Individual Progress Report

Proof of Concept A

Project Details

Project name	Cat's Conundrum
Group Number	C7
Author, discipline	Elizabeth Andrews, CS
Reporting period	Jan. 2018 - Jan. 2018
Date Due	Jan. 29

Summary

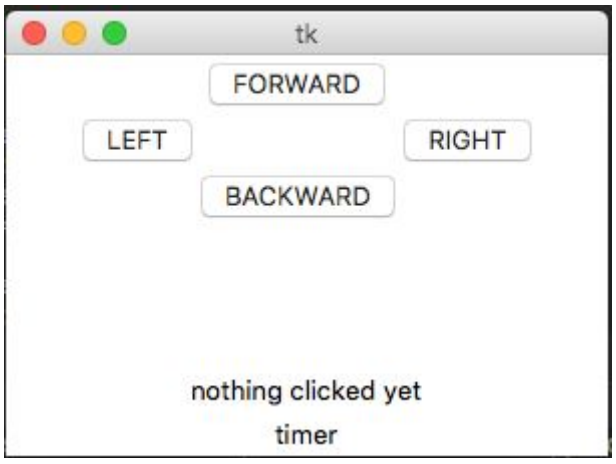
For the majority of this reporting period, I was mainly doing research and conceptual design to get a big picture idea of how I want to implement my portion of this project. My goals for this period were:

- Establish functional requirements and objectives for the Graphical User Interface I will be creating
- Determine several different options for a microprocessor based on the both the functional requirements that I determined previously and the needs of my electrical engineer
- Collect resources and references that I can look back on throughout the project to help with both implementation and design
- Identify resources available from the Makerspace

I also came up with three main questions that I am aiming to answer in order to better define what I hope to accomplish with my section of this project:

Question 1:	How will I interface the GUI with whatever microprocessor we decide to use?
Given:	We have purchased a microprocessor that meets our already determined needs
Find:	An effective way to interface and connect the microprocessor to the car and send information to the motors.
Assumptions:	The microprocessor has a way to connect using either Bluetooth or a wireless Internet connection.
Diagrams:	N/A
Solutions:	TBD, will have a more concrete solution once we have decided on a microprocessor.

Question 2:	How can I create a simple, yet functional GUI to interact with the microprocessor?
Given:	A microprocessor that can use a programming language with some library that supports the creation of a GUI.
Find:	A coded GUI that can communicate with the chosen microprocessor in the specified programming language.

Assumptions:	N/A
Diagrams:	Current prototype (written in Python): 
Solutions:	The prototype above seems to be simple and effective. I will be able to refine it more when we have purchased a microprocessor.

Question 3:	What physical platform should the GUI operate on? Phone, laptop, something else?
Given:	An object that can effectively run the program and has the ability to connect via Bluetooth or wireless Internet connection to the microprocessor.
Find:	The optimal physical platform to run the GUI program on.
Assumptions:	The chosen object can connect via Bluetooth or wireless Internet.
Diagrams:	N/A
Solutions:	This question also depends on which microprocessor we decide to purchase for the project. If we use a microprocessor that interfaces using a C-based language, I will probably write the GUI to be used on a smartphone. If our microprocessor interfaces using Python, I will most likely write the GUI to be used on a laptop.

I have also compiled a list of websites that I will use as a reference when I start writing the final version of the GUI and interface:

- Official Python documentation at https://docs.python.org/3/
- Python documentation on writing a GUI at https://docs.python.org/3.2/faq/gui.html
- Video discussing using wifi and port forwarding to interact with a microprocessor at https://www.youtube.com/watch?v=CpEwKRUGXko
- More information about port forwarding at https://www.hackster.io/whitebank/raspberry-pi-remote-control-car-camera-a7c7bf
- Resources on controlling DC motors with a raspberry pi at https://business.tutsplus.com/tutorials/controlling-dc-motors-using-python-with-a-raspberry-pi--cms-20051 and https://www.raspberrypi.org/magpi/rc-car-raspberry-pi/ and http://www.instructables.com/id/Raspberry-Pi-Smartphone-Controlled-Rc-Car/
- Combining a Raspberry Pi and a GUI at https://www.baldengineer.com/raspberry-pi-gui-tutorial.html and https://www.lifewire.com/make-simple-guis-with-the-raspberry-pi-using-easygui-4094706

- Another video containing a basic introduction to using a Raspberry Pi at https://www.youtube.com/watch?v=Jj4pjfU_-jo

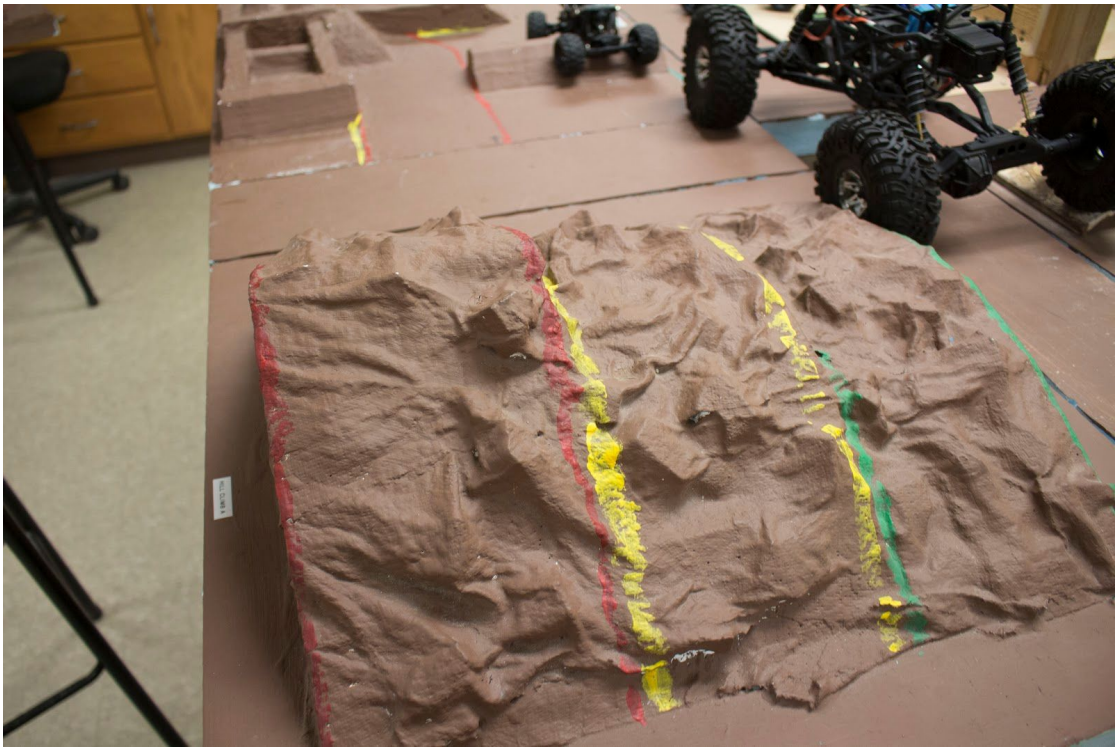
Activities

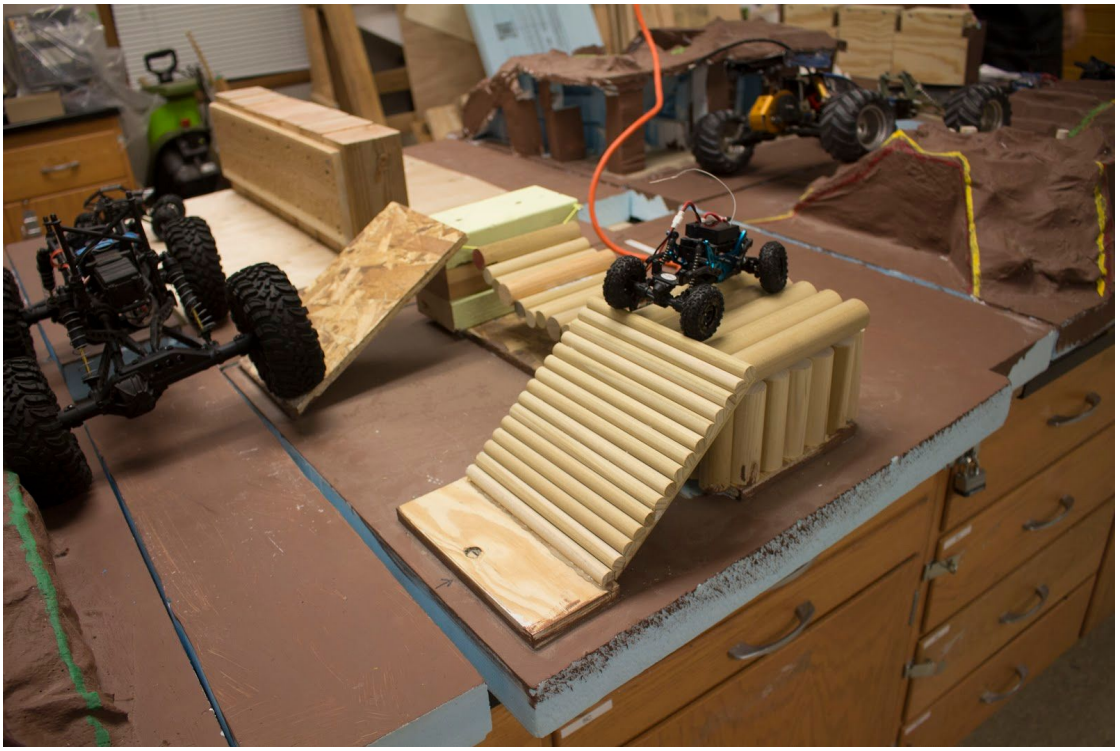
Establish Functional Requirements and Objectives

Status	**Achieved**
Objective	Establish a list of functional requirements and objectives for the CS portion of the project based on both my own needs and the needs of my team members, specifically my electrical engineer.
My time on this task	~3-4 hours
Support team member(s) time on task	Alyssa Ferry: ~2 hours
Visual Progress Update	N/A
Current Progress	Based on discussions with my electrical engineer and my own research, I created a general list of what my portion of the project needs to achieve: ● A Graphical User Interface (GUI) that will run on either a phone or a laptop. The choice of either a phone or a laptop will depend on whether I use Bluetooth or a wireless connection to connect to the microprocessor. This is still to be determined at a later time. ● The GUI needs to successfully interact with the microprocessor to steer and control the vehicle. ● The GUI needs to be relatively simple and easy to use.
Outputs created	The above list of requirements and functionalities is what has come out of this activity.
System Integration Considerations	Since my team has an Industrial Engineer, speed needs to be considered when connecting the GUI to the vehicle. Should the GUI display the current speed and time? If so, how will I connect to and get data from the accelerometer? Should the GUI be able to speed the vehicle up or not?
Challenges/Lessons learned	My Electrical Engineer wants to use a specific microprocessor that she has used before for the project, and is not willing to compromise and consider any other options, even though I have told her that the one she has picked out will be more difficult for me to code. This will make the interfacing portion of the GUI more challenging than I originally expected.

Identify Resources Available from Makerspace

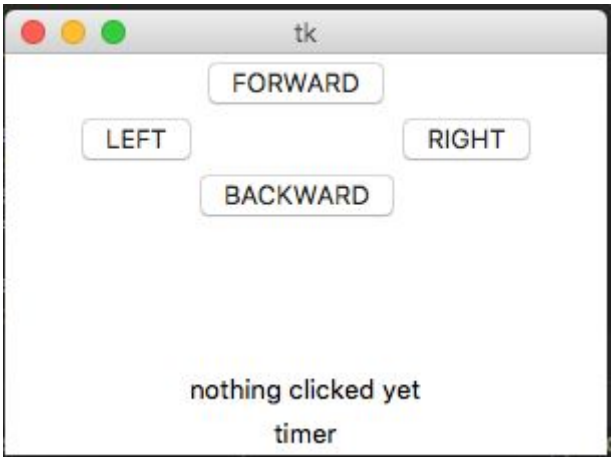
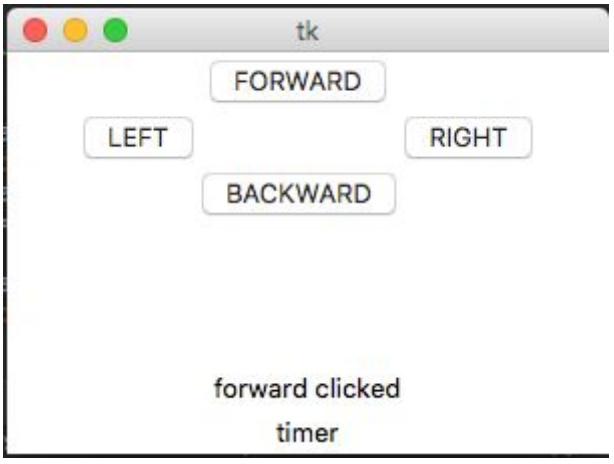
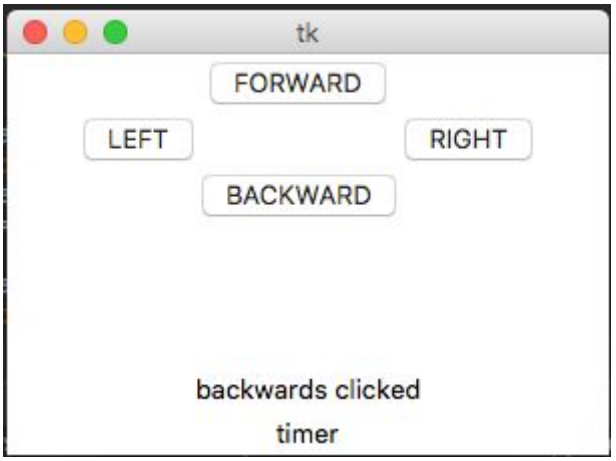
Status	**Achieved**
Objective	Visit the MSU Makerspace and identify resources and tools that are available for our team to use throughout the project.
My time on this task	1 hour

Support team member(s) time on task	Alyssa Ferry: 1 hour Jacob Johnson: 1 hour Ryan Lane: 1 hour Mubarak: 1 hour
Visual Progress Update	These are only a few of the pictures that Mubarak took of the obstacles in the Makerspace. The rest of them are located on the team's Trello board and on the Group Progress Report.  

	
Current Progress	My team and I figured out a time that we were all available, and the five of us went to the MSU Makerspace together. For most of us, it was our first time visiting the Makerspace. We spent about an hour in the Makerspace looking at all the tools and talking to Matt about the available resources. Matt talked to Alyssa and I extensively about the different microprocessors that are available for purchase, and the pros and cons of the different options. Jacob and Ryan examined all of the vehicles that were there, and seemed to get some good ideas about implementation and building our team's vehicle. Mubarak took lots of pictures that we can use for future reference and documentation.
Outputs created	Our team became more familiar with the Makerspace and was able to identify all of the different tools we could use. We also were able to look at all of the obstacles available for the course and start thinking about which ones we want to use.
System Integration Considerations	N/A
Challenges/Lessons learned	The biggest challenge for this activity was figuring out everyone's schedules to find a time that was available for everyone to go. This will probably be an issue for the entire semester, since we all have lots of other time commitments.

Create Graphical User Interface

Status	In progress
Objective	Write a simple GUI that can successfully interface with the chosen microprocessor.
My time on this task	~2 hours
Support team member(s) time on task	N/A

Visual Progress Update	Basic prototype on startup, before clicking anything:  After clicking the FORWARD button:  After clicking the BACKWARD button: 
Current Progress	I have written a very simple GUI that has four buttons: FORWARD, RIGHT, LEFT, and BACKWARD. There is also a label to show what button was last clicked and a label that will eventually display a timer that will start counting as soon as the first button is clicked.
Outputs created	The basic GUI prototype has been created. At the moment it doesn't actually do anything functional because I am waiting on the microprocessor.

System Integration Considerations	The GUI is currently being written in Python because Python is one of the simplest languages to use for a project that will be integrated across several platforms (in this case, the microprocessor and the device that is running the GUI). The language might need to be changed to a C-based language later, depending on the microprocessor we choose.
Challenges/Lessons learned	It is challenging to write a functional, working GUI that meets all my requirements without having access to the microprocessor that we will be using. I am glad though that I have already started on a basic prototype, because whenever we do purchase our microprocessor I will have at least started on a very basic GUI.

Total Time On Task for this Milestone

Total time spent by me	6-7 hours
Total time spent by support team members	3 hours

Next Steps

My progress on the next steps of my part of the project will depend on when we order and receive whichever microprocessor we decide to use. Until then, I will continue doing research on how to effectively interface between the GUI and the microprocessor, and I will try and refine the design and functionality of the GUI.

There are lots of resources online that I can reference for more information on interfacing. I plan on using the official documentation for whichever microprocessor we choose, official documentation for whichever language I use to write the GUI, and tutorials on Bluetooth or wireless interfacing. I also have several friends that took this class last semester, and plan on finding out what sort of products and designs they recommend or don't recommend.

Designing the GUI itself should be relatively simple. Again, it will be difficult to make it functional until I can use the microprocessor itself, but until then I will focus on simplifying the code and making it efficient.

Archived Activities

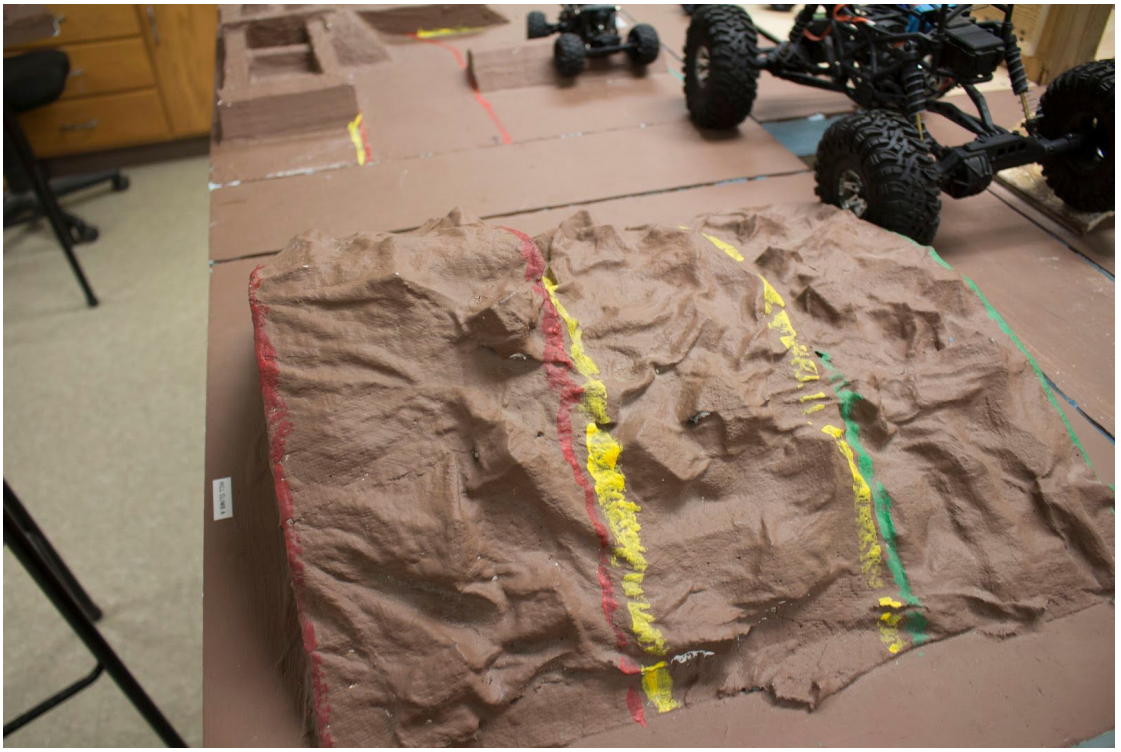
Establish Functional Requirements and Objectives

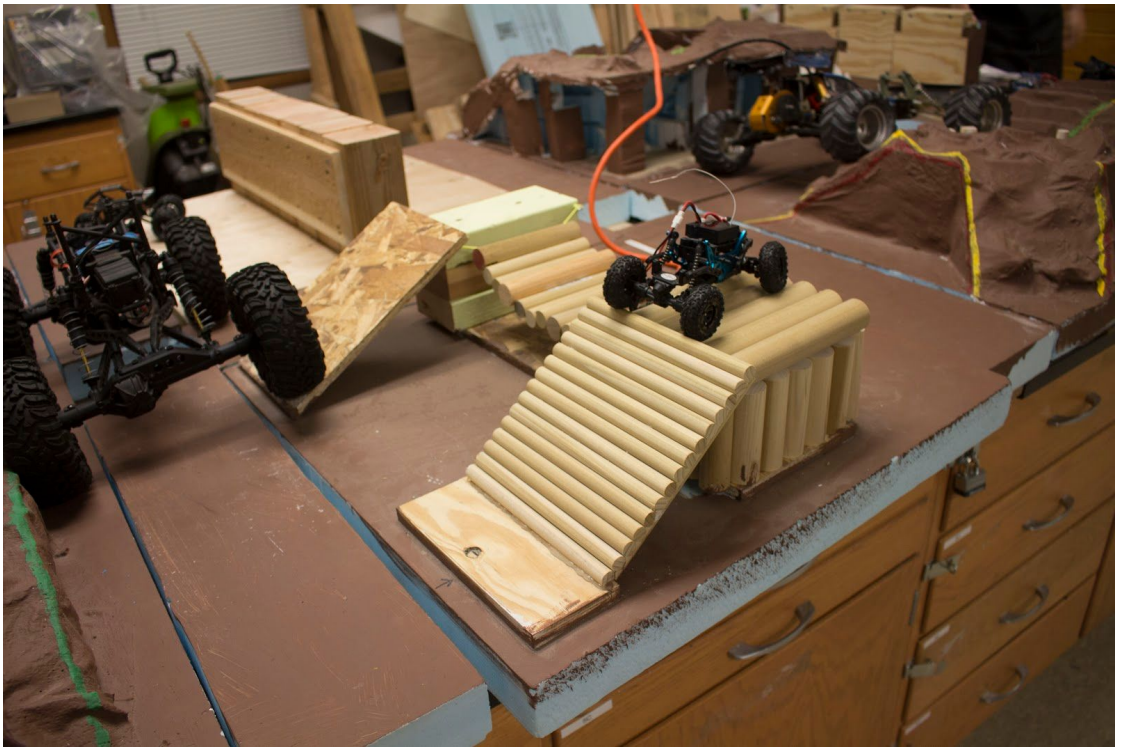
Status	**Achieved**
Objective	Establish a list of functional requirements and objectives for the CS portion of the project based on both my own needs and the needs of my team members, specifically my electrical engineer.
My time on this task	~3-4 hours

Support team member(s) time on task	Alyssa Ferry: ~2 hours
Visual Progress Update	N/A
Current Progress	Based on discussions with my electrical engineer and my own research, I created a general list of what my portion of the project needs to achieve: • A Graphical User Interface (GUI) that will run on either a phone or a laptop. The choice of either a phone or a laptop will depend on whether I use Bluetooth or a wireless connection to connect to the microprocessor. This is still to be determined at a later time. • The GUI needs to successfully interact with the microprocessor to steer and control the vehicle. • The GUI needs to be relatively simple and easy to use.
Outputs created	The above list of requirements and functionalities is what has come out of this activity.
System Integration Considerations	Since my team has an Industrial Engineer, speed needs to be considered when connecting the GUI to the vehicle. Should the GUI display the current speed and time? If so, how will I connect to and get data from the accelerometer? Should the GUI be able to speed the vehicle up or not?
Challenges/Lessons learned	My Electrical Engineer wants to use a specific microprocessor that she has used before for the project, but I would like to use a different one that would be much easier for me to code and troubleshoot. We will need to discuss the pros and cons of each option before we make a final decision.

Identify Resources Available from Makerspace

Status	**Achieved**
Objective	Visit the MSU Makerspace and identify resources and tools that are available for our team to use throughout the project.
My time on this task	1 hour
Support team member(s) time on task	Alyssa Ferry: 1 hour Jacob Johnson: 1 hour Ryan Lane: 1 hour Mubarak: 1 hour
Visual Progress Update	These are only a few of the pictures that Mubarak took of the obstacles in the Makerspace. The rest of them are located on the team's Trello board.



	
Current Progress	My team and I figured out a time that we were all available, and the five of us went to the MSU Makerspace together. For most of us, it was our first time visiting the Makerspace. We spent about an hour in the Makerspace looking at all the tools and talking to Matt about the available resources. Matt talked to Alyssa and I extensively about the different microprocessors that are available for purchase, and the pros and cons of the different options. Jacob and Ryan examined all of the vehicles that were there, and seemed to get some good ideas about implementation and building our team's vehicle. Mubarak took lots of pictures that we can use for future reference and documentation.
Outputs created	Our team became more familiar with the Makerspace and was able to identify all of the different tools we could use. We also were able to look at all of the obstacles available for the course and start thinking about which ones we want to use.
System Integration Considerations	N/A
Challenges/Lessons learned	The biggest challenge for this activity was figuring out everyone's schedules to find a time that was available for everyone to go. This will probably be an issue for the entire semester, since we all have lots of other time commitments.

