



IOWA STATE UNIVERSITY

AEROSPACE ENGINEERING DEPARTMENT
COMPUTATIONAL TECHNIQUES FOR AEROSPACE DESIGN
AERE 361

PROJECT PROPOSAL
TEAM DAEDALUS

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I ABSTRACT

As it is, the living spaces of modern college students are not that big. Dorms and apartments alike are created with the intent of housing as many students as possible in as small of a space as possible. This creates an obstacle for students when it comes to the types of recreational activities they are able to pursue in these small spaces. Inspired by the basketball-shooting games found in arcades, we have decided to create a scaled-down version that will allow college students to practice their basketball-shooting skills in a confined environment. This game will also help foster friendly competition among students and will provide a chance for them to gather together.

Our basketball-shooting game will display many of the same features found on the commercial games found in arcades. To accomplish this, we will be using the Circuit Playground Express circuit board and its array of sensors. Firstly, we will be design the physical court using inexpensive materials such as cardboard and plastic. We will then use the CPX board's light sensor, which will be mounted on the backboard, to detect when a ball is passed through the hoop. We will also create a program to display the time remaining on the game as well as the current score. Upon a successful shot, the user's score will increment, and this will repeat until the timer runs out. We will also utilize the LED lights on the CPX board to create a visual effect whenever a shot is made. With all of these features implemented, we will have created a fun game that college students can utilize in their small living spaces.

II INTRODUCTION

In this project, our team will use our programming skills learned in AERE 361 along with the Adafruit Circuit Playground Express to create an arcade-like mini basketball game. Our team, Team Daedalus consists of members, Andrew Finfrock, Ricardo Herrera, Otis Miller, James White, and Yolanda Zhang. We are all upperclassmen majoring in aerospace engineering at Iowa State University and we are currently taking the Advanced Programming for Aerospace class, AERE 361.

For this project, we wanted to create a fun, portable, simple game that could be played in small spaces yet still be entertaining. We wanted a game that could be used for stress relief as a quick study break, or as a friendly competition when hanging out with friends. With this criteria in mind, we landed on the idea to make an arcade-like mini basketball game, perfect for this project with the added bonus of improving one's hand-eye coordination.

III FEATURES

1. detecting a ball as it goes through the hoop This is the main feature of the game as without it, it cannot function. This also becomes important because it allows us to manipulate the game rules by changing how many points you would receive for getting the ball in the hoop. This feature is also critically important. 2. counting score according to game mode rules Counting score is the next feature we need to highlight as this goes hand in hand with the

first feature of detecting the ball. If we are able to detect the ball but not able to count the score then the game isn't much of a game at all. This feature is also important for the next feature of changing the game mode. Changing how we count the score is the main way we can create different game modes. 3. ability to switch game modes with a human machine interface And finally our game will have different game modes and allow the player to choose whichever mode they want. This adds to the game's replay-ability and really works to tie the other two features together as all three of these features need the other for the game to function.

Your Features section must include a listing of at least three key features that makes your project unique. Each item needs to be backed up with a description of what it will do and why. A listing of just three items is not enough, you need to describe what those features are and why your group feels they are needed. For that reason your features should have a paragraph for each key item that describes what that key feature is. A key feature should be something that is significant to your project. For example, a key feature an autopilot system is the ability to be able to set an altitude and the autopilot will automatically set the airspeed. That is a significant feature that has a large impact on that system.

IV PROBLEM STATEMENT

Here you will go into more detail on what problem you hope to solve or address. You should discuss what the problem is and why it is important to solve it. In this section, you need to be clear on what the problem is, so do not think of this as a "light" section. It helps to define your project.

Your team needs to do some research into the problem at hand. Because of that, you should have around two to three references that you are pulling from. There are lots of places you can find references from including the ISU library and Google Scholar. I would also suggest looking at Adafruit's website, as you may find inspiration or looking to improve something already there. Remember to cite your sources though. If you find something online, that can often be citation.

When you create your "ref.bib" file, don't forget to follow the standards for a BiBTeX file. Certain things like webistes requires certain keywords for it to render properly. There are lots of sources online to help with this and many places like the ISU Library and Google Scholar can also generate text that is compatible with a BiBTeX file. Once you have your Bib file ready, don't forget to cite your citations in your proposal like this [2] or this [1].

V PROBLEM SOLUTION

The solution to this problem we have decided on pursuing is a game to be played as a healthy interruption for study breaks and general recreation. The game will be similar to basketball involving tossing a ball through a hoop to gather score. Much like the basketball games found in arcades. Though we will be building a portable compact version, for use in college dorms and on campus.

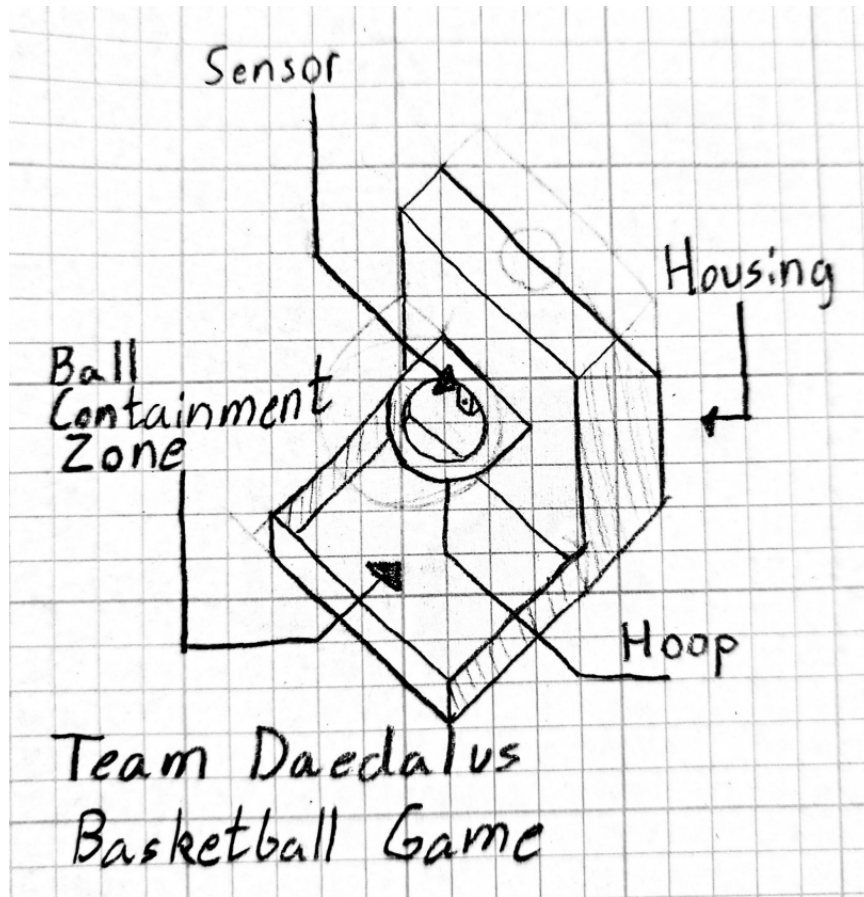


Figure 1: Rough Sketch of the Basketball Game Design

To achieve this we will be using the Adafruit Circuit Playground and a light sensor. We will build a structure that will house the electronics and act as the hoop for the basketball game. The light sensor will be mounted in a position beneath the hoop to detect if the ball thrown by a player enters the hoop because it will break the beam and send a different signal back to the Circuit Playground. The physical hoop structure itself will be responsible for ensuring the beam will only break if the ball enters the hoop. The software we will develop will then use this signal to tally score during a timed interval when the game is started. We will also be changing how score and time is recorded and set depending on some different game modes we will develop once we have a simple functional prototype.

With the final product the user should be able to select a game mode with the buttons on the Circuit Playground. Then during a timed interval the product will tally how many times the ball goes through the hoop and then give the total back once time is up.

Table 1: Parts we will be using

Part description	Qty
Adafruit Circuit Playground Express	1
Light Sensor of the Circuit Playground	1
AAA Battery Holder	1
USB Cable	1

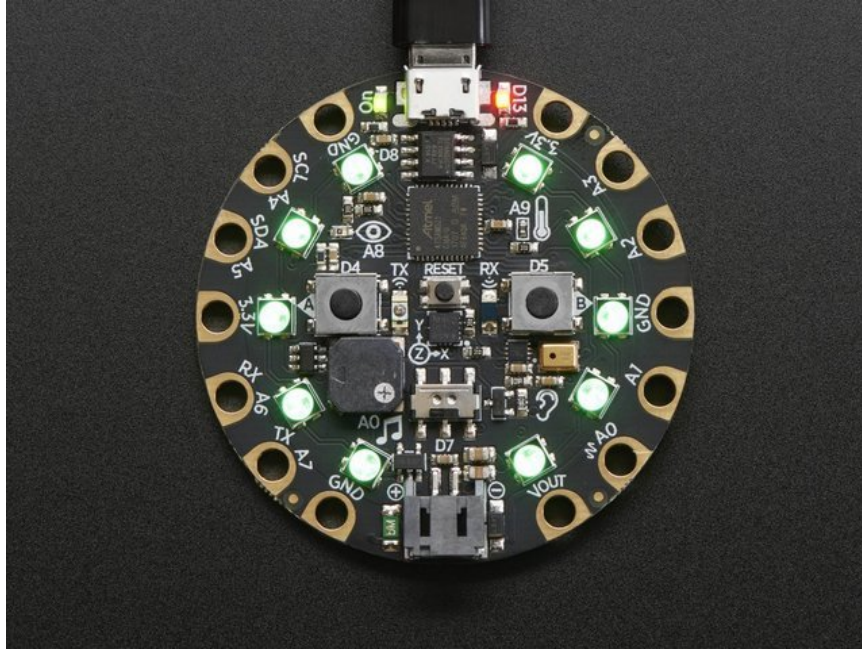


Figure 2: This is the Circuit Playground Express

VI CONCLUSION

With small living spaces, it can be difficult for college students to find a form of friendly completion that doesn't lie within video games. Our proposition to this challenge is to create a scaled-down basketball-shooting game using a CPX circuit board. The multitude of sensors and LED lights on the build will allow us to create a functional game that can provide students with entertainment and competition among their peers.

References

- [1] Paul Adrien Maurice Dirac. *The Principles of Quantum Mechanics*. International series of monographs on physics. Clarendon Press, 1981. ISBN: 9780198520115.
- [2] Albert Einstein. “Zur Elektrodynamik bewegter Körper. (German) [On the electrodynamics of moving bodies]”. In: *Annalen der Physik* 322.10 (1905), pp. 891–921. DOI: <http://dx.doi.org/10.1002/andp.19053221004>.