ECE 153B Final Project Proposal

by Yilong Zeng, Weiyun Jiang, Xin Zhang

Overview:

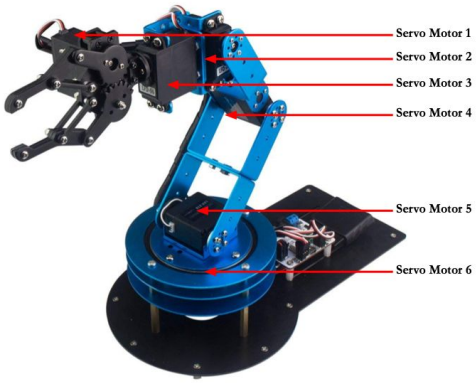

Figure 1. Robotic Arm

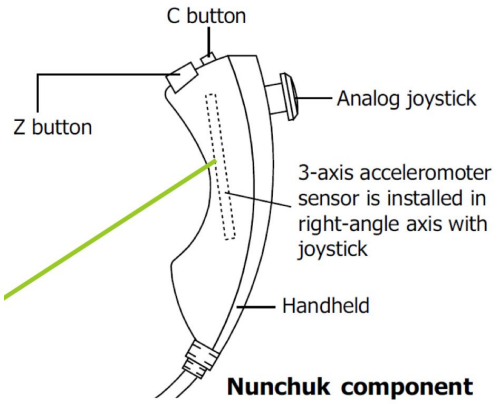

Figure 2. Wii Nunchuk

We are going to use LPC4088 to construct a motion-controlled robotic arm, which has six servo motors. These precision servo motors represent the joints of the robotic arm. Since it has six joints, we would like to use two Wii Nunchucks to control them. We plan to use two methods of controlling. The first method is to control the arm with accelerometers. The second method is to control the arm with joysticks. Firstly, the x-axis, y-axis, and z-axis of the first Wii Nunchuck control motor 6, motor 5, and motor 4, respectively. Similarly, the x-axis, y-axis, and z-axis of the second Wii Nunchuck control motor 3, motor 2, and motor 1 (clamp), respectively. Besides using accelerometers of the Wii Nunchucks, we also want to use the two joysticks and z-button on the Wii Nunchuck to control the 5 motors (omitting motor 6 in joystick method). Specifically, the x-axis and y-axis of the first joystick control motor 5 and motor 4. Similarly, the x-axis, y-axis, and z-axis of the second joystick control motor 3 and motor 2. In addition, the z button of the second one controls the motor 1 (clamp).

Peripherals

1. LDX-218: Digital high torque robot servo motor with full metal gear, use for joint of Arm.
2. LFD-06: High temperature resistance servo motor, use for metal claw.
3. LD-1501MG: Digital high torque robot servo motor with full metal gear, use for large bottom plate.
4. STMicroelectronics (LIS3L02AL): Nintendo Wii Nunchuk Remote

Software Design

We will use I2C to connect the two Wii nunchucks to the LPC4088. Each servo motor has three wires, Vcc, ground and signal. We will connect GPIO pins on the LPC4088 to the servo motors.

Accelerometer method:

By swinging the Wii Nunchuk in different directions, we are able to retrieve the acceleration values for 3 axis at each timepoint through I2C. According to the acceleration values of 3 axis, we are going to generate different PWM signals to control the rotation direction and speed of the servo motors.

Joystick method:

By moving the joystick in x and y axis, we are able to retrieve the position values for 2 axis at each timepoint through I2C. According to the position value of 2 axis, we will generate different PWM signals to control the rotation direction and speed of the servo motors.

Goals

1. Each joint of the Robotic Arm is able to move freely under the control of Wii Nunchuk.
2. The Robotic Arm can be controlled in 360 degrees by motion (accelerometer).
3. The Robotic Arm can be controlled in 360 degrees by joysticks.

Group Responsibilities

- Weiyun is responsible for programming the servo motors and control pins for Wii Nunchuck.
- Yilong will assist Weiyun with programming and responsible for the Website and weekly project progress updates.
- Xin Zhang is responsible for constructing the hardware components of robotic arm.

The Required Components:

1. https://www.amazon.com/LewanSoul-Controller-Wireless-Software-Tutorials/dp/B074T6DPKX/ref=sr_1_cc_6?s=aps&ie=UTF8&qid=1550196816&sr=1-6-catcorr&keywords=robotic+arm
2. https://www.amazon.com/Wii-Nunchuck-Black-Bulk-Packing-Nintendo/dp/B01IO5A534/ref=sr_1_7?ie=UTF8&qid=1550202566&sr=8-7&keywords=wii+nunchucks (Black)
3. https://www.amazon.com/Nintendo-Nunchuk-Controller-White-Wii-U/dp/B0094X2066/ref=sr_1_21?ie=UTF8&qid=1550203436&sr=8-21&keywords=wii+nunchucks (White)