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Course title: ECE1000-001

Project tile: Final Project

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INTRODUCTION

We chose to make a low-cost 3D-printed robot arm controlled by three servos, a joystick sensor, and a Raspberry Pi Pico. We chose this project since it is good for education and outreach demonstrational purposes. The chassis is entirely 3D printed, so assembly of the parts is fairly quick and intuitive.

DESCRIPTION (how work); need circuit and/or 3D prints

We connected the joystick to the Raspberry Pi Pico and coded in Python using Thonny, a Python IDE. We first coded the joystick to show its position on the shell output window of Thonny, then we initialized it to properly read 0 when it was not being moved.

The joystick provides different voltage outputs to the X and Y pins based on the how the joystick has been moved. We then used these values as inputs to two of the servos through the Pi to move the servos accordingly.

We wired up the servos to the board’s 5V, signal (GP0, GP1, GP2), and ground pins. We tested them to verify their positions and to code them properly before attaching them to the chassis.

TOTAL COST and RESULTS (meet expectations?)

* Smraza S51 9g Micro Servos (x3) = ~$5.40.
  + You can buy 10 from [Amazon](https://www.amazon.com/Smraza-Helicopter-Airplane-Control-Arduino/dp/B07L2SF3R4/ref=sr_1_1_sspa?crid=4DGVPN9K7DEM&dib=eyJ2IjoiMSJ9.dQ1RpevCVtzswP8D5ZD46v0AkLse9KH4x9IRShvj1TslUdQeb0gKyNCKsyaXWQA7BJhLIGCL_aH20ZTWhLmSrQZOVCUuNeIFKbP0cmjWMtHSDIcWkln1lwsYzkUCzh_NmwlTXJqdyd34eo-JAEy1Lh2q8aa88FbjZvAG27qN7xECMnLYR9v_AtO2-vLXrpYsu-rA7R6YM3Pgx3Oh9Tx42SmYCb96o2njsYgSQUdpbSCYkZ46F4rzQhY1ON3X2o8LAvKoTZeRWcPqXIb1GXVEq9y8uuInnvlJAXycp2tUwfw.ib1CedAxomuKS5xB7p701sR78kQnC7iItj9YhxiJ1r4&dib_tag=se&keywords=smraza%2Bs51%2Bservo&qid=1712759262&s=toys-and-games&sprefix=smraza%2B%2Ctoys-and-games%2C284&sr=1-1-spons&sp_csd=d2lkZ2V0TmFtZT1zcF9hdGY&th=1) for $18.
* The filament was free for us because we used TTU’s provided 3D printers.
  + A roll of [filament](https://www.amazon.com/OVERTURE-Filament-Consumables-Dimensional-Accuracy/dp/B07PGZNM34/ref=sr_1_2_sspa?crid=KSVP49ZJA4O6&dib=eyJ2IjoiMSJ9.zCuEi3fF7O8WNTPPtRF7PrF2Em2tEspa1hZpWcDz-oDn3ELyMQ6MfgBgfdS4EQzOPHw1VkYhIkcJcGZ9WacM2M9ff3EJHLCqHCAXxcnacsnF-FH3k87ouZSK03EWSNOLRP0mxy6qPB7ftAiz2hOzxidN7u_hXhcnWfG8sI7Q8S-f0Bu-pHEyyFfm7aUWG_7NTGtBdVTmUj08YktHSZZ1LcRcPlw6kgB9tVPpqEYkWq8.7dnxnDcdHEEAfn8QD84t8hq8JQOY9WSQ6iq7HVI7Jzk&dib_tag=se&keywords=filament+pla+white&qid=1712760483&sprefix=filament+pla+white%2Caps%2C106&sr=8-2-spons&sp_csd=d2lkZ2V0TmFtZT1zcF9hdGY&psc=1) costs about $20 or less, and you would not need the whole roll to make the robot arm.
* We were supplied a SB Components Raspberry Pi Pico Breadboard kit
  + These cost $18 from their website.

**Total cost:** ~$25 depending on how much filament you use.

Citations:

We used a design from Thingiverse for our robot arm: <https://www.thingiverse.com/thing:4316282>

We got a lot help with coding the joystick from a tutorial on YouTube by Paul McWhorter:

[Raspberry Pi Pico W LESSON 56: Using a Joystick With MicroPython (youtube.com)](https://www.youtube.com/watch?v=0W8XSJhGux0)

WHY INTERESTED IN PROJECT (concentration?)