Milestone Progress Evaluation

Synthetic Data Pipeline for Pose Estimation

Members:

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Faculty advisor and Client: Dr. Ryan White rwhite2009@fit.edu

1.	Progress of current Milestone (progress matrix)

Task	Completion %	William	Nate	Stephane	Hanibal	To do
Read in CAD models	90%	45%	45%	0%	0%	Read models into Omniverse
3D software API	60%	30%	30%	0%	0%	Learn Omniverse API and experiment with blender API more
Demos	70%	45%	25%	0%	0%	Do Omniverse demo
Compare and select 3D software	80%	35%	35%	5%	5%	Experiment more with Omniverse
Requirement Document	100%	40%	60%	0%	0%	None
Design Document	100%	0%	0%	50%	50%	None
Test Plan	100%	50%	50%	0%	0%	None

2.	Discussion (at least a few sentences, ie a paragraph) of each accomplished task (and obstacles) for the current Milestone:

- Task 1: We discovered how to read in different types of CAD models of different satellites. We tried a few different types and found that some of them are much easier to work with then others. Blender files are very easy to import but it does not automatically apply shading to them so it takes a long time to get them ready for rendering. Obj files are a little more difficult to import but automatically apply textures and shading. We discovered how to import files by hand and automatically using code.

- Task 2: We went through quite a bit of the blender documentation when trying to make the demo. We now understand the fundamental parts of the python blender API. We did not go through the Omniverse documentation much because we did not have a computer that was able to run Omniverse for much of the time.

- Task 3: We were able to create basic demos using blender. We created a still render using the blender GUI. We experimented with the different tabs in the blender GUI such as layout, shading, rendering, and composting. We also

- Task 4: We were not really able to compare blender and Omniverse that well because we only very recently got access to a computer powerful enough to run Omniverse. We did look quite a bit at blender though and it seems that this tool will probably be enough to do the whole project. We still want to investigate Omniverse a little bit because it might have tools that might help us out a lot in the future.
- Task 5: We created the requirements document by talking with Dr. White. He told us what sort of functionality the program needs. We then thought about some more things that might be useful.
- Task 6: We created the design document by thinking about what sort of code we would need in order to accomplish the requirements. We made a UML diagram to show how the different parts of the code interact. We also talked about how different functions will work.
- Task 7: We created the testing document. The purpose of this document was to come up with some tests to make sure that the design of the code accomplished the functional requirements. The different tests test different parts of the code and other things such as usability and ease of installing.

3. Discussion (at least a few sentences, ie a paragraph) of contribution of each team member to the current Milestone:
   - William Stern: I did some work using blender to see if it would work well for our project. I experimented with importing different file types into blender. I made a static demo using the blender GUI. I researched bpy, the blender python API. I then created a demo using the blender python API which incorporates importing models, setting camera location, setting lighting, rotation, movement, and rendering. I also worked on the requirement document and on the test document.

- Nate Pichette: I worked to evaluate blender as an effective tool for our needs. I downloaded multiple files from the nasa database to help find the appropriate file format to insert models into blender. I found some basic mechanics for movement and rotation using the bpy library in python as well as code to import obj files into blender. I helped write our project plan, requirements document, and test document.

- Stephane Baruch: I have mainly worked on parts of the design docs and I created the UML Models for said design doc. I've also been learning how to use Blender which is a tool that I've never used prior to this project. Learning this tool will be very important for future milestones

- Hanibal Alazar: I worked mainly on the design docs. I wrote the descriptions as well as research the different data types and protocols we are going to need for the final API product. I have been learning how to use Blender and I even learned how to load a 2d image rendering using code.

4.	Plan for the next Milestone (task matrix)

Task	William	Nate	Stephane	Hanibal
1. Add and test motion to of both satellite and camera	Develop code	demo	implement/test/demo ...	write test
2. Implement lighting features	Test	demo	Test features	Light location
3. Extract pose information at each frame of animation	Implement Feature	implement	Demo	Write test
4. Add static Background	Test Background	demo	implementation	Implementation (background upload)
5. Create config file for easier use	Test	implement	Test	demo

6. Investigate Nvidia Omniverse	Demo	implement	Test	Implementation /demo

5. Discussion (at least a few sentences, ie a paragraph) of each planned task for the next Milestone
   - Task 1: We were able to get a bit ahead and added some complex motion to a demo so we want to go a bit further and try to add motion to camera and satellite. We also need to understand a bit more how things like rotation and movement are quantified so we can make them more usable.

   - Task 2: Currently we are able to get a single point of light. Next we want to try and add multiple points of light and experiment with things like reflection.
   - Task 3: in order to get the machine learning to try and guess the pose we need to train it first by giving it the picture and pose for each frame. To do this we need to extract the pose information from the satellite through the python blender API.
   - Task 4: We are currently able to add a background using the blender GUI. It is a pretty complex process. We want to be able to automatically add backgrounds using the python blender API.
   - Task 5: When the users are using this program we do not want them to have to be coding python every time they want it to run. To avoid this we are creating a config file that will be easy to use and allow the user to change all the settings very easily and with little knowledge of code.
   - Task 6: Last milestone we were not able to learn much about Nvidia Omniverse because our computers are not compatible. We were able to get access recently to computers that can run Omniverse so we want to investigate that program to see if or how it can help improve our pipeline.

6. Date(s) of meeting(s) with Client during the current milestone:
   1. 9/22/2022
   2. 10/4/2022
7. Client feedback on the current milestone
   - see Faculty Advisor Feedback below
8. Faculty Advisor feedback on each task for the current Milestone
   - Task 1: Dr. White says that this is not too big of a deal right now because they have some models in the lab, and as long as we can import them that is nice.

   - Task 2: Dr. White said that we should just worry about one light source (sun/star) for now however in the future we can try to integrate multiple sources

- Task 3: Dr. White said that the two demos we made look good and are a great start.

- Task 4: Dr. White said that he is fine with blender but he wants us to look into Nvidia omniverse some more since it has some nice tools with automatic labeling. He gave us access to computers with GTX 2080s so that we can test it.

9. Faculty Advisor Signature: _____ Date: _____

10. Evaluation by Faculty Advisor
- Faculty Advisor: detach and return this page to Dr. Chan (HC 214) or email the scores to pkc@cs.fit.edu
- Score (0-10) for each member: circle a score (or circle two adjacent scores for .25 or write down a real number between 0 and 10)

William Stern	0	1	2	3	4	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10
Nate Pichette	0	1	2	3	4	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10
Stephane Baruch	0	1	2	3	4	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10
Hanibal Alazar	0	1	2	3	4	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10

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- Faculty Advisor Signature: _____ Date: _____