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ECE 350 Final Project Proposal

***Overview***:

We want to create a carnival-esque shooting gallery based on everyone’s favorite unlicensed and completely original superhero, Epic Web Hero (definitely not Spider-Man). The player will wear a pair of gloves that enable them to shoot at enemies in the gallery when flexing their fingers. The targets will appear on a metropolitan skyline, interspersed with innocent civilians. As the game progresses, it will increase in difficulty based on how well the player is performing.

***Technical Specifications***:

**Gloves:** Starting with a pair of long gardening gloves, we will sew two of the fingers together and use a flex sensor to detect when the player flexes their middle and ring fingers. This will activate a laser attached to the back of the hand on the glove. The glove will connect to the processor via a long wire extruding from the back of the glove along the player’s arm. This connection to the processor will enable us to regulate how often a player can shoot (i.e. no holding fingers and spraying everything).

**Background/Stage:**The targets (about 10) will be presented against a backdrop of a city skyline. LEDs above a target will indicate whether or not they can be shot, and the LED will change to a different color once the target is shot. If a player fails to hit a target in a certain amount of time, the target will become unavailable to shoot at as they will have escaped. Mixed in with malicious targets will be a handful of innocents who are not to be shot. As the game difficulty increases (based on player score), the timing windows for shooting targets will decrease in span. The background will be constructed like a shadow box in that it will have multiple planes where enemies may be present. Each target will have an attached photoresistor that will send a signal to an encoder module if it was an active target at the time it was shot. This is determined by two-input AND gates attached to each target (i.e. a “hit” signal will not be sent to the processor if the LED enable signal is not also high).

**I/O:**

Outputs:

* Current game score as a 10-bit (max score of 999) value
* Gun enable (1 for each hand)
* Active signals to targets

Inputs:

* “Hit” signals from each target
* Signal from each glove indicating that a shot has been fired
* Start game button

The processor will be responsible for running a game loop that is initiated at the press of the start button. In the loop, it will monitor when a target is shot and allocating points appropriately (points awarded for hitting enemies and removed for hitting civilians). After a shot is taken, the processor will timeout the gun enable for a cooldown period (Note: the other gun can still be active).

In terms of the targets that are active, the processor will be responsible for signaling which targets are active. When a target is activated, it will remain active for a set period of time. As a player’s score increases, the amount of time a target is active will become increasingly smaller, thus increasing the difficulty. The processor will keep multiple counters running simultaneously to track overall game runtime as well as individual target availability times. These would increment every game loop iteration. Another counter will be used to determine when the game is over. These counters will be created using mips instructions and will be stored in registers as well as DMEM.

**Reach Goals:**

* Paint the cityscape
* Light up windows for aesthetic
* Music/sound effects

***Schedule***:

* November 10 - Proposal Due
  + Proof of concept with laser and photoresistor
  + Experiment with LEDs near photoresistor (see how close they can be without affecting things)
  + Obtain plywood for the frame
  + Solidify what exactly we want the cityscape to look like
  + Electrical Schematic
* Max. November 14 - First TA Check-In
  + Early on for this week, gain proof of concept for flex sensor
  + Build the gloves
  + Cut out cityscape pieces
  + attach LEDs and photoresistors
  + Confirm that LEDs and photoresistors can communicate with the FPGA as expected
* November 21 - Second TA Check-In
  + Create MIPS instruction script for the game
  + Testing
  + Catch up time if there’s a problem in the first few weeks
* December 5 or 6 - Project Demo
  + Painting and aesthetic enhancements
  + Any reach goals that we have time for
* December 6 - Project Reports Due

***Supply List***:

* RGB LEDs (12)
* Flex sensor (3)
* Gardening gloves (2)
* Laser pointers (2)
* Photoresistors (12)
* 100 Ohm resistors (15)
* Depletion Mode Transistors (14)
* Assorted plywood
* Paint (maybe??)
* Wire (stranded)
* 2 AND gates
* Braided sleeving
* Proto board(s)