# RPi Arcade

Project Advisor: Paul Hatalsky
Project Lead: Brandon Kelley
Project Team: Alex Boyd, Garrett Chan, Ryan Eakins, Chauncey Neyman, Sang Cho, Ian Washburne, Eugene Chiang, Andrew Epperson, and Eric Parella

## Description

The goal of this Raspberry Pi (RPi) based project is to create a functioning handheld arcade. The arcade will use VisualBoyAdvance as an emulation software and downloadable Read-Only Memory (ROM) files to run classic Gameboy games as programs on a Debian-based operating system, all processed by a Raspberry Pi 2 Model B CPU. The Raspberry Pi will also be conveniently available for future application based on its ease of manipulation. That being said, it will be specifically programmed to function as a handheld, touch screen game system. The project will span the length of Spring quarter at Cal Poly, scheduled for completion June 6, 2015.

## Purpose

The purpose of creating an arcade from an RPi circuit board will be to allow engineers of the Sigma Phi Delta fraternity to get hands-on experience with setting up a functioning computer from scratch and programming it to accomplish a specific task. The process requires a variety of knowledge and thus signifies potential for learning among programmers and non-programmers alike. In addition, those who are already familiar with related skills will gain a chance to practice and refine what they have learned for use on their professional portfolio. This is an opportunity to work on a project team toward an established goal with an established timeline, which is an important experience for an engineering student. In addition, this project represents the beginning of professional projects structured and housed by the Beta-Nu chapter of the Sigma Phi Delta fraternity at Cal Poly.

## Equipment and Budget

In order to pursue the RPi Arcade, a number of materials will be required. The specifications of these are as follows:

- Raspberry Pi 2 Model B with Broadcom BCM2836 ARMv7 QUAD Core processor and 1GB of RAM
- PiTFT Enclosure for Raspberry Pi 2 Model B
- Kingston Digital 16GB microSDHC Class 10 UHS-1 Memory Card with Adapter
- SD card reader
- 5V 2.5A Micro-USB Charger
- EDUP 300Mbps 802.11n Wifi Adapter
- PiTFT 320x240 2.8” Capacitive Touch Screen Kit
- Any monitor, keyboard and mouse combination, with cables
- Soldering set
- Software (VisualBoyAdvance, Touch Screen drivers, Raspbian, etc.) and ROMs

A portion of the necessary supplies can be obtained from various team members and online sources without purchasing. This results in the following budget outline:

| Item | Source | Qty. | Unit Price | Tax | Shipping | Subtotal | Total |
|---|---|---|---|---|---|---|---|
| RPi Circuit Board | link | 1 | $35.00 | $5.25 | $7.99 | $48.24 | $48.24 |
| RPi Enclosure | link | 1 | $9.95 | $0.00 | $4.79 | $14.74 | $14.74 |
| SD Card | link | 1 | $7.95 | $1.28 | $8.00 | $17.23 | $17.23 |
| Power Cable | link | 1 | $4.59 | $0.00 | $0.00 | $4.59 | $4.59 |
| Wireless Adapter | link | 1 | $19.95 | $0.00 | $8.02 | $27.97 | $27.97 |
| Touch Screen | link | 1 | $59.99 | $0.00 | $4.99 | $64.98 | $64.98 |
| | | | | | | Grand Total: | $177.75 |

With a final budget of $177.75, including all expected cost, this project falls well within the budget parameters set forth by the fraternity. It should be noted that since this technology and anything pertaining to it is being chapter funded, it will be maintained by the fraternity and put to further use as dictated by active membership. Specifically, there has been an interest in using it to enhance the rush booth. Another such use could be as a server for code development. The general idea, however, is that it could be integrated into future projects.

## Timeline

In order to ensure the smooth execution of this project, a timeline (shown below) has been created with goals to be completed and presented on the date provided. A more detailed description of each milestone is provided under the “Milestones In-Depth” heading.

| Date | Expected Progress | Skills Required |
|---|---|---|
| 04/10/2015 | Purchase all materials and research | General research |
| 04/17/2015 | RPi functioning with operating system | Use of Disk Image files and basic Linux Commands |
| 04/24/2015 | Games are playable with downloaded ROMs and attached keyboard and display | File installation and associated Terminal processes |
| 05/08/2015 | Emulator runs automatically on startup | Editing Linux configuration files and Bash command knowledge |
| 05/29/2015 | Touch screen integrated with Graphical User Interface (GUI) and power selector | Soldering display to board and programming touch events |

Team Structure

RPi Arcade will consist of 10 team members who will cooperate in small groups, researching and implementing each step of the project. The success of this project will lie in the hands of each team as they progress through their assigned portion of the work. As a result, tasks will be delegated to teams based on their ability to do what each task requires. For example, when soldering needs to be done to attach the touch screen to the RPi board, it will be done by a member who can efficiently solder and has experience doing so. While this project is meant to be a learning opportunity for those involved, a neat final result is also a high priority. It is important to note that while each task is assigned to a specific team, there is no restriction on the group members not to participate or observe. The team assignment for each task is charted below:

| Date | Team | Expected Progress | Rational |
|---|---|---|---|
| 04/10/2015 | Brandon Kelley | Purchase all materials and baseline research | Project Lead |
| | Eugene Chiang, Ryan Eakins and Garrett Chan | Plan for next deadline | N/A |
| 04/17/2015 | Eugene Chiang, Ryan Eakins and Garrett Chan | RPi functioning with operating system | Garrett Chan has interest in operating systems |
| | Eric Parella and Sang Cho | Plan for next deadline | N/A |
| 04/24/2015 | Eric Parella and Sang Cho | Games are playable with ROMs and attached keyboard and display | Eric Parella familiar with file installation and associated Terminal processes |
| | Chauncey Neyman and Alex Boyd | Plan for next deadline | N/A |
| 05/08/2015 | Chauncey Neyman and Alex Boyd | Emulator runs automatically on startup | Have had related classes and strong work ethics |
| | Ian Washburne, Brandon Kelley and Andrew Epperson | Plan for next deadline | N/A |
| 05/29/2015 | Ian Washburne, Brandon Kelley and Andrew Epperson | Touch screen integrated with Graphical User Interface (GUI) and power selector | Experienced with programming event listeners and interfaces, soldering, circuits |

As is evident by the table, each team will be required to give a plan of what they will do to accomplish the goal set for them. This will be done simply by having them give a short presentation on their ideas and filling out the attached form (RPi Arcade Milestone Plan) for the

sake of organization. The project team will have weekly meetings at which the status of the project will be discussed and any milestones due at that date will be presented.

Milestones In-Depth:

Purchasing Supplies - 04/10/2015

Order and receive all materials related to RPi Arcade. Ensure quality of items.

Operating System - 04/17/2015

Retrieve a copy of Raspbian operating system (open source) and install it to the microSD card from a computer. Test run the system on the RPi with a display and keyboard attached.

Emulator and ROMs - 04/24/2015

Retrieve VisualBoyAdvance for Raspbian and install it onto the RPi. Download a couple of ROMs of popular games and test them. Troubleshoot where necessary.

Automating Arcade Startup - 05/08/2015

Research architecture of Raspbian and find out how to add VisualBoyAdvance program to the boot up sequence.

Integrating Touch Screen - 05/29/2015

First, there is a hardware aspect. This will involve soldering the screen to the circuit board and programming the interface to interact with a power button. Then, there is a software portion. In this part, drivers will be added to the RPi to support a touch screen and then graphical interfacing will be programmed in.

End Result:

The execution of this project will result in a small, contained touch screen device that will produce arcade games when turned on and function like a full computer when prompted. The figure below shows an example of the RPi circuit board integrated with the Adafruit touch screen and case as is the setup chosen for the project.




http://www.adafruit.com/images/480x360/1892-02.jpg

# RPi Arcade Milestone Plan

Names of team members:

Milestone:

Approach:

Software Required (if any):

Possible Difficulties: