

Harry Fultz Robotics 2021-2022

Club: Robotics 3-6 (Ad Astra)

ASTRACADE

Raspberry Pi Arcade Machine



Introduction

Arcades are one of the most important breakthroughs in the history of video games! They acted as the prominent point of innovation in the 70s and are looked upon whenever the industry takes the next step, as it has served the developers as a muse for the future. Now they are considered outdated, and with the world of video games coming closer to players, arcades are no longer considered a primary way of playing games. I was inspired by TV shows like “Stranger Things” to create my bar-top arcade machine.

1. Name of the project and typology

Project Name: ASTRACADE

Themes: Entertainment, Video Games, Raspberry Pi,

Format: Robotics 2021-2022

2. General Description

ASTRACADE is an arcade machine built upon the Raspberry Pi 4 microprocessor that acts as the foundation for the platform on which the games are played. The video games I have incorporated are old Capcom games that you would find in arcade machines back then, being side-scroller games that match the player against waves of enemies. As a monitor, I used an old CRT TV that my professor had in his house to create the feeling of an old arcade machine. I could connect the buttons and the microprocessor using a circuit called Makey Makey. The design is built with wood planks and is painted black for a more aesthetic view.

3. Detailed description of the project

3.1 Project Background

ASTRACADE is the only project in the 2021-2022 robotics competition that used computation.

The project started with installing the Retro Pi system that turned the Raspberry Pi into an emulator for arcade games. Along with the installation of Retro Pi, I had to pick some games among hundreds that are already in the internet. I prefer old sidescroller fighting games, so I outfitted the arcade with two of them. They were enough for me to test the arcade out. The Raspberry Pi was connected to the CRT TV using a VGA to HDMI adapter to display the signal on the screen. Being an old TV, I had to open it and rewire the circuit that controls the startup of the TV with a push button outside the plastic cover of the TV.

To connect the Raspberry Pi with the buttons, I first needed to connect it to a keyboard interface like Makey Makey, essentially simulating keyboard input by creating contact between ground and copper plates. This “keyboard” is configured using a real outside keyboard, assigning different keys to different buttons in the arcade. After configuration, the wires are grouped and closed off; meanwhile, the buttons are placed and fixated in the body of the project.

The wooden body is constructed with planks in the shape that a typical bartop arcade would look like. The ordered design was very different from the schematic I was following, so I had to rework the body. I repurposed old wooden drawers lying around in the laboratory to create a steady foundation for the TV and the top of the arcade. The back was left open to prevent overheating.

3.2 The purpose and objective of the project

The project's goal is to repurpose a Raspberry Pi into an arcade and use an interface like Makey Makey efficiently to control the button inputs. ASTRACADE needs to bring a sense of nostalgia to its user, so using a CRT TV is essential to the process. The body of the arcade must be The project's objectives are as follows:

- The creation of a bartop arcade machine.
- Using the Makey Makey board as an input interface.
- Using an old CRT TV to bring nostalgia to players.

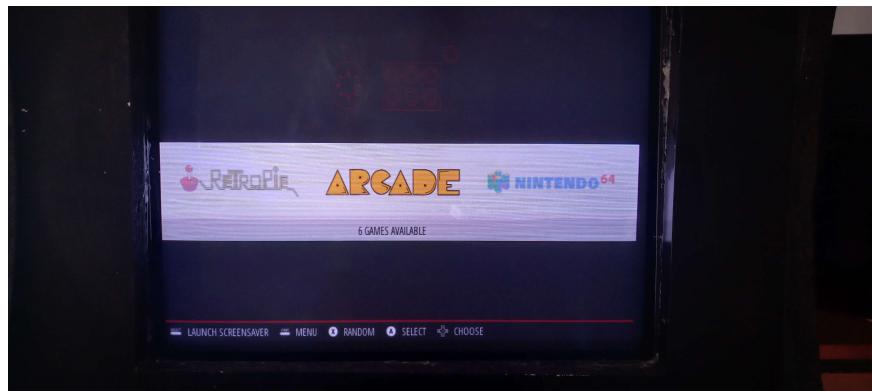
3.3 Requirements and results

Requirements:

- Creating a system where you can play old arcade games using a microprocessor.
- Creating an input interface similar to those from ordinary arcade machines.
- Using an old CRT TV to bring the old feeling that arcade screens used to have back in the day alongside the smooth wooden structure.

Results:

- Built an arcade system based on the Raspberry Pi microcontroller, using very little power and making software navigation simple and easy for every player.
- Built a button interface using the Makey Makey board.
- Created a model that resembles bartop arcade machines using a CRT TV to bring the old visual aesthetic back.



4. Development

4.1 Work plan

Preparation phase:

March 2022:

The work begins with uploading the Retro Pi system into the Raspberry Pi 4 microprocessor. I use a monitor and a keyboard to visualize the work. I upload the games and the system using an SD memory card. Meanwhile, I ordered the design to be built by a local carpenter. I fixed a minor issue with the CRT TV and adapted it to work with the Raspberry Pi HDMI port to display the output signal. I researched the Makey Makey board and worked out how it would replace the keyboard as the button input interface for the Raspberry Pi.

Development phase:

March 2022:

During the development phase, I worked on securing all connections and grouping them so that the cables wouldn't tangle. I got the model back from the carpenter, but it still needed work to fit the CRT TV. After I fixed the design, I started painting it black, using stickers on the side to decorate it a bit. I laid down the buttons and finished before preparing them for the robotics fair.



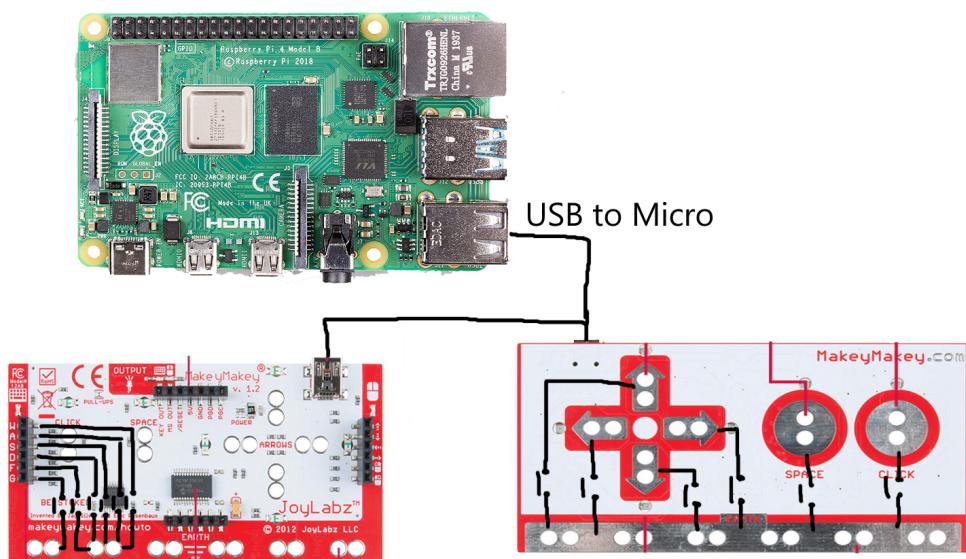
Final phase:

March 2022:

During the final phase, I did some bug fixes and minor repairs from the damage during transportation.



4.2 Electronic Schematics



4.3 Problems throughout development

There was a minor issue I encountered during the project development:

1. Heating:

Both the Raspberry Pi and CRT TV would heat a lot during gameplay sessions. This was a bit hazardous, so I had to be careful not to leave flammable objects behind the arcade and control the airflow.

5. Budget

No.	Name	Unit	Amount	Price per unit	Price
1	Raspberry Pi 4 B	piece	1	\$35	\$35
2	VGA to HDMI adapter	piece	1	\$20	\$20
3	Makey Makey	piece	3	\$7	\$21
4	Push Buttons	piece	12	\$6	\$6
5	Makey Makey	piece	1	\$12	\$12
7	CRT TV	piece	1	\$0	\$0
9	Carpenter Design	piece	1	\$40	\$40
10	Decorations	sticker	2	\$10	\$20
Total					\$144

* Price of the power block isn't included since the school laboratory provided the IC and the price was not mentioned.

6. Work Group

Project developers:

- Darti Lila – Electronics, Programming and 3D design

Project Supervisor:

- Msc. Eugen Hoxha

7.Photo of Final Product:



Club Supervisor: Eng. Eugen Hoxha, Eng. Klarens Hoxha

Head of Electronic Department: Eng. Eneida Allkoci