To: Dr. Satici, Nardos Ashenafi, Brian Higgins

From: Robotic Vision Team: Daniel Pullicar, Mason Cannon, Roscoe Ambrose, Haston LaGrone

Subject: Biweekly Update, 1/30/23 – 2/12/23

Date: February 12, 2023

Hello again professors. I hope the new month is treating you all well. The following is a short update on the progress our group has made since our last update.

# Work Completed

The first two weeks of February have been productive for the team. We decided on a feasible 60-fps camera for Nardos to order for our project. The project is also adopting a nicer (up to) 90-fps camera, from Haston, to use as its primary vision system. Image points can now be converted into locations on the hockey-table. We are still working on ordering a custom size light diffuser and frame with a potential company but haven’t received a quote back from them yet. We are all adding some finishing touches to the respective programs we have designed as well as integrating them into one cohesive system. There was an emphasis on testing in the prior week to ensure we can move forward.

Daniel Pullicar:

* Completed Conversion from Image-points to World-Points code.
* Introduced Mason to topic of calibration and point-conversion.
* Cleared a code-review with Nardos for linear algebra.

Mason Cannon:

* I am currently working on the calibration with Daniel. The work pending section has more information on that.

Roscoe Ambrose:

* Made master file more readable.
  + Moved comments to end-of-line to ensure compactness of code but still instructional.
  + Followed 80-character limit of code per line.
* Fixed bug where distance formula would throw an overflow warning after detecting the second circle.
* Created a new file to begin implementing Daniel’s calibration program.
* Added auto-focus and auto-exposure settings to GUI.
* Working with James from Set Shot to get quoted on a custom size light diffuser and frame.

Haston LaGrone:

* Confirmed that 60+ FPS can reduce the fast-moving object problem to a trackable level.
* Coded a modified version of the original testing program that is more efficient. By eliminating the many testing parameters as well as the cv.imshow() window the program runs significantly faster. 60 FPS cameras are able to run at maximum frame rate, while the 90 FPS camera can run up to 76 FPS. (The 76 FPS rate exceeds the rate in which the Logitech camera program indicates my computer can handle.)
* Modified detection program to a class in order to ease implementation.
* Manually adjust focus added to program, eliminates need for Logitech Capture app.

# Work Pending

The team’s focus in the coming weeks will be geared around the fusion of the 3 independent programs and the implementation/testing of a 2 camera system. Any final touches or desired functionality will be added as needed to the programs.

Daniel Pullicar:

* Create correctly-sized calibration chess-board to fit our intended hockey-table plane. Chessboard will also be asymmetrical to allow for different orientations depending on needs.
* Test point-conversion for accuracy.
* Edit code to allow for placement of chessboard anywhere on the table.

Mason Cannon:

* Going over the calibration and learning how it works. I am also following Daniel’s code and making sure it is correct and will work for what we want to do.
* Assist with testing point-conversion for accuracy.

Roscoe Ambrose:

* Implement Daniel’s calibration work into main program.
* Add any additional necessary features to GUI.

Haston LaGrone:

* Finish class implementation of both detection programs (test program and skeleton version).
* Test effectiveness of the focus parameter in OpenCV. (Compare to Logitech capture).
* Test tandem camera operation.
* Investigate method of autonomizing camera assignment in OpenCV.
* Tertiary: Linux API.

# Conclusion:

The prior two weeks have where much more successful than our last update. The calibration, user interface, and detection programs are finally fleshed out to a point in which we can approach the broader goals of the project. We are especially looking forward to being able to test the cohesive program and how it will interact with multiple cameras attached. We believe this marks the starting point in another large step in the project and are excited to see where it takes us.