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CS Senior Design

Capstone Assessment

Our planned project involves using facial recognition and motion tracking to create a sort of automated defense system. We plan to write a program that takes one or more camera feeds as input. When the program “spots” a face that is not authorized, it will fire at that face. As for the physical aspect, we plan to use a nerf gun and a set of motors to aim and fire it. The facial recognition will likely utilize machine learning to train the program to tell what is a face and what isn’t. If the facial recognition fails, we plan on using motion sensors as a backup. We want to combine these inputs, feed them to a program, and have it accurately determine if there is an unauthorized person approaching.

So far in our curriculum, we have had a couple classes that will assist us with this project. The biggest help will be from our Principles of A.I. class (CS 4033), as that will assist us with the machine learning knowledge that we will need to train the program. Hopefully, that knowledge will not be overly difficult to apply to facial recognition. Also helpful will be our Python Programming class (CS 2021), as the library we used for CS 4033 was in python so we will likely have to use it quite a bit. Finally, I think my current Requirements Engineering class (CS 5127) will be very helpful for us. Being able to accurately determine what we need to do will be very important for making sure this project gets done.

As for my co-op experiences, I’m honestly not sure how much help they’ll be. I spent my last four rotations as a C# Developer at Edaptive Computing, Inc. If our project ends up needing any work in C#, then I’ll likely be able to handle it. In addition to the C# work I did, most of my projects involved webapp development, so HTML, JS, and a little bit of TypeScript towards the end. I also did some work in SQL, which we will likely

need. Outside of coding, I worked in small agile teams, which meant that even as an intern I had responsibilities in our meetings, whether they be for peer review, sprint review, or sprint planning. I also did a lot of work on documentation for each of my projects, which has greatly improved my technical writing skills.

Our preliminary approach will be to build a sort of stand for the gun to sit on, which will hopefully be able to adjust itself to aim the weapon if we have time to implement aiming. We will also set up a network of cameras and motion sensors so that the turret knows if someone is approaching. We will also need a mechanism to pull the trigger. If we have time for aiming, we will use the sensors and a set of motors to aim the gun. Our expected result at the end is to have a functional turret that can detect a person approaching, and if their face is not recognized or authorized, then the gun will fire. I will evaluate myself based on if what I've done has made major contributions to the project and if the project is a success. If both are true, I'd consider it a job well done.

I am excited for this project for a few reasons. First and foremost, machine learning is a major thing right now, so doing as much work with it as possible is important in my opinion. Facial recognition is also big with a lot of companies right now, so learning how to do it would be helpful for job searches, on top of it being a very cool innovation. On top of the real world applications of our project, it sounded like a lot of fun to make. I expect to come out of this project with a much better knowledge of how machine learning and facial recognition work, as well as a strong understanding of how to set them up to live camera feeds and determine who it's seeing in real time. I also am excited to learn about all of the physical aspects, such as hooking up the motion sensors, building the stand, and setting up the motors to aim if time permits. This project sounded great to me when it was proposed by one of my groupmates, and I can't wait to get started.