Project Milestone 3

Vision Guided Picker

What were the key pieces from your Pitch Feedback?

There was critical feedback for this project. Our peer group has given some good points which helped in updating our project.

1. The end goal of the project is to be able to pick up a fruit using the robotic arm, and if time permits, place it in a separate location such as an adjacent box.
2. As per one of our classmates, the dataset seems to be limited. Hence, we are planning to increase the trainable features by data augmentation.
3. One more point to take into consideration was using Reinforcement Learning for motion planning and many suggested that we must go through a lot of concepts for understanding it. Since, it is under stretch goals, we try to understand and make it work if possible.

What are the key discoveries you've made so far in your month of progress?

1. Learned how to simulate detachable joint (an orange is attached to a joint of an orange tree)
    a. Completed a test of picking an orange from a joint (from a simulated tree)
2. Learned how to use Visual Kinematics for a robotic arm motion planning
    a. We moved a robotic arm using a Webots controller
3. Created a fictitious orange field
    a. Took 200 training images in the field
        i. It’s easy to take more pictures. But it takes times to annotate them manually
    b. Annotated training images using the VIA annotator
    c. Generated a mask image for each training image
4. Fine-tuned a pretrained PyTorch Mask RCNN model on our custom training data
    a. Confirmed that it reasonably works with ~200 training samples
5. Learned how to combine models to implement architectures such as U Net
6. Learned about the design of the U Net architecture
7. Learned how to use the image data generator to generate more samples for segmented images
8. Learned Key concepts about object detection and image segmentation models

What are the updates to your project?

1. We found that employing the Hindsight Experience Replay (HER), training 6 degree of freedom robotic arms is not a trivial task
    a. Might resort to a manual motion planning
2. We might use the image data generator to generate additional training samples if we observe overfitting, or if we just want additional samples that don't have to be manually segmented.

Confidential Feedback

Our group is working well, we meet each week before class to discuss breaking up goals and choosing what tasks to do.