

Individual Lab Report 10

Name: Dung-Han Lee
Team Name: Team E Wholesome Robotics
Team members: Aaditya, Aman, John, Hillel
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1 Individual Progress

1.1 Switch from TensorFlow to Pytorch

This week the individual progress has been focused on integrating the Unet PyTorch pipeline into the visualization pipeline to replace the original Mask-RCNN TensorFlow pipeline. To this end, a separate model file, data loaders, and different types of weight files have been created and added. The resulting integrated pipeline has shown improved performance on CPU: achieving three times faster than the previous Mask-Rcnn TensorFlow pipeline. This has resulted from both simplified architecture and a more optimized underlying framework.

1.2 Visualization

Some additional works have also been put to visualize the output of Unet because it has a different output structure from Mask-Rcnn. The function will first convert the output of Unet into a 2D matrix with each pixel corresponding to class classifications, and then color (e.g. red for class one) will be overlaid on the original image. A demonstration of GUI is shown in Fig 1.



Figure 1: Semantic Visualizer for UNet Outputs

1.3 Images-downloader

On the other hand annotating works are outsourced to an external company. The company submitted a result in a.json files which contains URL links to the annotated images and the original images. To automate the download process, a downloader script is put together to read through the json file and then automatically download images from the given URLs.

```
def download_images(fname):
    with open(fname, 'r') as f:
        for idx, line in enumerate(f):
            if "https" in line:
                if "attachment" in line and "internal" not in line:
                    image_id = idx
                    url = line[21:-3]
                    print(url)
                    print(idx)
                    r = requests.get(url, allow_redirects=True)
                    open("%04d" % image_id + ".png", 'wb').write(r.content)
```

```

if "indexedImage" in line:
    url = line[27:-2]
    print(url)
    r = requests.get(url, allow_redirects=True)
    open("_"+"%04d" % image_id + ".png", 'wb').write(r.content)

```

1.4 Post-processing

It is hard to get consistent annotations on agricultural images because there is no clear cut definition of what constitutes of fungus and holes, thus a lot of subjective decision is made by the annotators, which often results in poor quality annotations. An example of poor annotation is shown in Fig2, the left side of the leaf should not be annotated, and holes are completely ignored by the annotator. Resolving such issue would often require a detailed annotation guideline which would take a lot time – contradicting the very purpose of outsourcing. To fix this, post-processing and the selection are conducted after all the images have been downloaded. Of all the 540 uploaded images, 370 of them have a useful annotation.

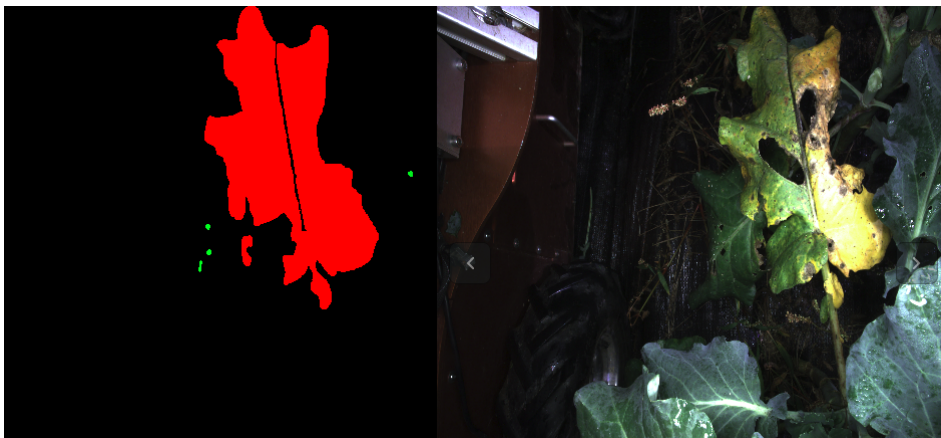


Figure 2: Poor annotation: left leaf should not be annotated; holes are missed out

1.5 Challenge

New data would be fed in to train the Unet. However, due to the noise and inconsistency in the labeling process, which cannot be easily removed by a software script, the trained models may not perform as well as their previous counterparts. Due to the limited time frame, one mitigation plan is to merge newly collected data with previously collected data, and hope that the model will generalize well.

1.6 Teamwork

Aaditya, Hillel and Dung-Han Lee've been working on integrating visualization pipeline specifically removing hard-coded paths and timing section, so that pipeline can truly run end to end on any given bag files with updated PyTorch framework.

Aditya has also been supporting Aman and John in their navigation pipelines. Aman has specifically been working on GPS, VO, IMU-based navigation. the transformation between different frames, however, is inconsistent and leads to problems. successful road navigation has been achieved but cannot be reproduced reliably on the field. John has been working on particle filter, which achieved a good role following results on the latest field visit. automatic rules switching is still not achieved and will continue to be the urgent goal for the team