***Race & Obstacles***

**Description:**

A player on the LCD screen to the left is racing to the end of the line and there are grenades being tossed at him as he is racing by an enemy standing at the other end of the line. He can shoot those grenades to clear its path. The LCD screen to the right displays the TIME left for the player to get to the end of the line and the remaining LIVES he has to do it.

**User Guide:**

**Rule:**

-Everytime the player switches row the enemies attacking him in the previous row

stop and wait until he comes back to attack again.

-There are three total lives for the player to use to get to the finish line.

-To get rid of **all** the enemies attacking on the same row, the best trick is to change

row (move up or down) and then move right back to your ladder row and shoot.

**Control Buttons:**

**-Up:** to move up or to change row when the player is on the lower row.

**-Down:** to move down or to change row when the player is on the upper row.

**-Forward:** to move the player character one column forward along the lines.

**-Backward:** to move the player character one column backward along the lines.

**-Shoot:** To shoot enemies and used to start/reset the game.

**Technologies and components:**

1. 2 *LCD screens* HITACHI h44780
2. 2 microcontrollers ATMEGA1284
3. USART communication
4. Custom characters
5. AVR Studio 6

**Link to Demo:**

<https://www.youtube.com/watch?v=w4fQDy0-pag>

**Citations:**

<http://www.quinapalus.com/hd44780udg.html>

<http://www.atmel.com/images/doc8059.pdf>

<http://www.8051projects.net/lcd-interfacing/lcd-custom-character.php>

**Link to source files:**

[custom\_lab.c](https://docs.google.com/file/d/0B5lIQ_9DNB5kTnR0YUtqcExZVWc/edit) : contains all the state machines for the first microcontroller and the logic of

the game all together.

[usart\_custom\_lab.c](https://docs.google.com/file/d/0B5lIQ_9DNB5kallHYXp5ZzhHM2s/edit) : contains the the state machines running the second microcontroller

and the usart communication to handle the timer.

[io.c](https://docs.google.com/file/d/0B5lIQ_9DNB5kMTVhOUJfMFdCUXM/edit): contains the code to write characters to the LCD screens and to create/store custom

characters to the [CGRAM](http://www.8051projects.net/lcd-interfacing/lcd-custom-character.php).

[usart.h](https://docs.google.com/file/d/0B5lIQ_9DNB5kSzZVZWFaai0zdlk/edit) : contains the code to initiate communication between devices.