

EE/CprE/SE 4910 WEEKLY REPORT #5

3/26/25 - 4/1/25

Group number 15

Vision Based Camera Motion Tracking

Advisor: Ashraf Gaffar

Team Members:

Andrew Gooding

Eric Wittrock

Isaac Kenyon

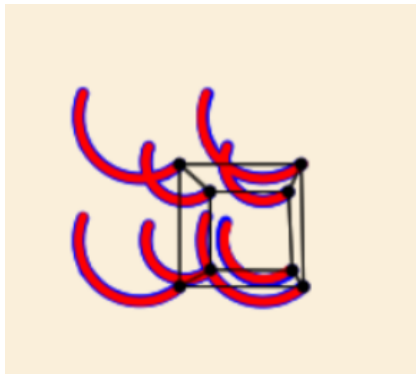
Will Ernatt

Weekly Summary

Our team continued to make headway on our respective tasks. We laid the groundwork for error detection on the blender side which will be useful once we interface blender with the tracking points found by our software. We made significant progress in the camera motion solving aspect of the project, achieving a perfect track for a simple synthetic scene under a few constraints (fixed orientation and focal length) that will be relaxed in later stages of development.

Past Weekly Accomplishments

Eric Wittrock



- Worked on camera motion math. The above image shows the paths of vertices of a cube as a camera moves in a virtual scene. The red paths show the actual motion, and the blue show the motion from the predicted camera path. They overlap perfectly, meaning this approach worked very well.
 - The resulting camera position equations are not solvable by traditional means, so we will use gradient descent

- Convergence to local minimum was very common. Using the ADAM optimization algorithm instead of GD improved this significantly
- The same algorithm was able to reconstruct the shape of the cube by looking at it from different angles

Isaac Kenyon

- Worked on the python programs to try and detect errors during calculation.
 - It works by grabbing all of the other points being calculated and if one specific motion change is way different than the others it can delete it.
 - Worked on a switch in the blender UI that can allow the user to turn this feature on or off.
 - Is a part of the error detection, can of course be automated but the user will have the ability to manually delete these points also.
- Github repository is ready for people to push there code.
 - This will help all of us see what we have worked on.
 - Will start allowing us to implement components together so that we can start testing the system as a whole.
- Continued work on the blender UI so that it is easy to add components when needed.
 - If we need new components in the future it will just be a quick change.

Will Ernatt

- Wrote a script in OpenCV to perform the feature matching process on a video.
 - Feature matching is the first step in the pipeline utilized by meshroom to generate a camera path, by writing this script I am able to create data to be utilized by future steps to eventually be utilized in our SfM algorithm to generate a usable camera path for Blender.
- Wrote a blender plugin to visualize the camera path as a curve in 3d space.
 - Helps to verify the accuracy of a generated path before creating a final render.

Andrew Gooding

- Created a script to automate the process of getting a file. Then accessing the motion tracking tool in blender and detecting tracks from the video uploaded into blender.
- Currently working on getting the script to delete errors after tracking points in the video. This will help us with our plugin and make it easier for the user to utilize the plugin with less hassle.

Pending Issues

- **Eric Wittrock:** The optimizer would get stuck in local minimums over half the time. Tuning the hyper-parameters fixed this for the most part, but it still gets stuck on complex scenes.
- **Isaac Kenyon:** Would like people to push their code on the repository so that I can work on combining the parts and so that we don't work on redundant code.
- **Will Ernatt:** No significant issues faced this week
- **Andrew Gooding:** While creating the script ran into an error with one of the methods used to automate the process of using the camera tracking tool.

Individual contributions

Name	Individual Contributions	Hours This Week	Hours Cumulative
Eric Wittrock	Solved camera motion using an optimization algorithm	9	34
Will Ernatt	Wrote OpenCV feature matching script. Wrote Blender camera path visualization script.	6	31
Andrew Gooding	Created a blender script to start automating the process of camera tracking in blender.	6	24
Isaac Kenyon	Worked on the python programs to try and detect errors during calculation. Github repository is ready for people to push	6	28

	there code. Continued work on the blender UI so that it is easy to add components when needed.		
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Plans for the upcoming week

Andrew Gooding

- Work through the error while creating script and automate the process of finding detecting and deleting error in tracks.

Eric Wittrock

- Improve convergence time of the optimizer when there are many points. Add focal length to the list of variables to be solved for.

Isaac Kenyon

- Continue the error detection during calculation. Start implementing different code components from all team members together.

Will Ernatt

- Write image matching program for openCV.
- Use output from image matching program in SfM algorithm to check accuracy of generated data.