Project: Minesweeper

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Basic:

A 5*5 grid, each grid assign a block id, whose corresponding memory location in the main RAM store whether it is a bomb, and if it has been flipped. After user flip a block, the block color will change. I will use color to indicate whether it's a bomb, or how many bomb there is near this block.

VGA/Button Control:

Display image based on a second RAM which stores information of each pixels and combinational logic.

Using a x and y reg as reference of where the user is pointing at. When directional buttons are pressed, update x, y, and update information on the monitor. Pass the location of current pixel being updated to processor (?) *[not sure how exactly will the timing work, and what role the processor should play]*. I plan to connect the this module with the regfile - When user flips a block, update a value to a special register.

Processor: I anticipate writing a while loop that constantly check if the special register is ~0. If it is ~0, I should jump to a program which check and see if the current x, y is located inside of a bomb *[this part is tricky since the area of a bomb is more than one pixel, needs to find a way to map x, y location to bomb ID]*. Load all surrounding block's information and count how many bomb there is nearby. Add them up and update it as the block information in the main RAM.

Other things I don't know:

- When the user flip a bomb, how and what to update the second RAM which stores information of each pixels, and complete this process within the allowed time (e.g. is there a way to update 100 pixels at a time, or something like this).
- Should the processor and VGA/Button Control be timed with the same clock? Do I need to write some sort of a constraint file?
- How to restart the game

Advanced version if time allows:

- Percolation. A search function that clear out an entire area if there’s no bomb.
- Random generation of bomb location
- Figure out a way to update RAM to display number.
- some sound effects
- Other appearance refinement