

PROBLEM : Design Point Eater Game on 16*2 LCD

List of Hardwares: Arduino Uno, 16*2 LCD , PushButtons and Resistors

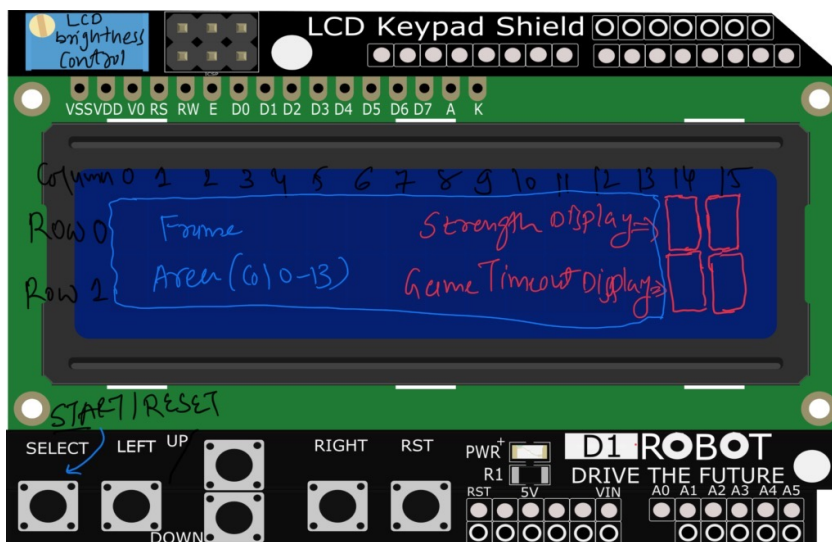
Software Platform: TinkerCAD

Prerequisites:

- Knowledge of delay() and millis() functions on Arduino
- Working of 16*2 LCD
- Knowledge of Random function

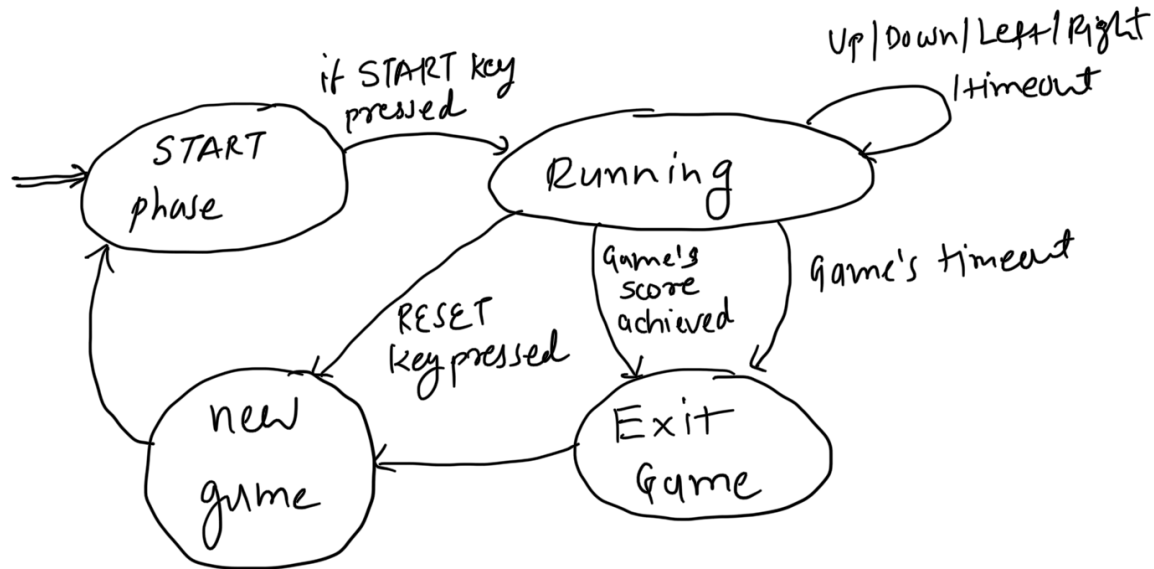
Problem Definition:

We are going to design real time Point Eater game. It has two main objects- Eater (which will gain its strength by eating point before its timeout) and Point(two points object which will appears on screen at random location with its strength value, both points have same timeout, which you know in advance). Apart from this you have game's data- score and timeout. So, before game's timeout occurs Eater has to gain enough strength to beat the game's score. Game's score and timeout both are known in advance. Eater needs to eat only one point from both and that eaten point's strength will be added to Eater's score. So choose wisely which point you want to eat. If any point is eaten then you have to load new points. You have unlimited points to run the game before timeout of game.



Game LifeCycle:

Game's Lifecycle:

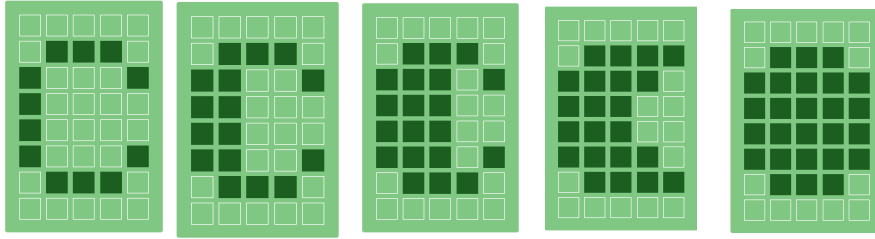


List of Functions:

Initialization:

You will initialize LCD by starting message that "Press START key " , so user needs to press START key (as per diagram) to start Game, until you will locked into waiting mode. You have to start timer for timeout values only after START key is pressed just make sure that. You have to configure pins of arduino in order to communicate with LCD shield. You needs to initialize random function. It will generates custom characters for Eater symbol and based on it's current strength it will show it's symbol. You can have only 8 symbols for customization,so choose wisely.

NOTE: Devides game's score into number of levels and check current value of Eater's strength lands on which level and then show symbol accordingly. For eample, if score is 100, then devides it into 5 levels , level 0 ranges from 1 to 20 , level 1 ranges from 21 to 40 and so on.

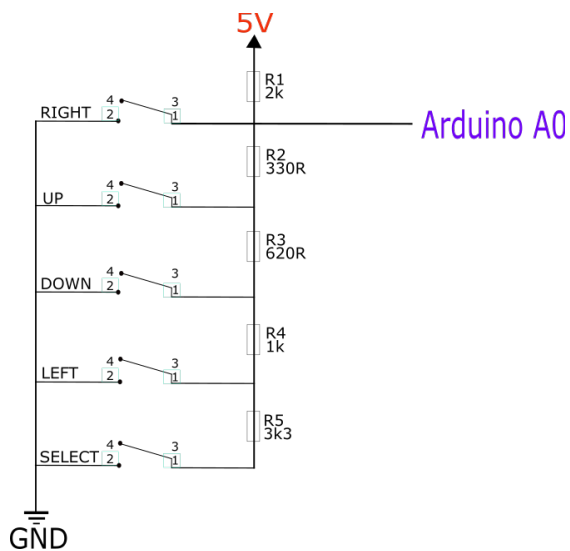


Get Radom Values : You have some parameters like point's location, strength which needs to be random. So use this function to get those values. You will use this function for two cases- 1st is to get location (row,col).- 2nd is to get strength. But make sure that current position of eater and point's position can't be same. Strength value for point is bound to [1,9].

Set Frame : This function needs to calculate values of timeouts, set new position of eater based on key pressed, get new points if needed, also decides that game should be move on further or it's end. There are two ways in which game should be END- 1st game's timeout occurs, 2nd eater beats the game's score. It will update time after every second, so you can track your timeouts. It also checks that points are eaten by Eater or not, if it does then add strength of that point to Eater's score and load new points. This functions Only sets new parameter's values.

Display : This function only display objects according the values set in Set Frame function. Frame area is defined in image please check it.

Read Input : Input pin is analog ,so you have to first calculate voltage for perticular Key press, then convert it into digital value and then decides which key is being pressed. We don't have this type of hardware, so you need to make this kind of circuit using pushbutton and resistors available. Also you need to calibrate it to validate for perticular key press.[check hints]

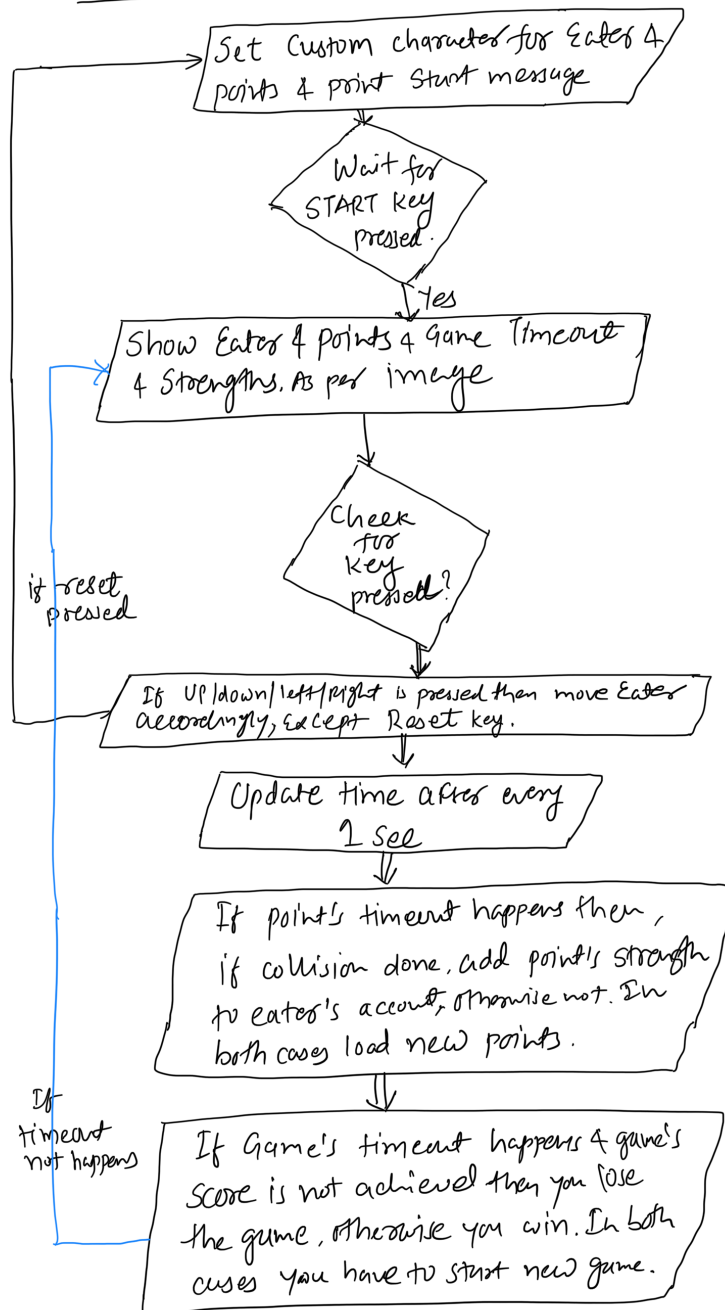


User Input Circuit , that you have to make using pushbttons and resistors.

Reset : This function will set new fresh game for you. It will reset all game's statistics and start new game for you. For this you have to press Reset key which is SELECT/START key.

Algorithm for Game:

Point Eater Game:

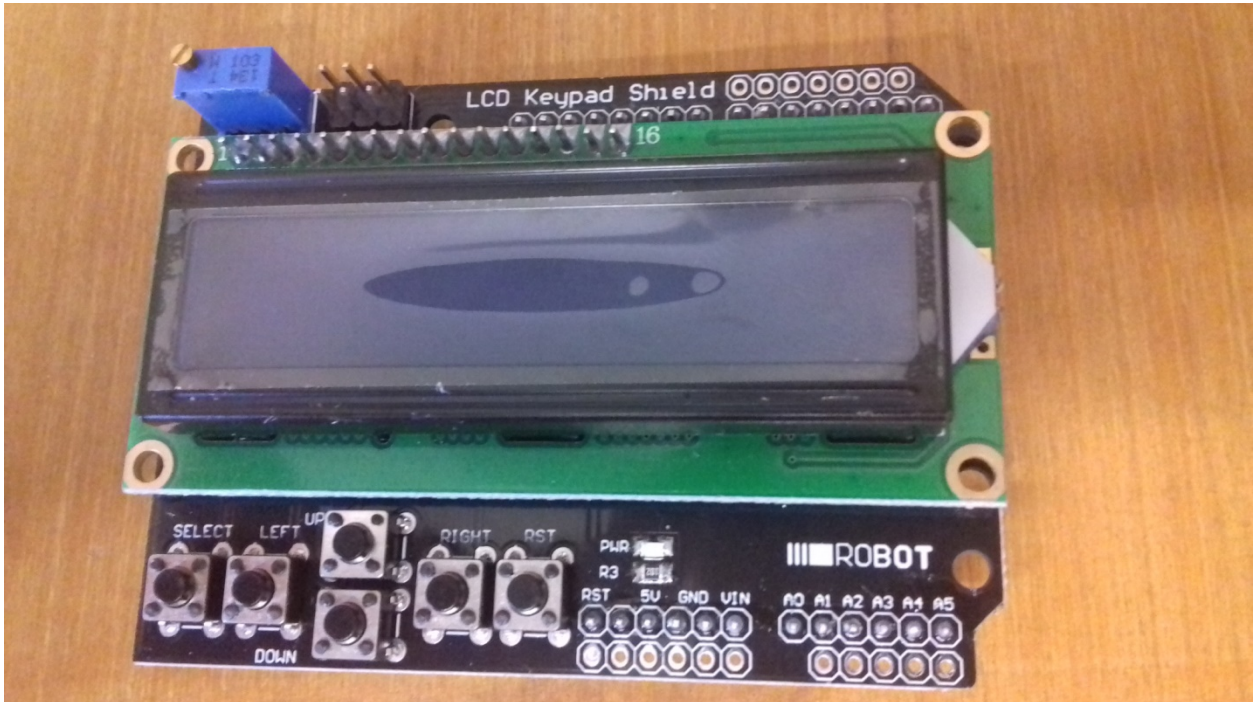


Outcomes:

After this practical done successfully , you will be able to understand usefulness of display devices on typical embedded system, need of OS, requirement of multitasking, need of Interrupts , need of hardware resources for Timers based application and game design.

Circuit Design:

In lab we have LCD keypad Shield for this practical.



Here, pushbuttons are works as User Input and 16*2 LCD display as Output, but TinkerCAD doesn't have this module, So you have to make this circuit on TinkerCAD.

For user input , we have already discussed resistors and push buttons. For output , one can easily find LCD interfacing examples on tinkerCAD.

So, you have to breakdown this module into two separate circuits.

Hardware components:

1. Arduino Uno
2. User Input Circuit (push buttons and resistors)
3. Display (16*2 LCD)

Hints:

1. You have to make circuit that will implement 5 individual keys , but condition is that , you have only one output which is connected to analog pin of Arduino Uno. So it's upto you, how you gone implement it. You need basic knowledge of electronics. For calibration of this circuit you can check demo code availabe in LAB folder for “LCDKeypadShield”.

Possible Simulation Errors:

1. While running simulation you can possibly get some delay for diplaying and key press detection.This is due to platform that we are using, but it is ok.