BUILD YOUR OWN GAME CONTROLLER

Josef Spjut

SIGGRAPH 2015
AGENDA

5 minutes: Intro
10 Minutes: Arduino LED blink example
10 Minutes: Arduino button example
20 Minutes: Arduino Joystick example
10 Minutes: Place buttons and joysticks on controller base
10 Minutes: Wiring
10 Minutes: Bring it all together (integrate software and hardware)
15 Minutes: Wrap up and testing.
**ASSIGNMENT**

- Build a game controller from the included parts
- Program the game controller
  - Read inputs
  - Send USB Mouse + Keyboard to PC
Developed at Harvey Mudd College

Wooden Controller Base
  - Richard Piersall (Harvey Mudd College ‘16)
  - Kirklann Lau (Harvey Mudd College ‘16)

Arduino Platform
  - arduino.cc
WHY BUILD OUR OWN GAME CONTROLLER?

Learning

- Get experience with circuits
- Learn some basic C programming
- Get experience building things
- Inspiration to make

http://josef.spjut.me
WHY BUILD OUR OWN GAME CONTROLLER?

Selfishness

- Control over behavior
- Control over the feel
- Control over the look
- Control any game!
- Can add functionality
LOGISTICS

- These kits can be purchased from me for $20 (under cost)
- Shopping list on website (after the course)
- Return the kit after otherwise
http://josef.spjut.me

ARDUINO MICRO
HTTP://JOSEF.SPJUT.ME

BREADBOARDS
http://josef.spjut.me

BREADBOARDS
http://josef.spjut.me

BREADBOARDS
PUT ARDUINO IN BREADBOARDS

http://josef.spjut.me
http://josef.spjut.me

IF YOU NEED MORE GROUND PINS
Setup Software

- Start Arduino (start menu)
- Tools->Board->Arduino Micro
- Tools->Port->(something that looks like USB arduino micro)
MAKE IT BLINK

// Josef Spjut

// Blink Example

void setup() {
  pinMode(13, OUTPUT);
}

void loop() {
  digitalWrite(13, HIGH);
  delay(500);
  digitalWrite(13, LOW);
  delay(500);
}
SWITCH

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Diagram of a switch with a resistor (R1) and a voltage source (+5V) connected.
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WIRES
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BUTTON
WIRE BUTTON TO ARDUINO

- One side to Ground
- One side to Pin number
void setup() {
    pinMode(4, INPUT_PULLUP);  // set pullup resistor for button
    pinMode(13, OUTPUT);       // set LED out
}
void loop() {
    int val = digitalRead(4);  // Read button
    digitalWrite(13, val);     // Turn LED to match button
    delay(5);                  // wait 5 ms
}
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KEYBOARD LIBRARY

ButtonKeyboard on website

- Keyboard.begin() // in init()
- Keyboard.press('w')
- Keyboard.release('w')
- Keyboard.print('w') - press and release at once
MOUSE LIBRARY

ButtonMouse on website

- Mouse.begin() in init()
- Mouse.move(x, y, 0)
- Mouse.press()
- Mouse.release()
- Mouse.click() - press and release at once

- MOUSE_LEFT
- MOUSE_RIGHT
- MOUSE_MIDDLE
JOYSTICK POTentiOMETER

http://josef.spjut.me
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JOYSTICK POTENTIOMETER
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WIRE JOYSTICK
http://josef.spjut.me

CONNECT TO ARDUINO
http://josef.spjut.me

JOYSTICK ANALOG

SimpleAnalog on website
// Global variables
const int xAxis = A2;
const int yAxis = A4;

// parameters for readAxis
int responseDelay = 5;
int range = 256;
int threshold = range/4;
int center = range/2;
void setup() {
  pinMode(13, OUTPUT);
}

void loop() {
  int xReading = readAxis(xAxis, 0);
  analogWrite(13, xReading);
  delay(responseDelay);
}
int readAxis(int thisAxis, int isY) {
    int reading = analogRead(thisAxis); // Read analog input
    reading = map(reading, 0, 1023, 0, range); // map the reading from the analog input range
    if (isY) reading = range - reading; // invert y axis
    // if the output reading is outside the rest position threshold
    int distance = reading - center;
    if (abs(distance) < threshold) {
        distance = 0;
    }
    return distance;
}
MOUSE LIBRARY

- Mouse.begin() in init()
- Mouse.move(x, y, 0)
- Mouse.press()
- Mouse.release()
- Mouse.click() - press and release at once
void setup() {
    pinMode(13, OUTPUT);
    Mouse.begin();
}

void loop() {
    int xReading = readAxis(xAxis, 0);
    int yReading = readAxis(yAxis, 0);
    analogWrite(13, xReading);
    Mouse.move(xReading, yReading, 0);
    delay(responseDelay);
}
FLOOR PLAN

- Plan out where you want to place things
- Remember your Arduino and breadboards!
- Please don’t attach breadboards if you don’t plan to buy the kit.

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MOUNT COMPONENTS

- Mount breadboards
- Mount Joysticks
- Stick on buttons
WIRING

- Connect things
- Soldering would be normal
- We’re using 2-sided mounting tape
http://josef.spjut.me

MOUNT BUTTONS

Should, d-pad, Face buttons (your choice)
http://josef.spjut.me

BRINGING IT ALL TOGETHER

- Program and you’re good to go!
- Start a game and test
Available at http://josef.spjut.me/class/ex/BasicController.txt
http://josef.spjut.me
FINISHED CONTROLLER
PLAYTESTING!

- Try out the mouse and keyboard input
- Cube 2: Sauerbraten
- OpenArena
- Should work with Counterstrike, TF2, Battlefield, CoD and more!
MORE OPTIONS

- 3D print the controller base
- Hack an existing controller
- Custom Printed Circuit Board (PCB)
- Advanced firmware
- Wireless:
  - Bluetooth module (BluSmiRF HID)
  - Battery pack
THANK YOU!

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- http://josef.spjut.me
- Other examples: http://pages.hmc.edu/jspjut/class/s2015/e190u/
- Feel free to contact me with any questions!