PROJECT METHODOLOGY

In this project an Arduino board, two ultrasonic sensors, an LCD display, a breadboard and jumper wires have been used. To effectively count the number of people in a room, the whole setup is attached to the entry/exit door of the room. The two ultrasonic sensors are placed on the top frame of the door, one on the outside and the other on the inside. For the rest of this detail, these two sensors shall be denoted as outside sensor and inside sensor respectively.

It works on the method of identifying the direction of motion through the door. When a person enters into the room through door, the outside sensor returns a distance less the maximum distance (75% of the height of the door) and hence detects the presence. This output is digitized to 1, i.e. change detected. Had there been no change, the output shall have been 0. Now at this point, the inside sensor cannot detect any presence and its output is digitized to 0. Now, after just entering the room, the inside sensor gives output 1 and outside sensor gives output 0 (As the person moved from outside to inside). Thus, for entrance of a person, data sets we get as output (in format [outside_sensor,inside_sensor]) from the sensors are [1,0] and then [0,1]. From these sets of data, we determine that a complete procedure of entrance is performed with the help of a variable ***state***. Here state is set as follows:

STATE	*CONDITION*
0	No movement
31	Entry
13	Exit

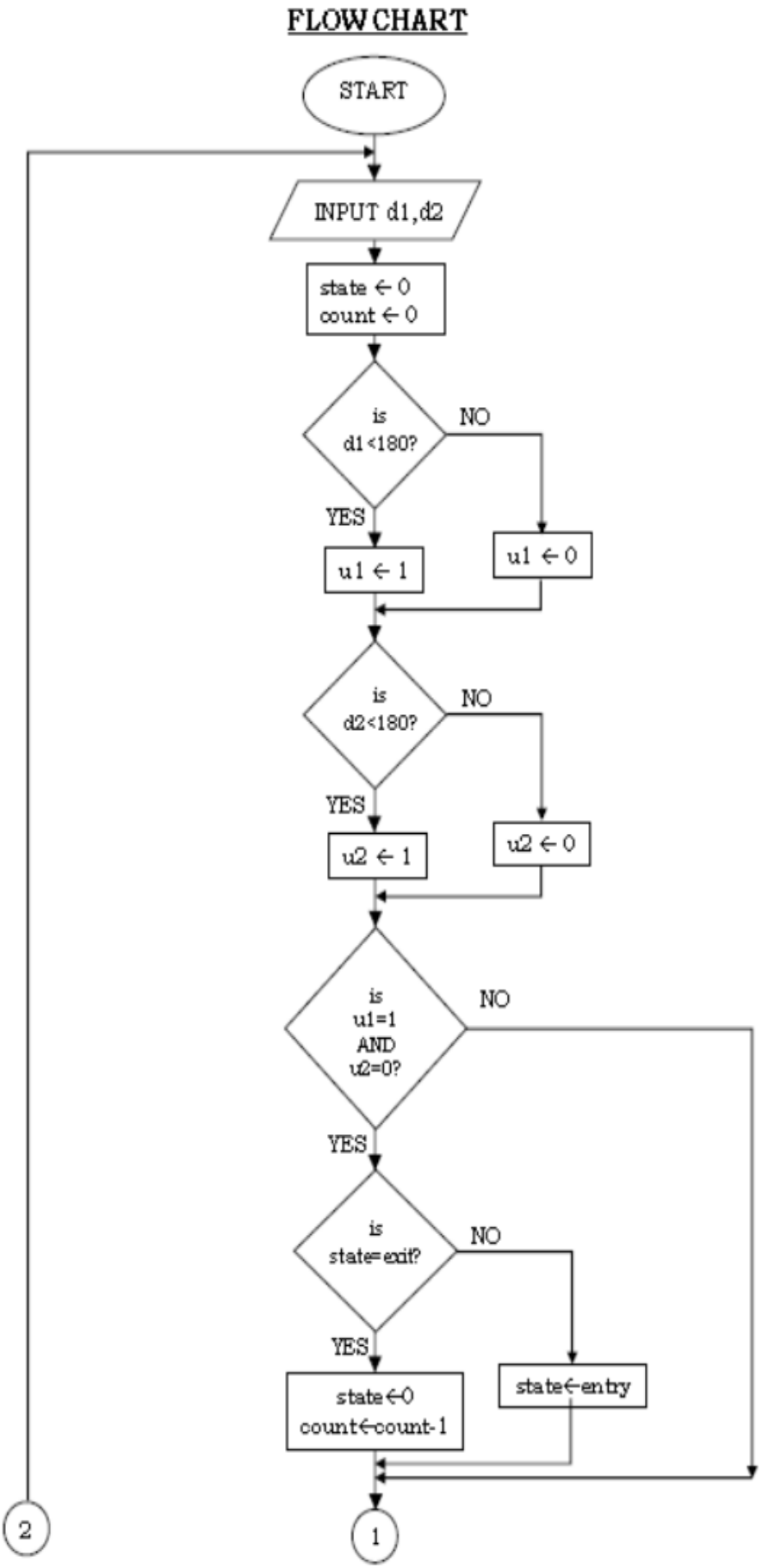
The state changes from 0 to 31 indicating an entrance and as soon as the person has completed his entrance, the state is changed back to 0. At that same time, the count of people in the room in incremented by one and the number of persons present inside the room is displayed through the LCD module.

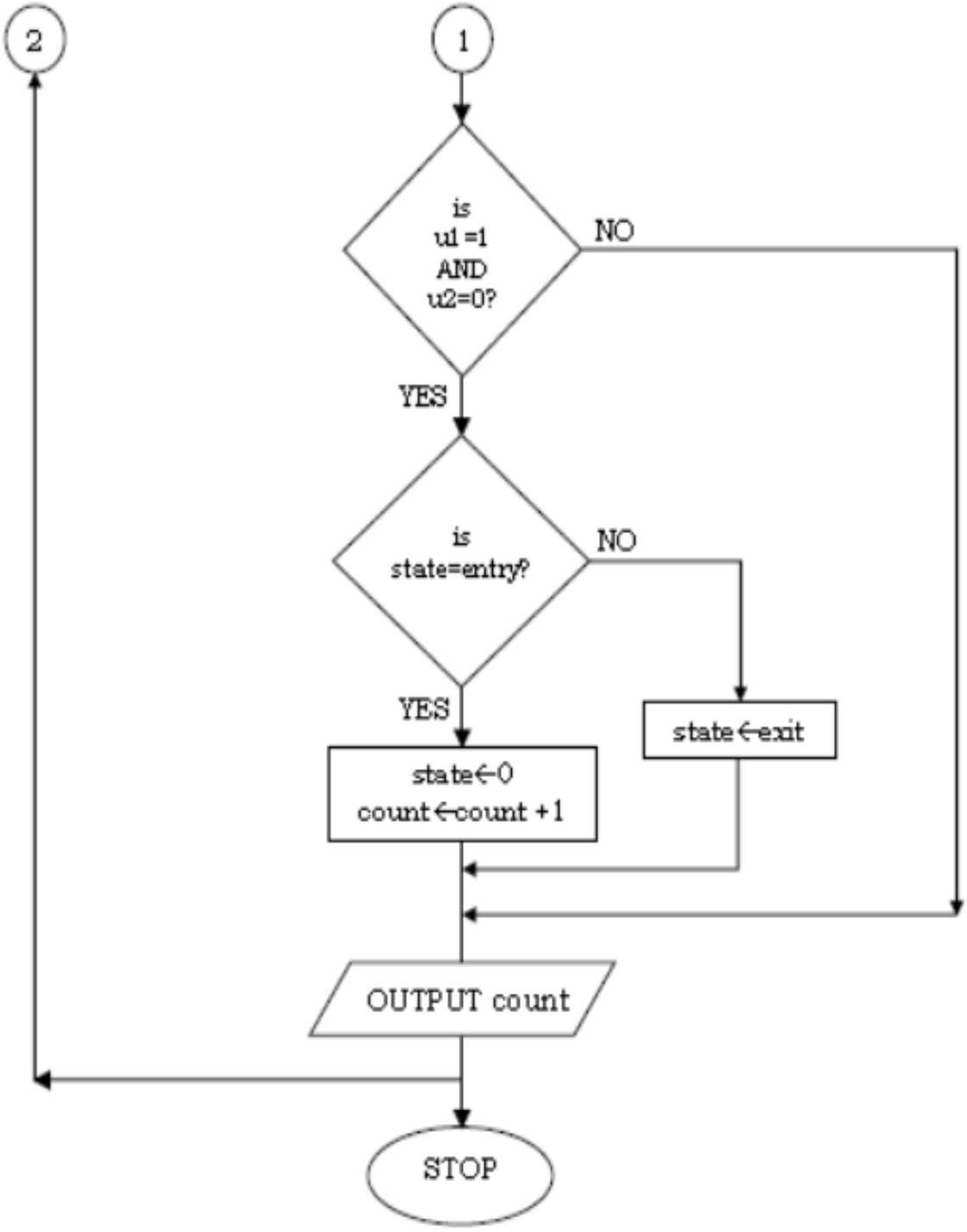
Similar to the above methodology, for departure of a person, output data sets [0,1] and then [1,0] are obtained, and the state shall be changed to 13. In similar logic of the entry, at the exit of a person, the counter will be decremented by 1 and the respective result is displayed on the LCD.

In case, the total number of people in the room exceeds the critical limit, the LCD is made to show, “MAXIMUM CAPACITY”.

For conventional simplicity of the project, it is assumed, that [0,0] and [1,1] output from the sensors makes no change to the count or the state.

A flowchart to demonstrate the program logic used in this project is given below :




2
1
is
u1 =1
AND
u2=0?
NO
YES
is
state=entry?
NO
YES
state←exit
state←0
count←count +1
OUTPUT count
STOP

SOFTWARE SIMULATION

This project has been simulated in Tinkercad, a free online computer-aided design (CAD) program website.

Here, the upper sensor is the sensor outside the door and the lower sensor is the sensor inside the door. The batteries are not shown here in this simulation.

The simulation provides perfect results here as shown below :