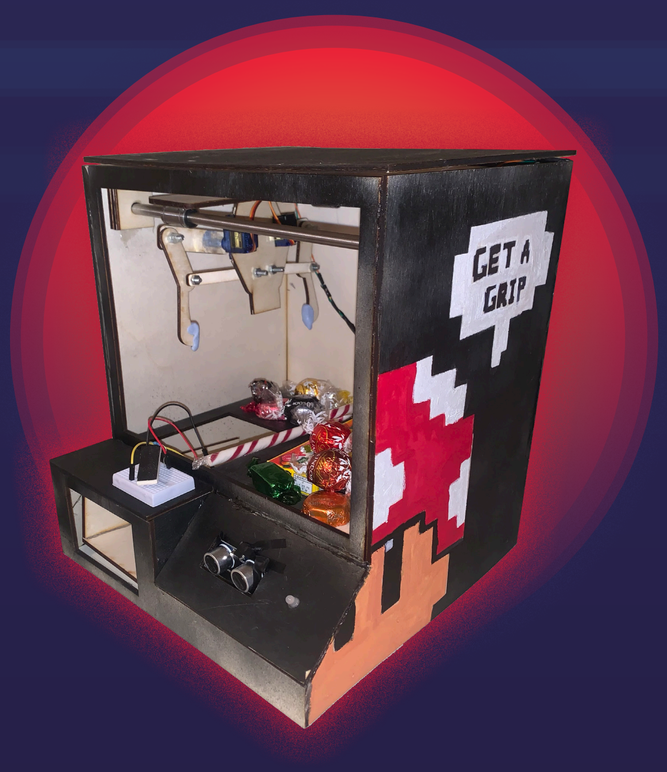
GET-A-GRIP

INTERACTIVE ARCADE



WHAT IS "GET-A-GRIP"?

Inspired by the Japanese UFO-catcher, made popular by SEGA, "Get-a-Grip" brings a more interactive approach to a classic carnival prize game.

By adjusting the distance from the ultra sonic sensor, the player can control the horizontal movements of the claw, operating through the gantry. The player has 20 seconds to move the claw to the ideal spot to grab the prize inside the machine.

PROJECT INSPIRATION

I wanted to construct a gizmo that is entertaining and feels like home. The UFO-catcher is a simple but multifacted game that naturally brings character out of people and encapsulates true joy. Hopefully, this gizmo can bring the same excitement that it has brought to me back in Japan.

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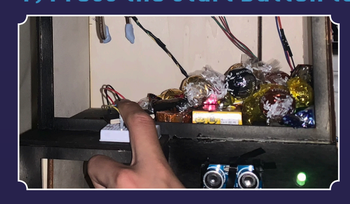
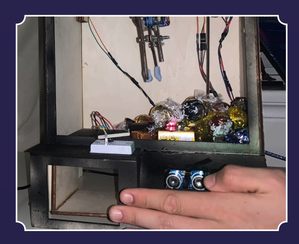
HOW DOES IT WORK?

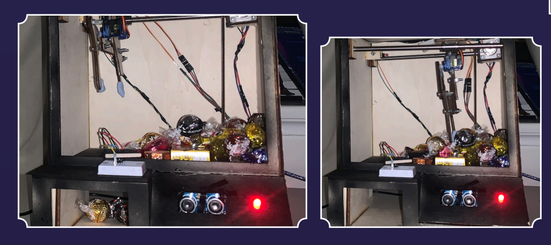
1) Press the start button to begin



2) After a three seconds countdown, move the claw using the sonic sensor
(the distance from the sensor determines the speed and direction of the claw)



4) The claw will return to its orignal location and drop the prize

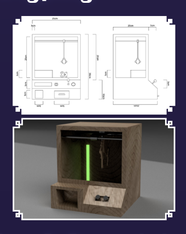


3) After 20 seconds, the lights will yellow and the claw will stop moving horizontally and contract, grabbing whatever is on site

DEVELOPMENTAL PHASE

Digital Prototyping

Initially, the gizmo process was laid out in a document and models were made online via illustrator and CAD to understand how to move forward for the rest of the project.



Material Prototyping

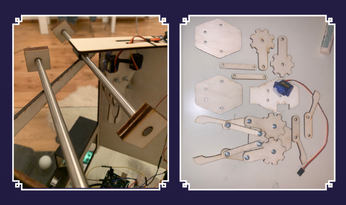
The physical prototyping process was done in order to better understand the design of the gizmo and build components around that. The first iteration was a cardboard prototype important for overall

Mechanical Assembly

After collecting the components required for the mechanical function of the claw game, they were assembled together to create functional parts. Furthermore, the parts were decorated to fit the arcade theme to create a better user experience.

Gantry Development

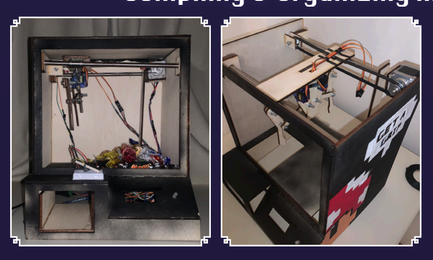
For the first iteration, the claw would use a threaded rod and lead screw; however, the weight of the movement, power of the stepper motor, and cost made it less feasible than using a timing belt.



Claw development

The claw was modeled to be operated by one servo motor; however, after attempting using different sized gears, it proved to be smoother to have two servos operating in opposite directions.

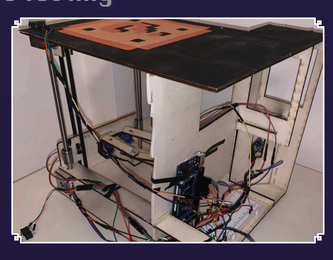
Compiling & Organizing All Components



Once the physical and electrical components were completed, the parts were finally compiled together and organised to easily be accessible for maintenance and functionality. Small changes were made to solve minor issues such as fitting problems and installation errors.

User Interface Testing

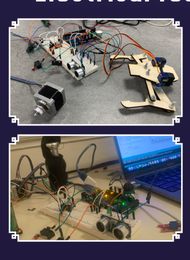
Different user interface methods were tested, including the sound sensor and joystick; however, the most accurate and interactive method was the ultra sonic sensor. Another option was using web-based semi-machine learning programs, thought it was financially and techincally unrealistic.



Arduino Assembly

After testing the electrical equipments separately, the voltage and current were calculated to safely compile all components and install it into the physical machine.

Electrical Test & Coding



To best measure the possibility of the project, each processes were separately coded and tested, then later compiled. The gizmo required an alternative power supply to process correctly.

USER INTERFACE

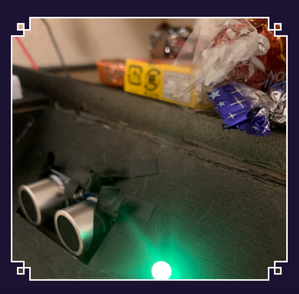
During the design phase, the primary goal was to create a contraption that focuses on user interface, to make the game captivating for the players. To do so, the game must follow the subsequent criterias:

- simple to understand (i.e. using lights and global signals that makes the functionality easy for anyone to follow)
- distinctive compared to other arcade games and traditional controls (i.e. avoid using joysticks and button controls)
- there must be a sense of accomplishment and reason to play

VISUAL: INDICATOR LED LIGHTS

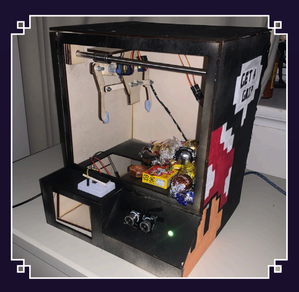
LED lights dictate when the claws retract and open, the player must keep an eye out while moving the claw to perfectly time it to increase the chances of claiming the prize!

1) Initial light green to indicate that the game is ready to start
2a) Bright green light flashes for three seconds to initiate game
2b) Bright green light when the claw is able to move
3a) Yellow light once it's half way through
3b) Yellow light flashes three seconds before end of the horizontal movement phase
4) Red light for automatic movement phase. Claw grabs, returns to original spot, and releases
5) Process repeats



PHYSICAL: ULTRA SONIC SENSOR

The main component of the user interface. By placing your hand a certain distance away from the ultra sonic sensor, you can control the speed and direction of the horizontal movement. The closer you are, the faster it moves in the right direction, and slows down as the distance increases. When there is nothing sensed, the claw will shift left, hence you will always have to be on your toes.

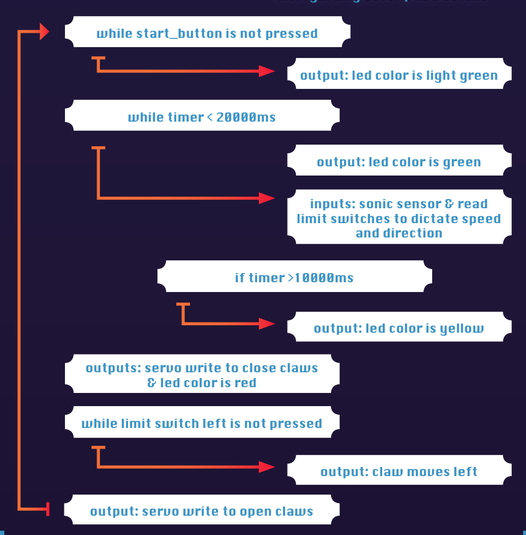


ENTERTAINMENT: ARCADE STYLE

This new twist to a Japanese arcade game is an addicting and thrilling game, as each failed attempt will make you want to try again until succeeding. Traditionally, the "UFO-Catcher" is operated using a joystick or buttons, with a time limit. Compared to that, "Get-A-Grip" brings a unique approach with more physical movements by the player. With bright lights and active user interface, the experience is anything but ordinary.

GENERAL CODE MAP

*disregarding descriptive details



Design Elements

Gantry Design

The gantry that enables the claw to move in a horizontal direction is powered by the NEMA14, using a external power source and A4988 stepper motor driver. The NEMA14, chosen due to its motor strength and small fit compared to other large stepper motors, powers the timing belt that moves accross a pulley wheel and idler. The maximum distance for the horizontal movements is controlled by two limit switches: right and left. When the limit switch is pressed, the stepper motor is prevented from moving further in the same direction, as described in the code.

Claw Design

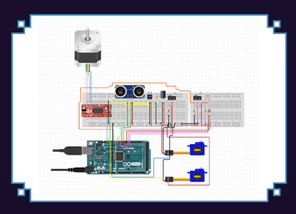
The claw is activated via two servo motor that can contract and retract both claws. Compared to its initial one servo design, the new model operates more consistantly and smoothly. In order to negate the need for vertical movements, the claw was designed to fit the height in its two phases.

TECHNICAL FACTORS

MATERIAL ANALYSIS

The primary materials used for "Get-A-Grip" is plywood. In addition, it utilizes stainless steel rods and linear bearings for smoother movements and curvitures. Plywood is easy to shape into different components that are two dimensional, such as the walls and claw. It is 4mm thick, light, and durable, making it versatile for various parts of the gizmo.

DISASSEMBLY OF ELECTRICAL COMPONENTS



- 1 x Arduino MEGA 2560
- 2 x 90g Servo
- 1 x NEMA14 Stepper Motor
- 1 x A4988 Driver
- 1 x Ultra Sonic Sensor
- 1 x RGB LED Light
- 3 x 220 Ohms Resistors
- 1 x 1k Ohms Resistor
- 1 x 100microF Capacitator
- 2 x Limit Switch
- 1 x 12V Power Supply