

Customer Limit System Using Arduino UNO

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ABSTRACT

In the pandemic of covid-19 the new norms of limitation for customer entering shops or place have been implement continuously as a part of standard operating procedures (SOP) that need to be follow. The risks of getting COVID-19 are higher in crowded and inadequately ventilated spaces where maybe some of the infected people spend long periods of time together in close proximity area. Other than that, there are still have customers who do not comply with the standard operating procedures (SOP) guidelines set by the Ministry of Health Malaysia because of lack of environmental notification. The purpose of customer limit system serves as an informant to the customer who come to the shop to get notify for number of space available in the shop without entering the place. This system is design to correspond with the standard operating procedures (SOP) of compliance that have been set to the targeted shop. The Arduino Uno is use as a microcontroller and IR module as a sensor that will detect the number of customer entering the shop, while LCD will display the output of the available space for customer who wait outside the shop to be notify. Therefore, the approach taken help to create a customer limit system that is capable of helping in maintaining the physical distancing of customers. This system will help user to avoid from crowded space and get notification easily without any distraction. This successful project can be implemented in various field and place that will help this country to stop the spread of covid-19 virus.

INTRODUCTION

At the early of the year 2020 until the middle of 2022, the life of the new norm with the Covid-19 pandemic has left business operators with no choice where they have to implement all the guidelines provided by the Minister of Health [4]. They also need to explain to their employees to ensure that they comply with standard operating procedures (SOP) as the new business norm. The current system at that time showed many peoples still do not fully comply with standard operating procedures (SOP) while in public places. Peoples who do not follow the rules cause no physical distancing by entering the crowded place or store without any warning. This situation had also come with the need of more manpower to handle the limit of the customer from outside the store. In many place, the warning of entering certain shop or place was doing manually. Figure 1 shows that the example of a customer limit instruction picture that does not use proper system. Refers to the problem statement above the objectives of this project are to build the system that can give solution by calculating how many customers enter the area inside the store or premises and give the difference between minimum and the maximum number of customers to estimate the amount of space available. To achieve the project objective, the project scope is to create the system that can run by using Arduino UNO with two infrared sensors and displays the number of incoming and outgoing customers on the LCD screen according to the number of customers present. The Malaysian Ministry of Health (MOH) had announced that social distancing or physical distancing is a key practice to reduce the risk of Covid-19 infection. Therefore, place such

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as shop need to have appropriate measures to avoid close contact at workplace by limit the risk of exposure [3]. SOP and rules of physical imprisonment, hygiene practices, wearing face masks as well as avoiding 3C which means, crowded places, limited space and close conversation should be practiced at all times without compromise.

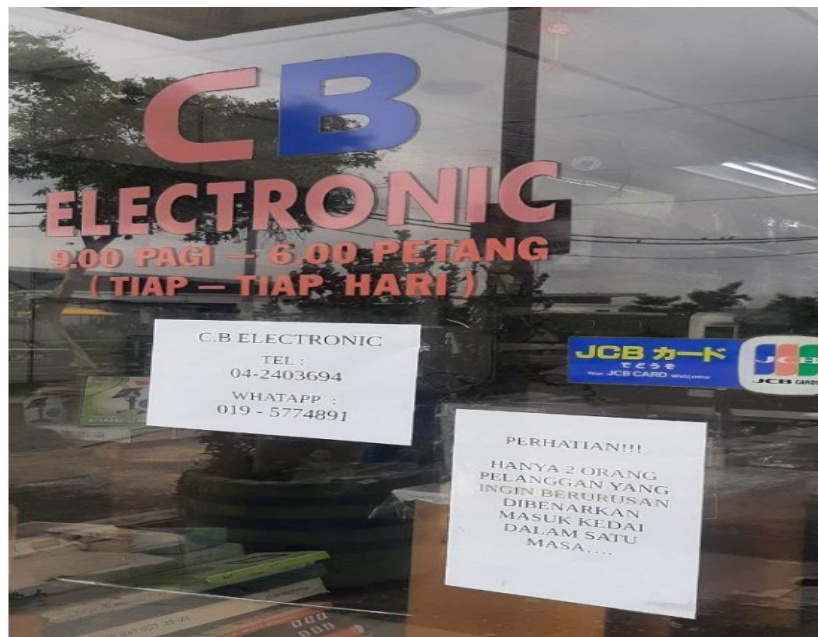


Figure 1. Instruction picture that use manual system.

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Project Design

The operating principle of this project design are show as the Figure 2 below where the block diagram shows that the input is processed of sensor measure the amount of person detected by infrared while the output is value of available space that Arduino UNO process and display directly to the LCD screen. The output on the LCD screen is the amount of space that are still available in a store or shop according to the size capacity of the place. Thus, customers who are outside are not allowed to enter the store or premises as long as the LCD screen displays 0 free space. The flowchart diagram at Figure 3 show the basic idea how Arduino UNO is used to program the system process.

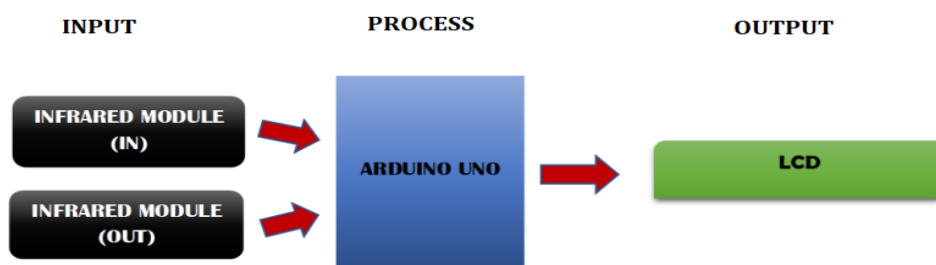


Figure 2. The block diagram of Customer Limit System Using Arduino Uno.

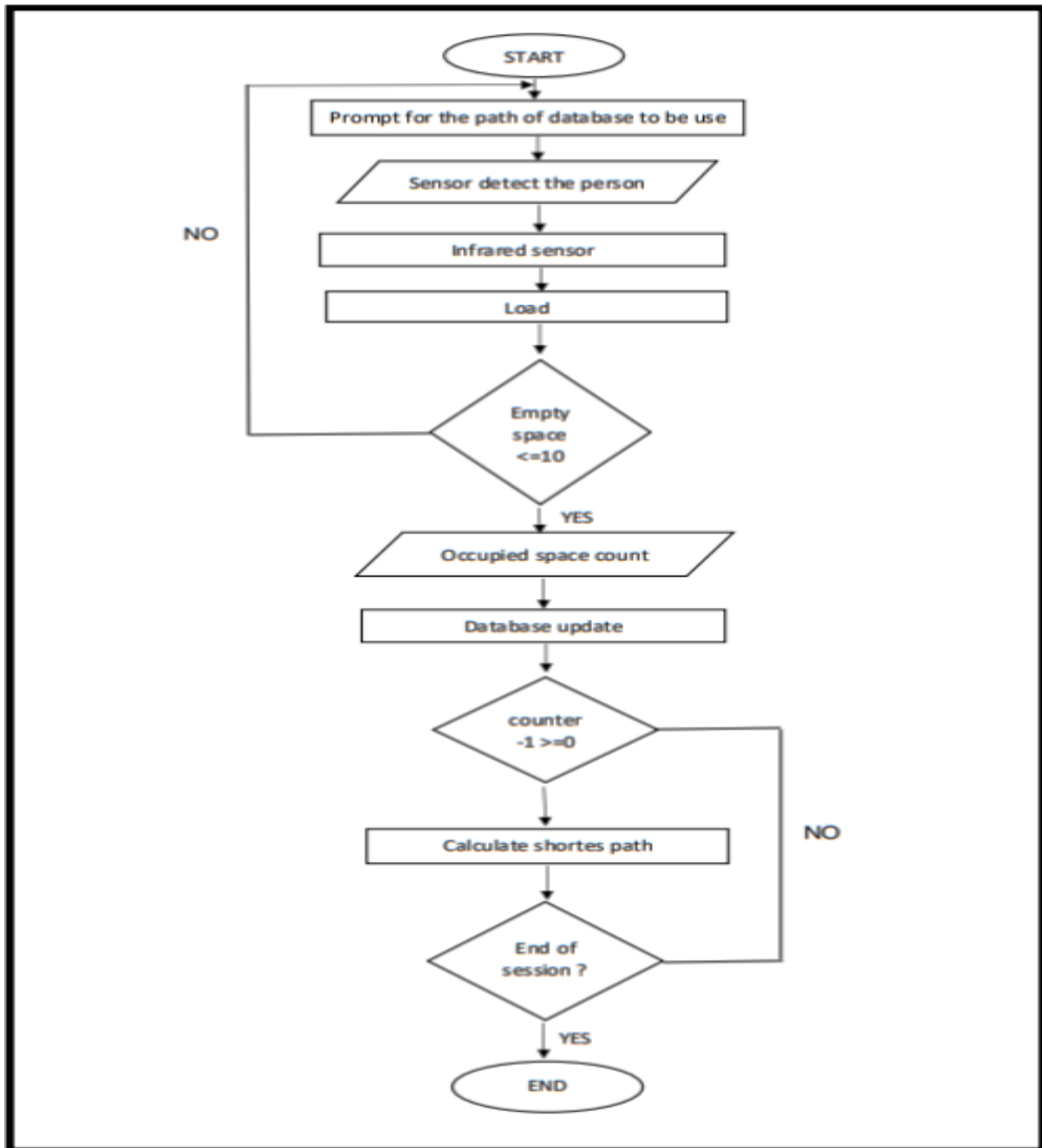


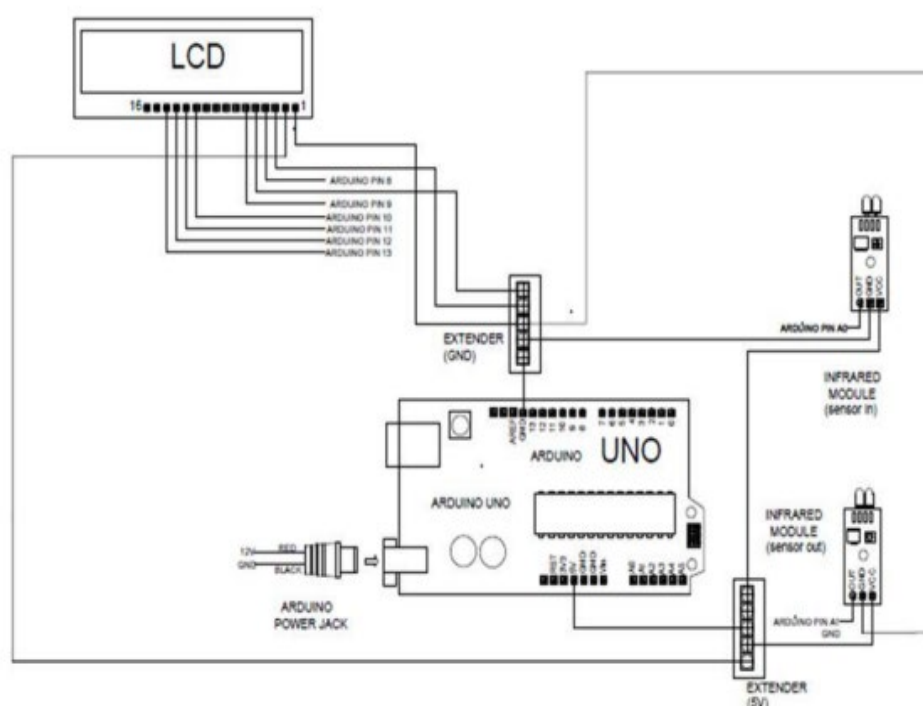
Figure 3. The Flowchart program for Customer Limit System Using Arduino Uno.

Circuit Design

The circuit design at Figure 4 below show the design of the customer limit system using Arduino Uno. Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs such as infrared sensor. Programmer can tell the board what to do by sending a set of instructions to the microcontroller on the board. Programmer use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.

Table 1 Arduino Uno Properties

Microcontroller	ATmega328
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limits)	6-20V
Digital I/O	Pins 14 (of which 6 provide PWM output)
Analog Input	Pins 6
Flash Memory	2 KB of which 0.5 KB used by bootloader
Clock Speed	16 MHz

**Figure 4.** Circuit design using Arduino UNO.

Hardware Implementation

The installation of Arduino Uno and Infrared sensor can be seen at Figure 5 where the system work when the user passing by the infrared sensors at the in and out door as show in Figure 6. TE infrared sensor used to detect the movement of incoming customers as well as outgoing customers through a specified route. Inputs and output are fed into two different Arduinos output pin where the total space that available will be display based on the infrared sensor detection calculations at the in and out door. The input will process the amount detected by infrared, same goes to the output from the Arduino directly to the LCD screen. The output on the LCD screen is the amount of space that are still available in a store according to the size capacity of the store. Thus, customers who are outside are not allowed to enter the store or premises as long as the LCD screen displays 0 free space.

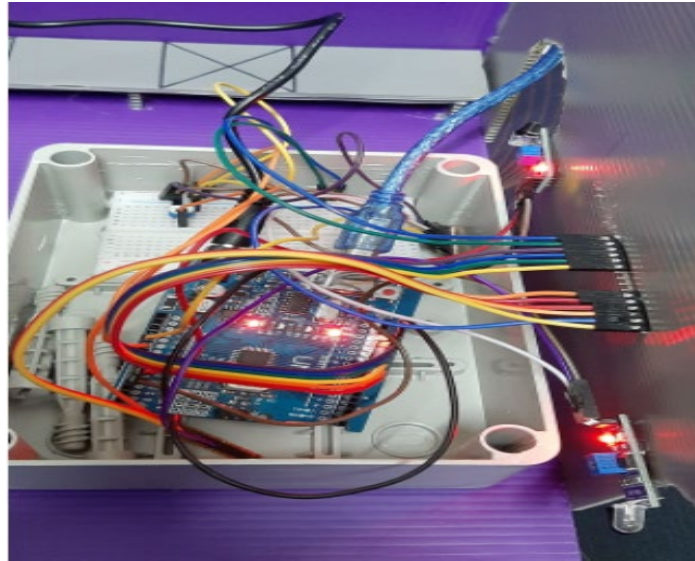


Figure 5. The installation of Arduino Uno and the Infrared Sensor.



Figure 6. The installation of Arduino Uno and the Infrared Sensor in and Out.

RESULTS AND DISCUSSION

Based on the output design of the Customer Limit System Using Arduino Uno, Table 2 shows that some improvement has been made compare to the manual previous system. Physical distancing can helps limit the spread of Covid-19. People need to keep a distance of at least 1 meter from each other and avoid spending time in crowded places or in groups. By build the system which can notify the limit of person entering the certain place, can help to reduce the cause of spreading virus.

Table 2 Comparison for Customer Limit System Using Arduino Uno and Manual System

Arduino Uno	Manual System
Customers are easy to get information by looking at the LCD screen outside the store	Customers don't get accurate information for number of persons inside store
Does not require manpower to control customers	Need to have manpower to control at the front of the store
Limit for 10 customers depending on the size of the store	There is no customers limitation and the virus can easily spread in crowded place.

Figure 7 show the result of LCD display where this customer limit system has been set to only 10 people who can enter this Kir Barbershop. While Figure 8 shows that when a customer has entered through an entrance door named IN, the infrared sensor will send output to microcontroller at Arduino Uno to process and display the available space by showing the output on the LCD screen reduce to 9. This process will continue until the LCD screen displays the number 0, then the customer cannot enter the barbershop and will need to wait in the waiting area outside the store until there is a customer come out from the door name OUT. Thus, when a customer finishes and come out through the exit the infrared sensor (out), will display on the LCD screen displays Free Space 1, one of the customers waiting outside the barbershop can enter the waiting room in the barbershop.



Figure 7. The LCD display of space available for customer to enter the shop or place.



Figure 8. The LCD display of space available for customer OUT the shop.

CONCLUSION

The attention of the user awareness for fast preventing of Covid-19 has become the most precious way to create health environment. Even now Malaysia are already transition in the endemic stage where the limitation of customer is not compulsory anymore, this customer limit system that using Arduino Uno can still help user to manage the space of available information in two ways. First, the system manages triggers that monitor the number of customer information and notifies the user the available space in situations of interest have arisen. Second, the system provides LCD screen notification to allow the user to be notified with the space in the mode where physical

distancing can be creating. This system turns the information given to advantage by easily show the number of customers in the place then deliver the information in the most effective way through based access control. The Customer Limit System Using Arduino Uno clearly show the results that the system is effective, and a reliable means for limiting the customer in places like barbershop, retail stores, super markets, factories and others.

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