CSE 321 – PROJECT 3

STAGE 1

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BODHISWATTWA BASU
State University of New York at Buffalo

Part A: Project Statement

After and during the course of the pandemic, the entire world had felt its effects. Restrictions on gatherings, events and crowds, in general, were implemented heavily to combat the spread of the deadly virus.

The Room Capacity Reader is a device that will deduct the capacity of the room by ultrasonic sensors stationed at the entrance of the room. The LCD will display a counter of the people who have walked in the room. As soon as the room reaches the desired capacity, which can be set by the administrator of the room, a buzzer will sound and the LCD will display that the room has reached capacity for social distancing purposes.

Social distancing has allowed the world to return to its new "normal". Keeping up with the practices that kept the world safe is important to the longevity of society and the economy.

Part B: Initial Constraints and Specifications

Constraints

Direction of Motion

Differentiating the direction – in to or out of the room – in which a person is walking is not possible to deduce with the ultrasonic transducer. Therefore, the final product is going to be implemented on entrances only.

Multiple People

The ultrasonic transducer is also not going to be able to deduce multiple people walking into the room together at the same time, since it was not a simultaneous action. This limits the final product to only allow one person into the room at a time – which might be time inefficient for rooms with larger capacities.

Distance

The ultrasonic transducer HC-SR04 has a distance range of 0.02 meters to 4 meters. So, people entering rooms with entrances greater than 4 meters will not trigger the ultrasonic transducer.

Sensing Accuracy on Soft Materials

Often, a disadvantage of using an ultrasonic transducer, is that objects covered in soft material – people in winter jackets and sweaters – make it harder for the transducer to sense the distance to the target due to the high absorption rates of those fabrics.

Specifications

Keypad

The keypad will be used to enter in the desired capacity of the room.

Ultrasonic Transducer

Stationed at the entrance of the room, the ultrasonic transducer will detect people walking into the room. The transmitter will be triggered and a sound wave will be emitted, and as soon as there's an obstacle in the way, the receiver will pick up the reflected sound wave and increase the head count of the room.

Buzzer

Once the room reaches the desired capacity set by the user, the buzzer will sound to alert the user it has been reached.

LCD Screen

The LCD screen will display a prompt to let the user enter in a desired value. Then, as soon as a person walks into the room, the counter displayed on the LCD will increase. Once the room has reached the desired capacity, the LCD will alert the user.

Part C: Asks

Purpose

The purpose of the Room Capacity Reader is to allow the user to set a desired capacity for the room that they are in. The reader will then increase the headcount of the room when a person walks in.

Inputs

1. Ultrasonic transducer output.
2. User input of the desired room capacity on keypad.

Outputs

1. Ultrasonic transducer output.
2. Head count of the room on LCD.
3. Buzzer sound.

Part D: Preliminary Bill of Materials

PERIPHERALS	DESCRIPTION	WHERE TO BUY
LCD Screen	LCD1602, liquid crystal display, is a kind of dot matrix module to show letters, numbers, and characters	Amazon
Ultrasonic Transducer	HC-SR04 ultrasonic distance sensor.	Amazon
Buzzer	A buzzer is an audio signalling device.	Amazon
4x4 Keypad Matrix	The 4*4 matrix keypad module is a matrix keypad consisting of 16 keys in parallel.	Amazon
Nucleo-L4R5ZI	STM32 Nucleo-144 board.	DigiKey
Breadboard	Used to develop prototypes of electronic circuits.	Amazon