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6.111 Checklist

Major Modules

Random number generator

This module generates random bits for item launch position, item launch velocity, and active status of items. To do this, it captures a variable number of bits from a CRC output, depending on which value is needed. To demonstrate this, the fruit in the game should have unpredictable launch behavior as well as unpredictable number of fruit launched at each step.

Remote

This module creates x and y coordinates of a cursor based on a user's movement. It does this by acquiring data from a gyroscope and integrating for position. The remote also uses a Teensy to process the data and send them to the FPGA via a serial connection. To demonstrate the remote's function, we will be able to see a cursor displayed on the monitor.

Fruit and bomb

This module generates "pixel" of fruit and bombs to be displayed on the monitor. It controls which sliced version of a fruit to display, as well as whether or not to display an item. To test this module, we will be able to see it on the screen.

Item Movement

This module determines the x and y coordinates of launched items. X coordinates are created by adding velocity at each time step, and y coordinates are created similarly. However, y velocity varies in order to create parabolic motion. We test this by observing an arc of motion for fruit and bombs on the display.

Game FSM

This module keeps track of the main game states, as well as the slicing of items.
Game states:

- Start → play: clicking on-screen play button
- Play → game over: Detecting that 3 fruit have fallen to the bottom of the screen without being sliced, or a bomb has been sliced

- Game over → play: clicking on-screen play button

Detecting a slice:

- At each time step, comparing cursor coordinates to each item’s coordinates. If there is an intersection, the item is marked as “sliced’ and this information is used to trigger game over for a bomb or a changed image for a fruit.

Minimum viable product:

- Game states are able to be navigated according to expected inputs and behavior
- Remote and cursor movement correspond intuitively and smoothly
- Item launch positions and angles are unpredictable to a human
- Item mechanics seem realistic to a human
- Slicing a fruit provides a smooth and realistic transition to the correct slice image
- Sliced fruit image is based on angle the fruit was slashed

Goal:

- Music for states and sound effects for slashes
- Wired serial connection replaced by Bluetooth (which would use a Bluetooth module)

Stretch:

- Improved slice animation for split pieces of fruit: fruit slices rotate
- Animated fruit - glistening, dripping
- Obstacles on screen that you have to go around
- Fruit that need more than one slice to be counted as sliced
- Leaderboard function: store the highest score in memory which can be viewed later
- Combination feature: if you slice through multiple fruit, you can receive more points