Rodent’s Revenge

In Space

6.111 Final Project

Naoshin Haque
Matthew Kwan
Lynne Salameh
Game Overview

• Tim the beaver is lost in space
• Goal of the game: find wormhole and return to MIT
• On the way, Tim encounters malicious aliens who plan to steal his knowledge in order to conquer the universe.
• Armed only with logs, Tim must defeat the aliens and escape.
**Scoring**

- Tim has three lives at the start of the game.
- Tim receives 100 points if he defeats an alien.
- Tim receives 20 points for picking up power-ups along the way.
- Tim loses a life if injured by aliens.
- The game is over when Tim loses three of his lives.
Display Mechanism

• The screen is divided into several sprites
• The sprites are of different sizes and different (x, y) coordinates.
• Each sprite also has a fixed z coordinate denoting its precedence over other sprites.
• The sprite with the largest z coordinate would eclipse the others.
Basic Block Diagram

Game Controller

Video Controller

Decimator

User Input

x_coor 9
y_coor 8
sprite no 5
score 16
start_frame
busy
next_sprite
done

le_read
le_size

size 3
enemy_sprite 6

LCD SCREEN

HS VS
Decimator

FPGA

RAM 32K x 8

ROM 32K x 8

Address

15

Address

15

output to video unit

Address

6

Choose 2 bits of data for R, G, and B

Separate into 2 bits for R, G, and B

Extend each of the 2 bits to 8 bits

Sign ext to 20 bits

20

Concatenate 2 zeros at end of data

Range

Choose 2 bits of data for R, G, and B

Accumulator

 le_size

size

le_read

X

Tristate Bus

Do multiplication and accumulation for R, G, and B in parallel

6

8

8

6

8

20
Video Controller

Big FSM

Start frame

score sprite_no x_coors y_coors size done

16 5 9 9 3

busy

Next_sprite

from ram of decimator

c control (oe1,we1,ce1)

Address V1

Video Memory

Pixel clock

Sync generator

HS VS

15 input VGA

LCD screen

Control (CE,OE)

Rom 1
AMF020-70

control (oe1,we1,ce1)

Rom 2
AMF010-70

Address V2

Video Memory

Video Memory

FSM (video memory output to screen)

DAC

Control (CE,OE)

Address

Rd

Rd

Rd

Rd

Rd

Gd

Gd

Gd

Gd

Bd

Bd

Bd

Bd

2 Ra

2 Ra

2 Ra

2 Ga

16 5 9 9 3

74LSC74

Pixel clock

control (oe2,we2,ce2)