Physically Immersive Video Gaming

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Can you be Mario?
System Overview

RF Receiver

Suit (N sensors)

RF Transmitter

FPGA #1 Signal Processing

Key Code

Key Mapper

ASCII Key Code

FPGA #2 PS/2 Interface

1-bit Serial

Receive Error

Sensor Data

Sensor Data

8

8
Wireless Module

- Transmits measurements from accelerometers and gyroscope to FPGAs
CC1010

- 900 MHz, up to 76.8 kb/s
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- 1 kb/s minus overhead
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- Embedded 8051 microcontroller
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- 900 MHz, up to 76.8 kb/s
- 1 kb/s minus overhead
- Embedded 8051 microcontroller
- 3 channel 8–bit ADC
Signal Processing

Three Tasks

‣ Distribute Data to proper places
‣ Detect motions
‣ Infer Actions
Signal Processing

UART FSM

Separator FSM

Counter

Wait

Control FSM

Distributor

Interpreter
Signal Processing

- Based on Changes
- Subject to RF constraints
Keyboard Interface

- Convert actions into keyboard strokes
Keyboard Interface

- Convert actions into keyboard strokes
- Use keyboard strokes to play computer games
Keyboard Interface

- Convert actions into keyboard strokes
- Use keyboard strokes to play computer games
- Two modules
  - KeyMapper – Maps actions into scancodes
  - PS/2 interface – Sends scancodes to computer
KeyMapper

- Maps actions into scancodes
KeyMapper

- Maps actions into scancodes
- Programmable
KeyMapper

- Maps actions into scancodes
- Programmable
- Test mode
KeyMapper

Main_Menu

Test_Mode

Control_FSM

Program_Menu

KeyMapper

KeyMap

actions[5:0]

enable

enable

enable

enable

enable

enable

keycode[15:0]

menu_select

return

return

return

next_key keymap

return

keycodes

return

action
PS/2 Keyboard Interface

- Take mapped scancodes and send them to the computer
- Packets of 11–12 bits
  - 1 start bit
  - 8 data bits (scancode)
  - 1 parity bit
  - 1 stop bit
  - 1 acknowledge bit
PS/2 Keyboard Interface
PS/2 Keyboard Interface

Device to Host communication

Host to Device communication
PS/2 Keyboard Interface

Control_FSM

Deserializer

PS2_Clock

Serializer

keycode_in

received

receive_data

line_receiving

data_in

clock_in

generate_clock

clock_out

generate_clock

line_idle

keycode

send

data_out

clock_in
Questions?