PACMAN GAME

CSEE4840 Embedded System Design

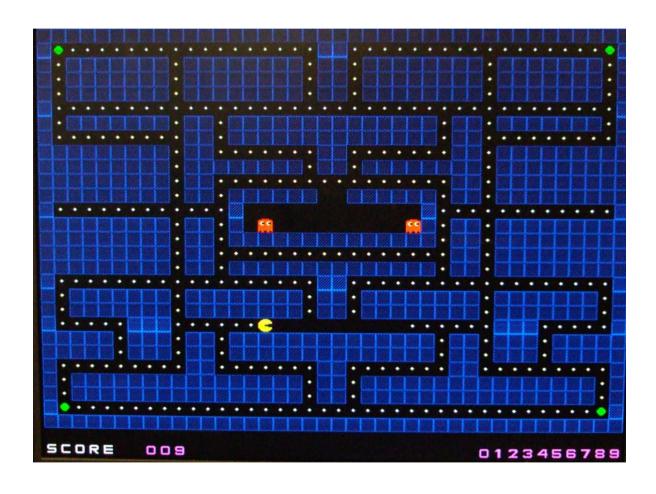
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Date: 1:30PM May 14th, 2010

General Appearance



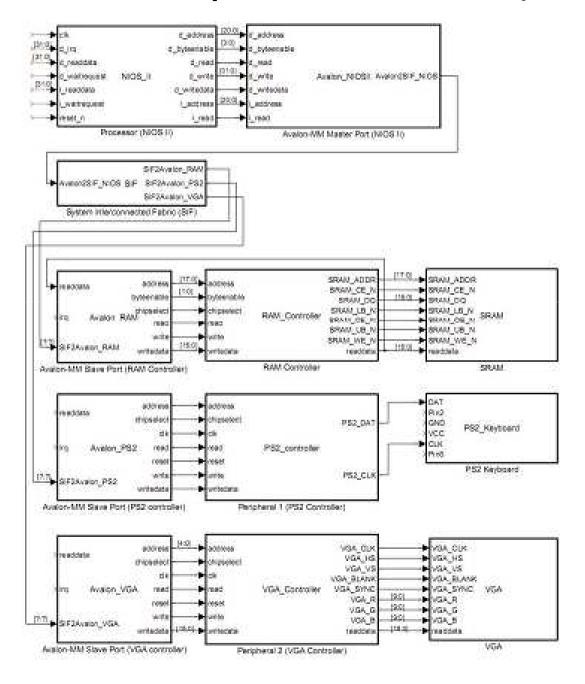
Basic Objectives to Achieve

- (1) There is only one PacMan;
- (2) There is only one "active" ghost;
- (3) There are lots of small dots to eat (1 point/small dot);



- (4) There are 4 large dots to eat (5 points/large dot);
- (5) The "score" at the bottom row should update whenever new dots are eaten;
- (6) The "chasing" algorithm is the most naive ---- ghost simply goes towards the location of pacman.

Hardware Implementation (block)



Basic Idea of the Game



*** TRICKS ***

No SRAM required for control array: the on-block ram is ~ 60KB which is "more than enough" ----- the control array in vhdl contains only totally 30x(40*4) = 4800 zeros and ones with a few additional sprites array ☺.

Control Array (in C)

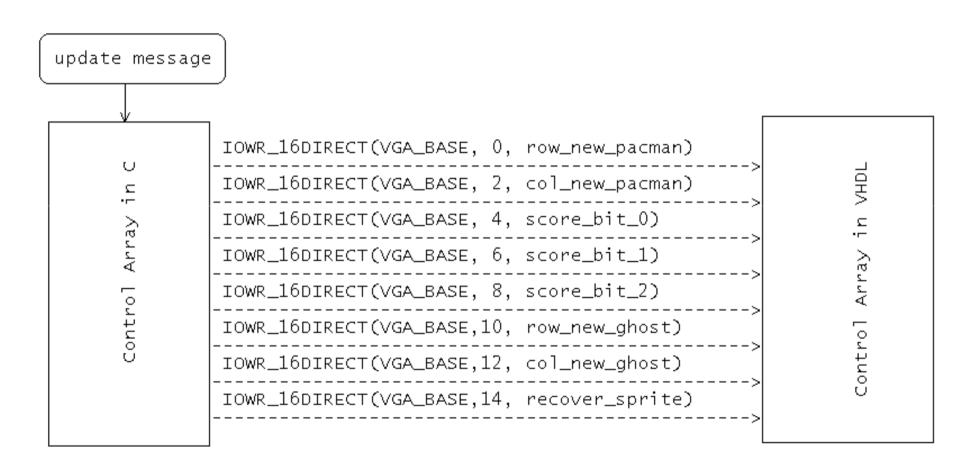
```
// pacman
  : 0001 (0x1)
    int control array[30][40]
// brick
  : 1111 (0xf)
// background
  : 0000 (0x0)
// dot small
  : 0010 (0x2)
// dot large
  : 0011 (0x3)
// ghost
  : 0100 (0x4)
  9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36
 // 0
// 1
// 2
// 3
// 4
// 5
// 6
            // 7
// 8
// 9
//10
//11
//12
//13
//14
//15
//16
//17
//18
//19
//20
//21
//22
//23
//24
//25
//26
//27
//28
```

Control Array (in VHDL)

[We can see the PATTERN of the MAZE!]



How to update the control array in both C and VHDL



DIFFICULTIES

(1) PS2 reading never worked:

Solution: To be able to distinguish the name of DAT from DATA.

(2) The key press does not update the pacman location "sometimes":

Solution: keep sending the control array updates instruction even in the while loop.

```
-- for control array V = 29:
                                                                                 : 0001
(3) How to have more sprites to display, e.g. "score":
                                                                                 : 0010
                                                                                : 0011
Solution: using additional constraints of row number.
                                                                                : 0100
                                                                                : 0101
                                                                  ' E '
                                                                  ' በ '
                                                                                : 0110
                                                                                : 0111
                              for control_array_V <= 27:
                                                                                : 1000
                                                                                : 1001
                                             : 0001
                              pacman
                                             : 1111
                                                                                : 1010
                            -- brick
                                                                                : 1011
                           -- background
                                             : 0000
                                                                                : 1100
                           -- dot small
                                             : 0010
                                                                                : 1101
                           -- dot large
                                             : 0011
                                                                                : 1110
                           -- ghost
                                             : 0100
                                                               -- '9'
                                                                                 : 1111
```

Lesson Learned

- % Knowing how to read ps2 keyboard;
- % Knowing how to make interactive game where the pacman could eat the dots, the score could be updated and the ghost could chase the pacman to the highest extent "my program does".

I sincerely thank Baolin Shao and Scott Schuff during my entire project ---- they are extremely helpful and they always encourage me to see the "bright side" whenever I was clogged in the hardship no matter how stupid my game is.

Their encouragement spurs the pacman come out.