or air conditioner (as the case may be). Mercury switches are used rarely nowadays, and they should be disposed of using hazardous waste protocols due to the high toxicity of metallic mercury in the environment [5]. Another example of a switch that works automatically but a high tech one is an automatic room lighting system, which ranges from sound automatic room light system, infrared automatic room light system, temperature automatic room light system in addition to the basic principle stated above, the principle behind these automatic room light system is that the light turns ON and OFF automatically which is sensor dependent. For this system design, the principle behind this is that when a person enters a room, a light sensor placed at a particular location gets a pulse and the light comes ON and when the person goes out, the same sensor gets another pulse and the light goes OFF. The room light controller has a lot of domestic applications and besides, power is seriously conserved when using the unit since the light in the room is automatically switched off when nobody is in the room. The same opto-sensing stage is used to sense when someone enters or leaves the room. The sensors control the mono-stable multivibrator whose output activates the counter and comparator unit and switches ON the lights once there is any count, and OFF when the total count is zero (since the counter counts one place down for every person leaving the room) and one placed up when someone enters the room. The other part of this work which is the automatic sliding door operates basically in conjunction with the automatic light switch of which it uses a motor for the sliding. The sliding of the door occurs when the same sensors placed at a particular location of the door is broken. A motor is incorporated to drive the system on breakage of a pulse at the receiving end. The mechanical arrangement of the door is done such that the door slides open with the control of D.C motor and metal bearing mechanism automatically upon detection of somebody approaching the door when the beam is broken. This system has both financial and security benefits. (1) Financial savings: By setting lights to come on only at certain times, you can reduce utility bills, and (2) Security: With this kind of device, you can link lights to a timer so they come on when it gets dark. You'll never have to return home to a dark house. One basic limitation of this device is that it encounters the problem that when more than one person enters the room one after the other the light sensors get more than one pulse and the light remains in the OFF state. This research comprises both analog circuits and digital circuits. The opto sensing stage is an infrared transceiver at the base of the door which has a projected infra-red receiver on the opposite side of the door. The projected beam is broken by anybody entering the door. Once broken the infra-red receiver stage gives an output which triggers the two monostable multivibrators. Monostable (A) has a time constant of 20s and monostable (B), 10s. The output of both monostable goes to the input of an Exclusive-OR gate which allows only one relay to be active. Hence, enable timing of the motor in different directions, since opposite polarity voltage are furnished to the motor at different times, to open and close and door via a mechanical metal and bearing system. The application of this system cannot be overemphasized. Optical interruption, electronic timing functions and relay circuits, logic control (since the movement of the door is controlled logically and in particular directions). The system has both security application and luxury, since it is more comfortable and easy if the opening and closing of the door and switching of the room lights are done automatically. The system could be done and implemented in the building of school, hall, auditorium, banks, shopping malls and various departmental buildings.

II. PROJECT CONCEPT

This project idea is very simple and easy to construct. The main parts of this project are Microcontroller, Motion Sensor and motor driver IC. Where the microcontroller is the main controller that will be used to control the whole system[1]. The Motion sensor is able to sense the infrared energy produced by the human body. For this reason in this project is used to detect human movement. The motor driver IC is used to control the DC motor. This system works like that when someone comes in front of the door (Motion Sensor), then the Motion sensor detects a movement and produces high output[2]. Microcontroller read that output and send commands to the L298N motor driver IC to open the door by controlling the DC motor. When nobody is present in front of the door, the Motion sensor doesn't detect any motion and produces high output. Again the Microcontroller read this that output and sends commands to the L298N motor driver IC to close the door by controlling the DC motor[3]. The idea of using infrared signals to establish routes in communication networks between receivers and transmitters for the purpose of convenience, safety and guarantee of service is not new, but the application, cost, design method and reliability of the system varies. In [6], home automation systems as multiple agent Systems (MAS) were considered. In their work, home

automation system was proposed that included home appliances and devices that are controlled and maintained in home management. Their major contribution to knowledge was to improve home automation, but not minding the cost of the entire system. In a related work, [1, 2], in their paper also proposed an Internet Based Wireless Home Automation System for Multifunctional Devices. They proposed a low cost and flexible webbased solution but this system has some limitations such as the range and power failure. In [2, 3], problems with the implementation of home automation systems were considered. Furthermore the possible solutions were devised through various network technologies. Several issues affecting home automation systems such as lack of robustness, compatibility issue and acceptability among older and disabled people were also discussed. Besides, much were treated in papers by Zungeru et al. [6, 7, 8] which consider the use of infrared rays to count the number of passengers in a car and also remotely control home appliances via short message services.

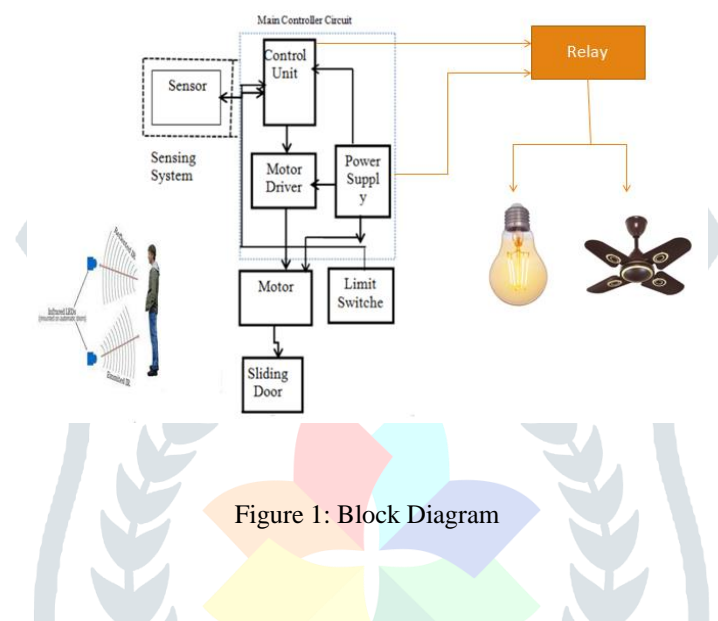## III. SYSTEM MODELLING AND DESIGN

Figure 1: Block Diagram

Generally, the human body emits infrared energy. When a human body comes in the detection range of the motion sensor then it detects the infrared energy of the human body and gives High output (+5v) from the output pin. When it doesn't detect the infrared energy of the human body, then it gives Low output (0) from the output pin. In this way, the motion sensor detects motion and produces output[4].

Figure 2: Output Model

In this mechanical sliding door opening and closing system, the motion sensor is placed at the top of the entrance. When a person comes in the range of motion Sensor, then the motion sensor detects the movement of that person and its Data OUT Pin will become HIGH (+5). Then the digital Microcontroller read this HIGH output and it understands that there is a person approaching the door. Then the digital pin of Microcontroller become High (+5) and Low (0) respectively that immediately activates the L298N Motor Driver module to start rotating the DC motor at one direction and the door opens. At the same time, Green LED (LED1) starts glowing that indicating the door is open[5]. After some time (about 5 seconds in this project), the digital pin of Microcontroller become Low (0) and High (+5) respectively, which will once again activate the L298N Motor Driver module to start rotating the DC motor in another direction. Now the door will close automatically. This time, Green LED (LED1) becomes turned off and Red LED (LED2) starts glowing, which indicates the door is closed[6].

IV. Conclusion

This system which is the plan and building of a computerised sliding door using motion sensor was designed considering some factors such as economy, availability of workings and research materials, efficiency, compatibility, portability and also durability. The presentation of the system after test met design specifications. The general process of this scheme and performance is dependent on the presence of the person entering through the door and how closer he/she is to the door.

VII. REFERENCES

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