Robot Arm Documentation

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My final project for the class was a wooden 4-axis robot arm. The body of the arm is made of laser cut plywood, and the joints are rotated by 180 degree servo motors.

The arm is controlled by rotating five servo motors, which are controlled using an Arduino Uno board. The code uploaded to the Arduino made to arm controllable by a joystick.

For the sake of learning and making it more fun, I used two Arduino Uno boards for controlling two different parts of the arm, with two separate joysticks.

To be able to connect the five servo motors to the arduino boards, I created a simple shield. The shield had three rows of 10 female to male pins. The first and second rows were connected along a line (but separated from each other). These rows were connected to an external power supply and ground on the Arduinos. The third row had pins that were connected to the digital pins of the Arduinos. The servos were attached to these pins.

The arm works in a way that the Arduino reads the value from the analog pins which is given by the joystick, and according to that value the code converts it into a value for the digital pins to which the servo motors is attached. The servo motors then move to the given position. In the code there is a map function which converts the value of the joystick from 0 - 1023 to 0 - 90.

The given output value tells the servo at precisely which degree it should turn, so I made it to be able to turn from 0 to 90 degrees. One joystick controls the rotation of the base of the arm and the shoulder, and the second joystick controls the elbow and the wrist.

There are 5 servo motors because I used two, instead of one, to control the shoulder, because it needed more torque to lift due to its weight.

The main problem while I was building the robot arm was that the continuous rotation servos that I used at first were not doing what they were supposed to do. That was due to an error in my code. Another problem was that the arm was acting too “violent” because the speed of the servos was very fast and also constant. This problem appeared because the code did not control the speed of the servos, just the position. The servos were moving to the assigned position as fast as they could and that is what caused the arm to be violent. This problem was solved by adding a delay between each degree while the servos were moving to their position.

\*Note: I do not have any pictures of the finished project, because I disassembled it before I created this documentation.