UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF AUTOMATIC DOOR WITH COUNTER
USING ARDUINO

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia
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by

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ABSTRAK

Pada masa kini, terdapat banyak bangunan dan pejabat yang mempunyai ramai pekerja. Tetapi kadang-kadang majikan tidak mempunyai bilangan tertentu seseorang di pejabat. Pada asasnya, pejabat dan bangunan mempunyai bilangan pelawat yang ramai. Biasanya, dalam senario ini, sistem pintu automatik dengan cara-cara mengesan orang yang diterima supaya membuka pintu seperti yang dikehendaki, dengan itu reka bentuk dan prinsip operasi pintu automatik pengawal mikro berasaskan dengan bilangan pelawat. Reka bentuk yang diperbuat daripada pengesan yang mengesan kehadiran manusia dan unit paparan dinamik yang memaparkan mesej yang berbeza pada masa yang tertentu untuk mengelakkan keadaan yang tidak dijangka yang perlu untuk mengosongkan bangunan seperti gempa bumi dan kebakaran. Projek ini adalah lebih dipercayai dan menjimatkan kerana ia menggunakan pengesan yang mudah untuk bertindak sebagai suis dan pembilang. Pengesan ini akan dipasang di tepi pintu. Apabila pengesan mendapat isyarat, pintu akan terbuka secara automatik dan mula mengira apabila orang yang berjalan melalui pintu. Bilangan sebenar orang masuk melalui pintu akan menghantar terus melalui penghubung tanpa wayar kepada pasukan pengawal keselamatan.

ABSTRACT

Nowadays, there are many buildings and office that has many workers. But sometimes the employer doesn't have a specific number of a person in the office. Basically, office and building have the mass number of visitors. Usually, in this kind of scenario, an automatic door system with a means of detecting incoming people so as to open the door as required, thus the design and operational principles of a microcontroller based automatic door with visitor counter. The design is made of sensors that detect human presence and a dynamic display unit that displays different messages at a specific time to avoid the unexpectable situation that need to evacuate the building such as earthquake and fire building. This project is more reliable and economical because it uses simple sensors to act as a switch and counter. The sensor will mount on the side of the door. When its sense human presence, the door will open automatically and begin to count when the person walk through the door. The exact number of the people enters through the door will send directly via wireless to the security outpost.

DEDICATION

Special dedicated to

My beloved father and mother,

To my family, lecturers and friends.

Thanks for all the encouragement and supports.

ACKNOWLEDGEMENT

First, and foremost, I would like to express my sincere gratitude to my supervisor En AB Wafi Bin AB Aziz for his support during my research, for his patience, motivation, enthusiasm and immense knowledge. His guidance helped me in all the time during the research and writing of this thesis and for his guidance on working in the lab as well as his suggestions and comments. I would like to thank my fellow friends for the discussion, help and support. Last but not least, I would like to express my sincere thanks to my family, my parents, for giving spiritually and unconditionally supports throughout my life and my studies.

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1.0   Project Background

Nowadays, there are many buildings and office that has many workers. But sometimes the employer doesn't have a specific number of a person in the office. Basically, office and building have the mass number of visitors. Usually, in this kind of scenario, an automatic door system with a means of detecting incoming people so as to open the door as required, thus the design and operational principles of a microcontroller based automatic door with visitor counter. The design is made of sensors that detect human presence and a dynamic display unit that displays different messages at a specific time to avoid the unexpectable situation that need to evacuate the building such as earthquake and fire building. This project is more reliable and economical because it uses simple sensors to act as a switch and counter. The sensor will mount on the side of the door. When its sense human presence, the door will open automatically and begin to count when the person walk through the door. The exact number of the people enters through the door will send directly via wireless to the security outpost.

1.1   Problem Statement

Many office and building employer don't know the exact number of people in their office. This is unacceptable because when the building is too crowded without security know the exact value of the person in the office and building, it will become

dangerous. When disaster happens rescuer doesn't know if there is victim still in the building or not. Basically, when the building on fire, a firefighter will calculate the number of victims and trapped victim in the building. But if the exact number of victim unknown, it's hard to do a rescue.

1.2 Project Scope and Limitations

(a) The scope of this project to focus on office and building.

The office and small building take as an example because it uses small requirement for this system

(b) 2 entrances

The person will enter or out use different door. It will easier for system to count the exact value of person in the building.

(c) Develop a prototype.

The prototype of the system will build exactly based on the requirement for office and small building.

(d) Test the accuracy of the system

This system will only count the presence of the people that walk through the door. The system will count as 1 per person enters.

CHAPTER 2
LITERATURE REVIEW

2.0 Introduction

Automatic door is an automated versatile obstruction introduced in the section of a room or working to confine access, give simplicity of opening a door or give visual security. As a consequence of improved development and modernization, the human instinct requests more solace to his life. As the outcome, human looks for approaches to do things effortlessly and which saves time. So subsequently, the automatic door are one of the illustrations that human instinct imagine to get solace and facilitate its everyday life (Zungeru & Abraham-Attah 2013).

Automatic doors are the doors that close or open automatically and regularly utilized for entrance and exits. There are diverse sorts of automatic doors. Some sort of automatic doors are actuated by a catch which comes about the doors to open. These kind of doors is utilized as a part of mechanical, used in industry. Automatic door started in the twentieth century, 30 to 40 years, which was predominantly utilized for military distribution center, an imperative plant for the discharge, bullet proof and simple to open the door (David, 2005; Conte and Scaradozzi, 2003).

The doors automatically open when a human enter or leave due to sensors incorporated into the doors. So the sensor detects the movement of the individual and the door will be automatically opened. Not with standing, the sensors power is required to work the automatic doors. Microcontroller based system door control with individual

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counter was expected to actually open the door automatically when somebody approaches the door without the prerequisite for any switch, catch or handle. The structure in like manner has a module that serves as individual counter and in light of current circumstances, incorporate the amount of entries and out of the building (Shoewu & Olatinwo, 2011).

Mechanization in the electrical, hardware and registering world has become quickly of which it goes back to 1940 when the main gadgets figuring machine was produced. This has helped people as it essentially lessens or disposes of human mediation, of which automatic sliding door likewise makes the rundown of mechanization in the electro-processing world (Kelechi et al, 2014).

2.1   Automatic Door

There are different types of automatic doors these days:

(a) Automatic swinging door.
(b) Automatic telescopic door.
(c) Revolving automatic door.
(d) Automatic parking barrier.
(e) Automatic balanced door.

2.1.1   Automatic Swinging Door

A swing-door administrator is a device that works a swing door for people on foot use. It opens or close the door automatically, holds up, then closes it.

Figure 2.1: Automatic Swinging Door

2.1.2 Revolving Automatic Door

A spinning door commonly comprises of three or four doors that hold tight a focal shaft and turn around a vertical pivot inside around and hollow fenced in area. Rotating doors are virtually proficient as they anticipate drafts (by means of going about as an airtight chamber), in this manner avoiding increments in the warming or cooling required for the building. In the meantime, spinning doors permit huge quantities of individuals to go in and out.
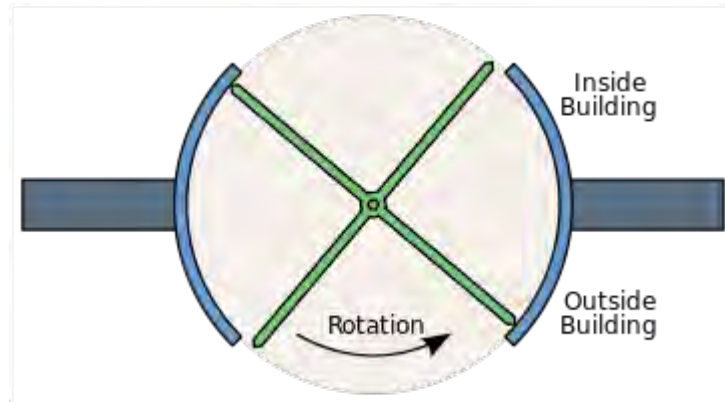
Figure 2.2 Revolving door from above

Rotating doors can likewise be utilized as security gadgets to confine section to a solitary individual at once if the dividing between the doors is sufficiently little. This is rather than an ordinary door which permits a second individual to effortlessly "rear end" an approved individual. Great security can require shot confirmation glass.

In some cases a rotating door is intended for the one-way activity. A case is the now-basic utilization in air terminals to keep a man from bypassing airplane terminal security checkpoints by entering the way out. Such doors are planned with a brake that is actuated by a sensor if somebody enter from the off base side. The door likewise spins in reverse to allow that individual to exit, while additionally telling security of the endeavor.

Entryway exit-just doors are likewise regularly utilized as a part of trams and other quick travel offices to keep individuals from bypassing admission installment. They are also utilized everywhere wears stadiums, amusement parks, and other such venues, to permit people on foot to exit unreservedly, yet not to enter without paying confirmation charges.

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2.1.3   Automatic Parking Barrier

Automatic parking barrier is a bar, or post turned to permit the blast to square vehicular access through a controlled point. Normally the tip of a blast door ascends in a vertical circular segment to a close vertical position. Automatic parking barrier are regularly counterweighted, so the post is effortlessly tipped. Blast doors are regularly combined either end to end, or counterbalance fittingly to piece movement in both bearings.

Figure 2.3 Automatic Parking Barrier

Some automatic parking barrier additionally have a second arm which hangs 300 to 400 mm beneath the upper arm when brought down, to expand approach perceivability, and which holds tight connections so it lies level with the fundamental blast as the boundary is raised. A few boundaries additionally highlight a turn generally most of the way, where as the obstruction is raised, the furthest half stays even, with the hindrance looking like a upside-down L when raised.

2.1.3.1   Operation of automatic boom barrier

An Automatic boom barrier can be operated through:

(a)   Push Button

(b)   Remote Control

(c)   RFID Tags / RFID Reader

(d)   Loop Detectors

(e)   Any third party access control device

2.1.4   Automatic Sliding Door

The sliding door is a standard kind of door which utilizes worldwide for an automatic door, whereby the door is either mounted on or suspended from a track. Sliding doors are regularly glass doors and the framework should likewise be possible and executed in the building .Hence, they can be to a great degree helpful in a wide assortment of situations. Mechanization is the craft of making procedures or machines self-acting or self-moving, it likewise relates to the strategy of making a gadget, machine, procedure or method all the more completely automatic, it is a self-controlling or self-moving procedures. A variety of methods are available for detecting the presence of a person within the open doorway.

Photo beams - A photo beam presence detector contains one or more light beam sources and a corresponding set of receivers. The light wavelength may fall within the visible spectrum, or outside it, typically in the infrared. The light beams are directed across the door opening toward the receivers mounted on the

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opposite jamb and/or guard rail. A presence detection signal is generated whenever an object breaks any one, or several, of the light paths between a source and receiver. In the past, this scheme was referred to as an "Electric Eye."

Figure 2.4 Photo   beam Sensor

Ultrasonic - A ultrasonic sensor uses a transducer that delivers an electrical yield in light of got ultrasonic vitality. A ultrasonic sensor is utilized as a hindrance recognition sensor for recognizing impediment by transmitting and getting a ultrasonic wave.

A commonplace ultrasonic sensor is intended to emit a ultrasonic pulse toward an item to be distinguished to get a thought about wave, which is mirrored the article, to quantify a timeframe from the ultrasonic pulse radiating time to the reflected wave getting time to identify the article.

A ultrasonic sensor involves no less than one ultrasonic transducer which changes electrical vitality into sound and, in converse, sound into electrical vitality. The ultrasonic sensor has a piezoelectric vibrator; the piezoelectric vibrator vibrates to transmit a ultrasonic wave and gets a reflected wave from a obstacle, so that an obstacle can be identified. The uncertainty contribution due to the constant can be made

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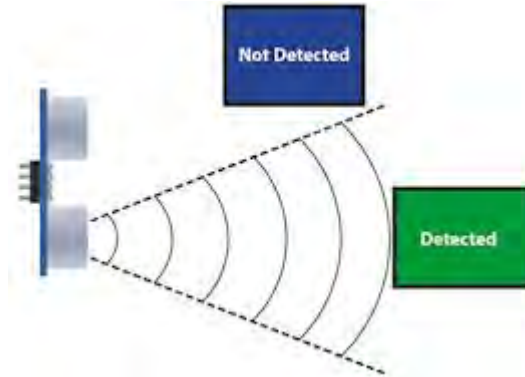negligible by means of a sensor calibration after mounting the measuring head (Carullo & Parvis, 2001).
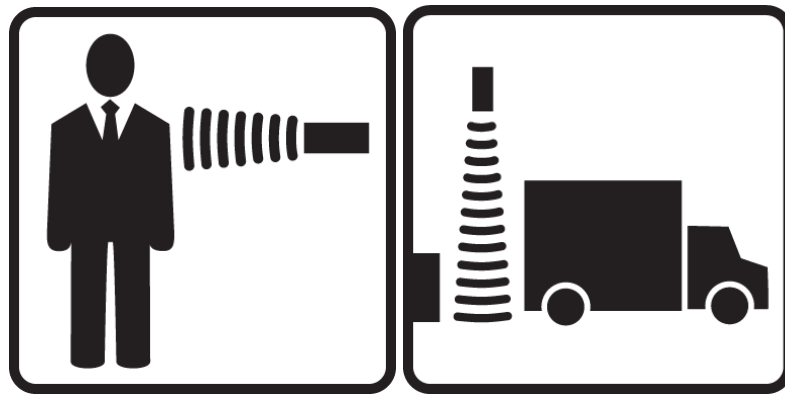

Figure 2.5: Ultrasonic detection

Figure 2.6: Example usage of ultrasonic sensor. It acts as warning and people detection

2.2   Counter

There is such a large number of techniques for automatic door around the globe. It likewise has numerous approaches to trigger the programmed entryway. The counter for the quantity of individual who enter a door is required for the business reason, for example, checking the confirmation number of presentations or shops, or the security reason to deal with the quantities of individual in PC rooms, information rooms, safes

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and so on. Yet, it is checked by individuals or via automatic counters (Jin Nakamura,Yutaka Tomita, 2000).

A door operator may be triggered in various ways:

(a) Approach sensor (such as radar sensor) – the door opens when a user approaches it.
(b) Push button – the door opens when a button is pressed.
(c) Push & go – the door opens fully when the user begins opening it.
(d) Access control – the door opens when an access control system determines the user is authorized to go through.

A trigger from any of the above solicitations that the door is opened. The administrator will regard cap asks for simply after it can do as such securely for whatever other clients in the area.

There are three methods by which an automatic door is activated.
A sensor detects traffic is approaching. Sensors for automatic doors are generally:

(a) A pressure sensor - e.g., a floor mat which responds to the pressure of somebody remaining on it.
(b) An infrared curtain or beam which shines invisible light onto sensors; if someone or something blocks the beam the door will be open.
(c) A motion sensor which uses low-power microwave radar for the same purpose.
(d) An electronic sensor (e.g. based on infrared or radio waves) can be triggered by something that someone carries, or is installed inside a vehicle. These are popular for garage doors.

A switch is worked manually, maybe after security checks. This can be a push button switch or a swipe card. The user pushes, or pulls the door, once the door identifies the movement, it finishes the open and close cycle. These are otherwise called power-assisted doors.

In addition to actuation sensors, automatic doors are generally large fitted with security sensors. These are typically an infrared shade or shaft, but can be a pressure mat fitted on the swing side of the door. The motivation behind the wellbeing sensor is to keep the door from opening or moderate its pace if an item is identified in its way while opening and to keep the door shutting or reactivate it if an object is detected in its path.

Ordinary automatic sliding door system are automatically operable because of different sensor setups for starting an opening sequence or in response to command from operation starting gadgets, for example, a push plate, a card reader or a mat. Two methodology sensors are situated for scope at every side of the sliding door, and a limit or safety sensor covers the edge range in which the moving door boards travel. The methodology sensors are ordinarily microwave field bending gadgets or detached infra-red movement detecting gadgets. The limit sensors are expectedly presence detecting gadgets, for example, infra-red through-beams (Shoewu & Olatinwo, 2011).

2.2.1   Infrared Sensor

An infrared sensor is made out of a transmitter and a receiver. The mono stable trigger is associated to the receiver. The synchronous counter need to associate with the mono stable trigger while the decoder is associated with the synchronous counter. Through modulation of a receiver circuit, the electric gives input to the trigger. At the point when the electrical sign of the receiver changing, the trigger inputs a pulse signal to the counter. As indicated by the

counter, the high edge of the pulse prompts bit carrying of the counter (Nhivekar & Mudholkar, 2011).

For this project sliding door type is used because it not to complex. The sliding door will mount with ultrasonic as a door opener and infrared sensor as a counter.
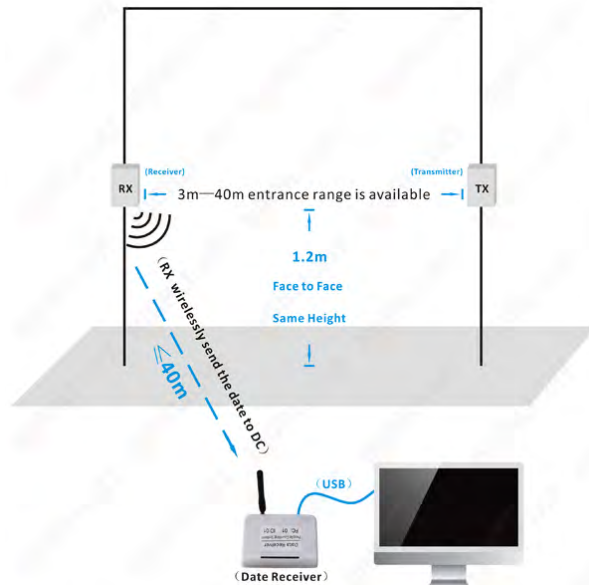

Figure 2.7: The infrared sensor will act as counter

2.2.2   Proximity Sensor

A proximity sensor is a sensor ready to distinguish the presence of object with no physical contact.

It frequently transmits an electromagnetic field or a light beam (infrared, for occasion), and searches for changes in the field or return signal. The object being detected is referred to as the proximity sensor's target.