***EE/CPR E/SE 492 BI-WEEKLY REPORT 5***

3/13/2020 - 4/03/2020

***Group number***

sdmay20-40

***Project title***

IC Chipz

***Client & Advisor***

Dr. Henry Duwe

***Team Members/Role***

Andrew Kicklighter - Mobile Developer
Alexander Weakland - Wildcard Developer
Nicholas Dykhuizen - Integration Developer
Justin Elsbernd - Integration Developer
Joshua Heiser - Embedded Developer
Paul Kiel - Embedded Developer

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**Bi-Weekly Summary**

The past few weeks have been strange with COVID. No major progress has been made developmentally on the ingretation board. A few minor bug fixes were patched, but for the most part there has been a lot of research into the darknet C++ implementation. Dr. Duwe expressed a lot of interest in the integration program being able to self check its results which was kind of a new feature; hence the need for research. For the mobile team, no major progress was made as well on the application. Similarly to the integration team, only a few minor bugs were patched and a new version was pushed to Test Flight. During the past few weeks, the Embedded team has continued to work on integrating the scoring application into the previous C++ program that was written by the integration team. The team was able to write a rough draft of the scoring algorithm to read the footage, and the respective file transfer that takes place from this result of the algorithm. The Embedded team also began to debug the application, but was not able to finish it before the meeting with Dr. Duwe. In addition,  the models continued to be trained using Darknet, and a major issue with Lens flare was found and was expressed to Dr. Duwe. The team began looking to see if there were any solutions to the Lens flare, but expressed that it would be

hard to know if this problem was still present, as the camera on the board is different then the camera that was present when this footage was recorded.

**Past week accomplishments**

- Reviewed darknet C++ integration and potential use cases for the integration team
- Resolved minor bugs in the mobile application - Andrew
- Added support for .avi videos as opposed to .mp4 - Andrew
- Submitted the new application for testing on Test Flight - Andrew
- Finished converting rough draft of scoring algorithm to C++ - Embedded Team
- Began debugging scoring algorithm- Embedded Team
- Continued training dataset with Darknet - Embedded Team
- Found issue with Lens flare negative affecting accuracy- Embedded Team
- Began researching into potential solutions for Lens flare issue- Embedded Team

**Individual Contributions**

| Name | Individual Contributions | Hours this Report | Cumulative Hours |
|---|---|---|---|
| Andrew Kicklighter | ● Resolved minor bugs in the mobile application<br>● Added support for .avi videos as opposed to .mp4<br>● Submitted the new application for testing on Test Flight | 10 | 57 |
| Alexander Weakland | ● Continued to resolve and label inconsistencies in collected images including the issue of lens flare.<br>● Began to user test mobile application to ensure its stable and not crashing for any reason. | 10 | 50 |
| Nicholas Dykhuizen | ● Resolved minor bugs and inconsistencies within the integration application<br>● Investigated (and investigating still) using darknet to auto label datasets through C++ | 10 | 70 |

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|---|---|---|---|
| Justin Elsbernd | • Worked on fixing bugs, specifically ones caused by shutdown command not terminating properly<br>• Looking into ways to automate data labeling using opencv or other means | 10 | 52 |
| Joshua Heiser | • Finished converting scoring algorithm from from Python to algorithm in C++<br>• Installed the various C++ plugins/extensions needed to run Darknet<br>• Began debugging the scoring algorithm to fix its issues | 12 | 56 |
| Paul Kiel | • Continued to re-train model using Darknet<br>• Found issue with Lens flare making images inaccurate<br>• Started looking into solutions to fix issues with Lens flare | 10 | 55 |

**Pending Issues**

- Build training application mode
- Documentation of integration application
- Documentation of Darknet
- Documentation of Python scripts used to obtain accuracy values
- Bugs with the C++ scoring algorithm

**Plans for the upcoming weeks**

On the integration side, our clients have expressed heavy interest in having a training application mode over documentation. Therefore, most of the remaining time this semester will go into the training mode as well as writing out brief documents on the integration application. For the mobile team, the plan is to implement the save states for the mobile device and figure out with Dr. Duwe what else can be done remotely without the board. For the Embedded team, Dr. Duwe expressed a need for documentation of how Darknet works, how the model can be trained, and how the various scripts/programs that are used operate. Because of this, the Embedded Team will begin to write documentation for all of the work that they have done throughout the past two

semesters, so that it will be easy for Dr. Duwe to understand how this works and can pick up any work that he would like to edit easily. In addition, the Embedded team needs to finish debugging the scoring algorithm to make sure that it correctly scores shots, that it will update the mobile app correctly with the result, and that the footage is placed in the correct directories both during and after scoring takes place. Lastly, the Embedded team will continue to train the dataset, in an attempt to increase accuracy while attempting to find any other issues that could be the reason for inaccurate results from the Machine Learning algorithm.

**Summary of weekly advisor meeting**

In the last meeting, not all teams were able to make the meeting, but each team updated Dr. Duwe on their progress, whether that was through email or through the actual meeting. At the actual meeting, the Embedded team explained the progress that they had made in the past week. The Embedded team showed their updates in the training set, showing how they had been able to further increase the accuracy. The team also discussed the issue of Lens flare with Dr. Duwe, and how that was negatively impacting the accuracy. The team explained that they were looking into the issue, but they had not found a specific solution yet, so that they would continue researching the issue. In addition, the team showed Dr. Duwe the rough draft of the scoring algorithm that they had written in C++, and explained that they were in the process of debugging it, and hoped for it to be entirely complete by the next meeting. Since the other teams were not present due to the complications of COVID-19, Dr. Duwe mainly expressed his expectations for next week with the Embedded Team. He explained his requests for the next couple weeks, which was for each team to document their work, so that Dr. Duwe could easily pick up the work at some point in the future if needed. In addition, he expressed the ideas of what he believed what each team still needed to do before the final presentation in late April. Since the Integration teams and mobile teams were not able to make it to the meetings, these two teams updated Dr. Duwe with their progress via email. The integration team explained how they had continued to assist the embedded team by researching darknet in C++, and fixing bugs in the main C++ application that would be used for Skeet shooting. Dr Duwe replied,  expressing his desire for this team to begin writing documentation on their work, so that it would be easy for him to pick up and understand the C++ application that they wrote if needed. Lastly, the mobile team updated Dr. Duwe with their updates, explaining that they had fixed an issue with video playback since the mobile app and the Embedded board were not expecting the same file format, and he also explained that he continued to fix bugs in the application. Dr. Duwe replied, asking for more fixes if possible to Test ilght, and he also asked for the Mobile team to begin documenting their work. After this occured, each team had a clear understanding of the work that Dr. Duwe was expecting before the next meeting and began to work on their requirements to complete before the next meeting.