LEBANESE UNIVERSITY
Faculty of Sciences II

PROJECT REPORT

Electronics Laboratory E3306

JEE: Quarantine Center

By

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Presented to Dr. Mohamad EL ZOGHBI

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J.E.E
Here For You

II-Introduction

The COVID19 pandemic has shown the requirement of quarantine centers since most people do not have the ability to self-isolate away from their families in the case of positive results. Even in quarantine centers patients and caretakers are not completely safe despite taking precaution measures. This project consists of a digitalized automated quarantine center.

III-Plan

To apply this project, the following parts are to be realized:

III-1- Mobile application:

a. Profile form
b. Symptoms questionnaire
c. Results
d. Zone guidance

III-2- Automated systems:

a. Food delivery basket
b. Lock system
c. Sanitization system

The mobile application is coded and simulated on “Android Studio” using java and kotlin languages. All automated systems are simulated on “Proteus”. All microcontroller codes are written on “MPLAB” using assembly language.

IV-Architecture

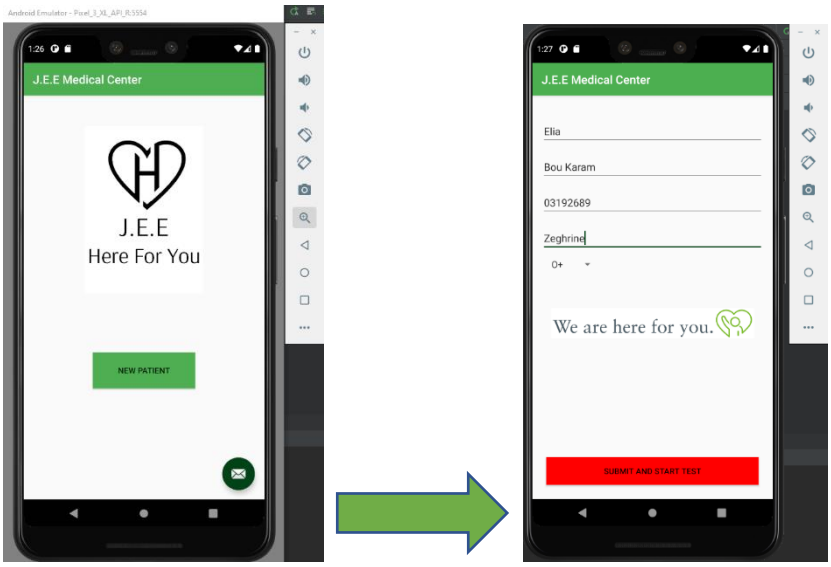
The Quarantine center consists of 4 floors numbered 0 to 3. The center has a total of 6 rooms in addition to the central control room which is in floor 0. In each floor numbered from 1 to 3, there are two rooms facing each other. For example, floor 1 has rooms 1 and 2 on opposite sides of the building; that means that all odd rooms are on the same side of the building but on different floors and so are all even rooms. Each floor is reserved for a zone. Floor 1 is for zone A, floor 2 is for zone B, and floor 3 is for zone C.

V-Simulation

V-1- Mobile Application:

V-1-a- Profile form:

Upon first opening the application, the user sees what is shown in figure 1. After clicking on "NEW PATIENT", the application takes the user to the profile form that should be filled as shown in figure 2. After the form completion, the "SUBMIT AND START TEST" button is to be pressed to advance to the next section.

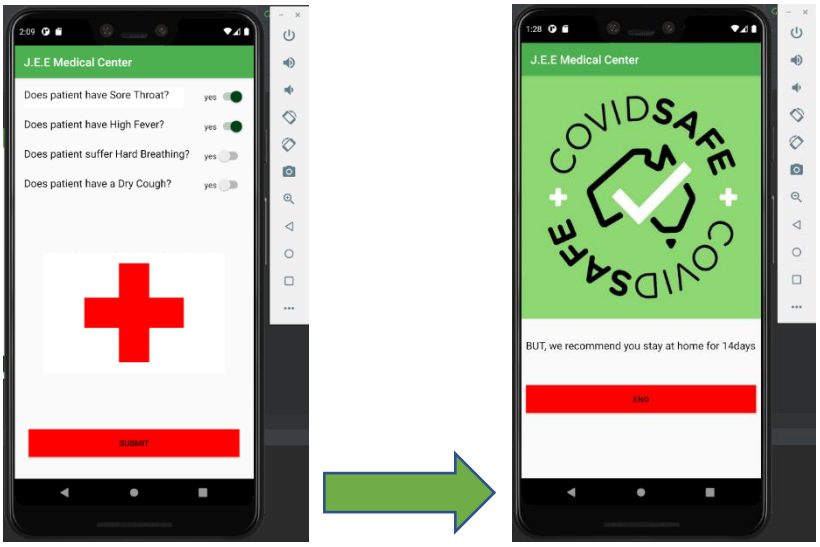


Figures 1 & 2: simulation of profile application

V-1-b- Symptoms Questionnaire and results:

The user is now asked to select the symptoms that they are experiencing and then click the "SUBMIT" button.

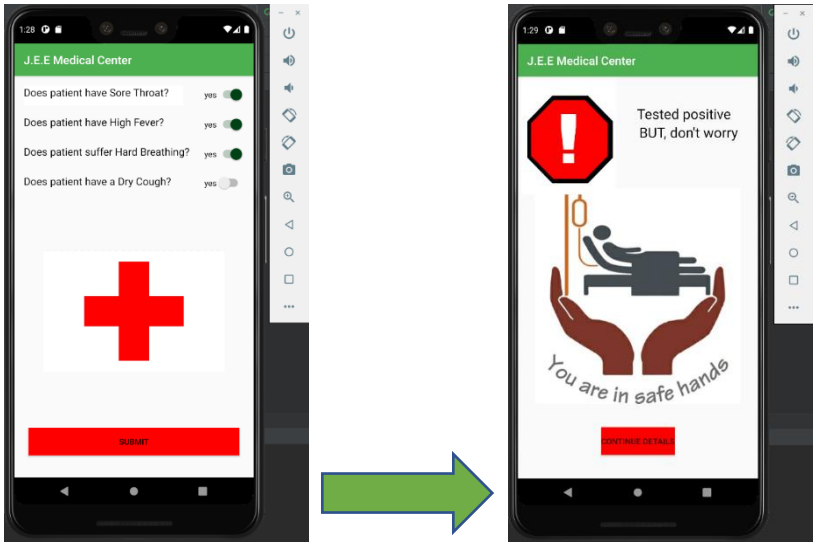
If only 0, 1, or 2 symptoms are selected, the following is shown:



Figures 3 & 4: simulation of symptoms questionnaire for 2 symptoms or less

After that, the user ends the questionnaire by pressing the “END” button.

If 3 or 4 symptoms are selected, the following is shown:

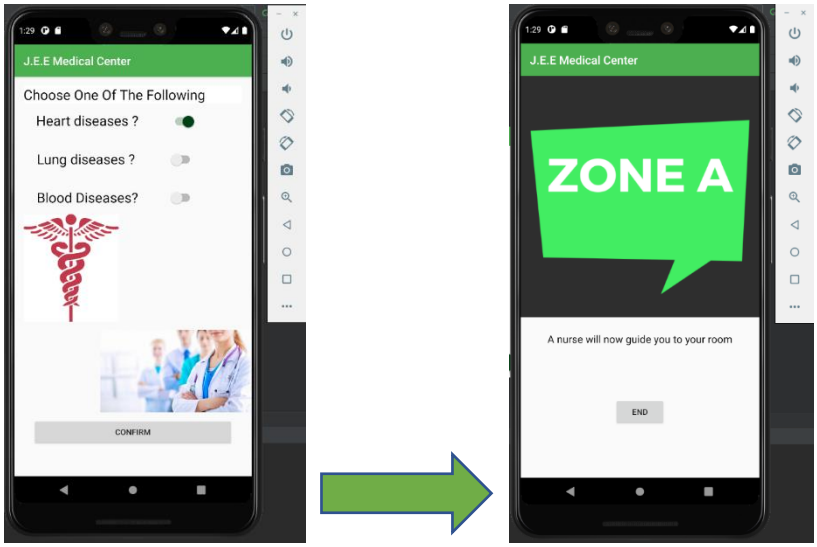


Figures 5 & 6: simulation of symptoms questionnaire for 3 or 4 symptoms

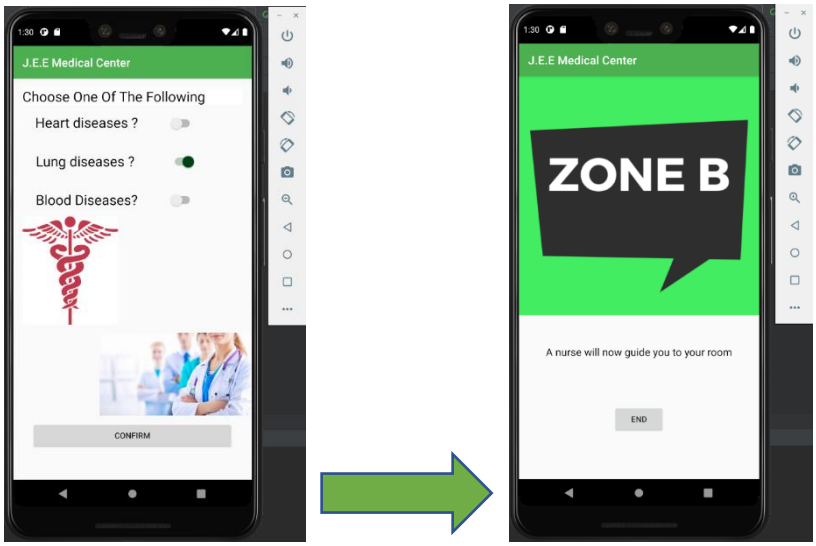
Afterwards, the user is to press the “CONTINUE DETAILS” button to proceed to the zone guidance section.

V-1-c- Zone guidance:

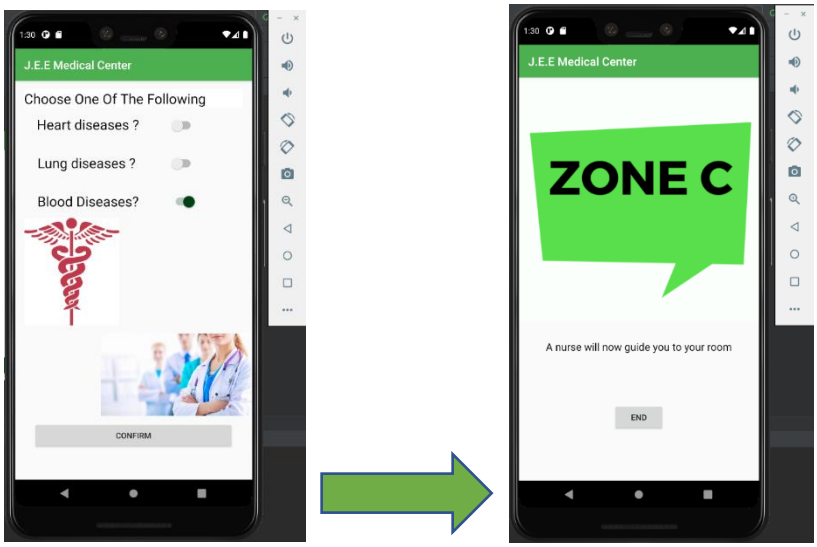
In this section, the user needs to choose if they already have any of the three diseases, heart, lung, or blood disease, as shown below thus guiding them to their corresponding zone.
Zone A is for patients with heart diseases. Zone B is for patients with lung diseases. Zone C is for patients with blood diseases.



Figures 7 & 8: simulation of guidance to zone A



Figures 9 & 10: simulation of guidance to zone B



Figures 11 & 12: simulation of guidance to zone C

After completion, the user ends the questionnaire by pressing the “END” button.
The data collected from the user’s profile form, symptoms and disease questionnaires are registered in a local database.

V-2-Automated Systems:

Below are details and explanations for each circuit. Please check the ".asm" files sent along with this report for the coding of the following microcontrollers.

V-2-a- Food Delivery Basket:

The following parts were used:

i. 7 push buttons
ii. 2 up-down motors
iii. 7-segment display
iv. 2 colored LEDs: red and green
v. 11 relays
vi. Diodes
vii. Resistors
viii. Current sources
ix. AC-DC converter from 220V to 5V
x. Crystal oscillator (clock)
xi. PIC16F877A

The food delivery basket can be fully controlled from the control room in addition to the ability for each room to request the basket to reach/leave the room.
The AC-DC converter, crystal clock and the reset relay are used to set up the microcontroller.
The 7 buttons, connected in sourcing mode, are used to control where the 2 up-down motors take the 2 baskets:
Buttons 1-6 are room-labeled; meaning that button 1 orders motor 1 to take the relative basket to room 1 etc. Motor 1 can reach rooms 1, 3 and 5. Motor 2 can reach rooms 2, 4 and 6.
Button 7 is labeled automatic, once pressed the baskets go to all rooms automatically in the following way:
Motor 1 takes the basket to room 1, waits for the room's confirmation button to be pressed, and then moves to room 3, again waits for the room's confirmation button to be pressed to ascend to room 5. After room 5's confirmation button is pressed, the motor descends the basket to the control room.
The same concept is applied for motor 2 to move from room 2 to room 4 to room 6 and then to the control room.
Each motor can go up and down and needs 4 relays to do so. The motor has 2 poles, each pole can be connected to either a positive or a negative source based on the order from the microcontroller. If pole 1 is connected to a positive source; then, pole 2 is connected to a negative source; thus, allowing the motor to move in a certain direction. If the microcontroller orders the relays to be connected oppositely, the motor moves in the opposite direction. This allows us to move the basket upwards or downwards using the same motor instead of using 2 motors for each basket.
It is to be noted that 2 colored LEDs are used to show if the basket/motor is in use (red) or not (green) in addition to a 7-segment display that shows at which room the basket is.
For simplification, the simulation circuit shows the parts needed for the control room only since it includes everything. However, each room will have a smaller circuit that includes 1 push-button, the 2 colored LEDs, the 7-segment display, and their corresponding circuitry along with a smaller microcontroller.

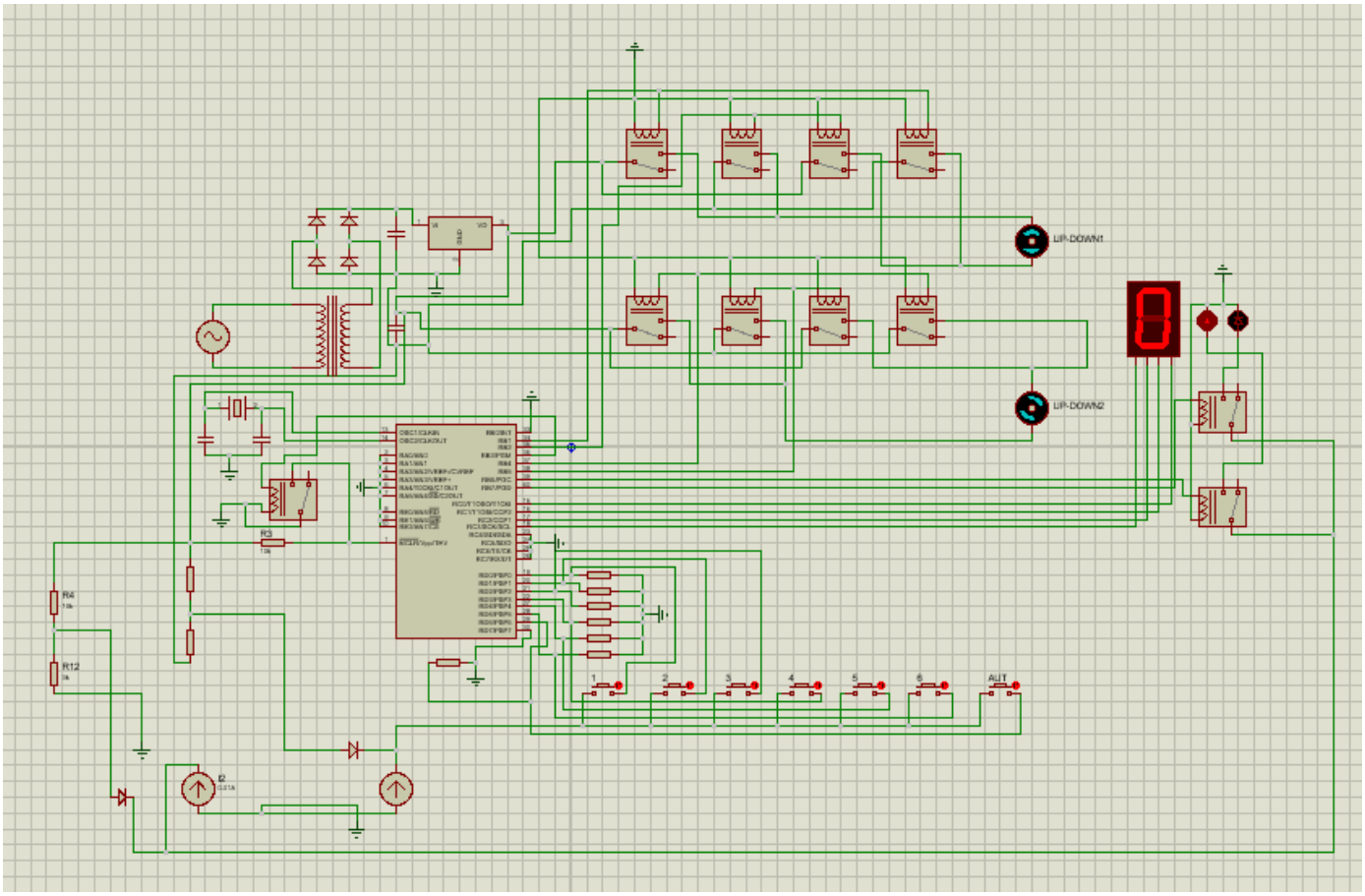


Figure 13: food delivery basket simulation circuit

V-2-b- Lock:

The following parts were used:

i. 9 push buttons
ii. 6 right-left motors
iii. Crystal LED display
iv. 13 relays
v. Diodes
vi. Resistors
vii. Voltage source
viii. AC-DC converter from 220V to 5V
ix. Crystal oscillator (clock)
x. PIC16F877A

The lock control system can only be accessed from the control room.
The AC-DC converter, crystal clock and the reset relay are used to set up the microcontroller.
The crystal LED display is used to help the person in charge navigate the following.
The passcode can be entered by 0-9 push buttons, connected in sourcing mode. After entering the passcode, the crystal LED displays a text asking for the floor number (1-3) to be chosen using these same buttons. After that, the corresponding room locks are checked. If the locks were open, they are

automatically closed, and a text is displayed to indicate that. Similarly, for closed locks. This means that rooms 1 and 2 are either locked or opened together.
Note that 4 relays are needed for each right-left motor and function as previously explained for the up-down motors.

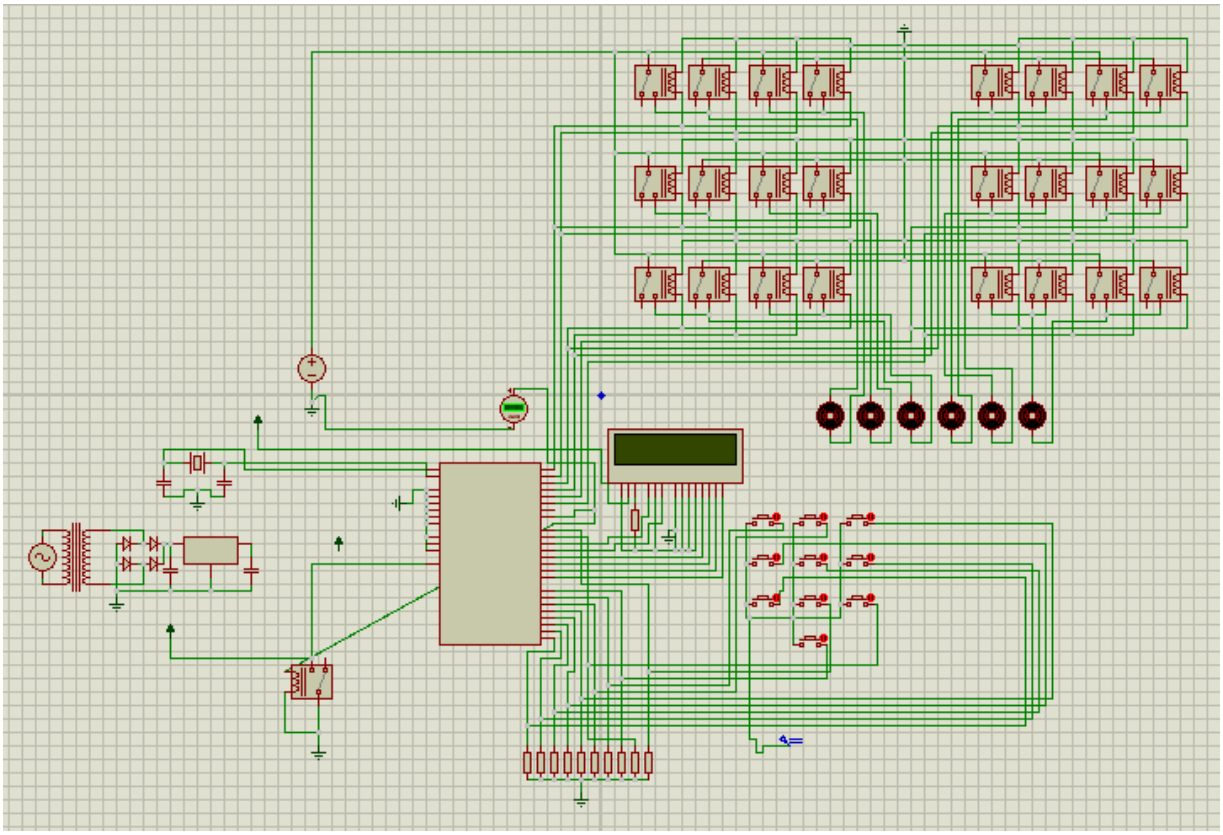


Figure 14: lock simulation circuit

V-2-c- Automated Sanitization:

The following parts were used:

i. Push button (to symbolize an infrared sensor)
ii. Motor
iii. Diode
iv. Phototransistor
v. Crystal oscillator (clock)
vi. PIC16F84A

The auto sanitization system is installed at the door of each patient's room. Anyone entering the room will be able to sanitize their hands without touching the sanitization unit. By just approaching one's hand, the infrared sensor detects a close object. This detection leads to the microcontroller to order the motor to turn thus allowing sanitizer to descend on the hand.
In the simulation on proteus shown below, the infrared sensor is replaced by a push button since no IR sensors can be found on proteus.
The phototransistor is used to connect the motor to the ground when the microcontroller sends a signal thus turning the motor on and off.

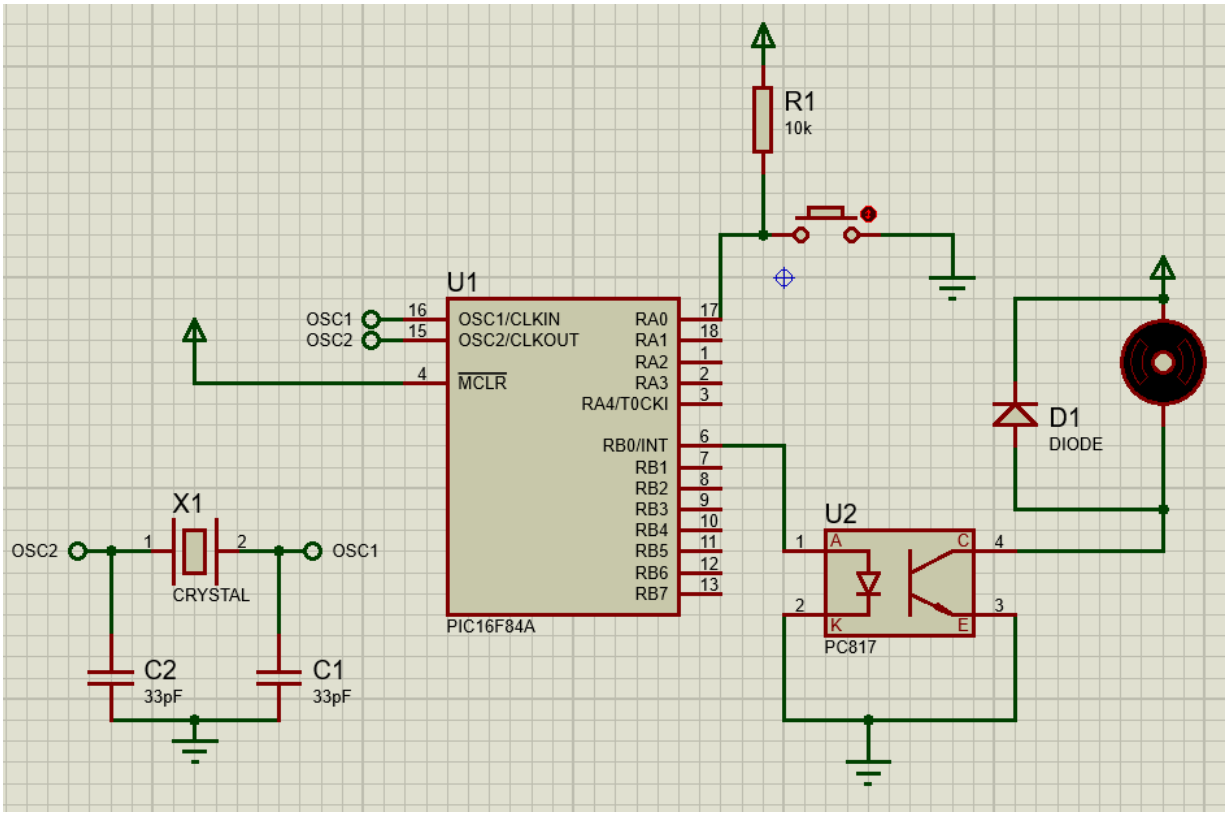


Figure 15: automated sanitization simulation circuit

VI-Implementation

Due to the current situation, this project will not be implemented physically. The simulation of this project will suffice.