Friday, May 17 2019

Phytotyping4D

Technical Report

Phytotyping4D is a non-invasive and accurate imaging system that combines a 3D light-field camera (Raytrix GmbH) with an automated pipeline, which provides validated measurements of growth, movement and other morphological features at the rosette and single-leaf level.

We want to use this pipeline on our own data but the problem is the code is very outdated and not documented well. Therefore, we discussed 5 main tasks:

1. Install the code and the dataset from the official website and workout the correct directories.
2. Fix the original code until all the dependencies are working and the pipeline is able to produce similar results to the original paper.
3. Adapt the pipeline so that it is able to read, analyze, and plot results with our own data similar to the results produced with the website's dataset.
4. Update the code from Python 2.7 to a more reliable and up-to-date Python 3.7.
5. Write a proper documentation for the pipeline.

• Task 1:

The code was available on the website but the dataset was not, it gave a broken link but we were able to get it finally. The tricky thing is with the directories of the dataset, they should be like: [dataset name]/Col0/exp1/depth, [dataset name]/Col0/exp1/focus, [dataset name]/pgm/exp1/depth, and [dataset name]/pgm/exp1/focus. Where the normal focus images are stored in the focus folders and the 3D depth images are stored in the depth folders.

• Task 2:

This task was mainly about adapting the code to the updated dependencies and we were succeeded to produce results close to the results in the original paper. You can see the input in figure 1 and 2, and we can see the result in and figure 3. In figure 4 we can see results of analysis on a series of 19 images.

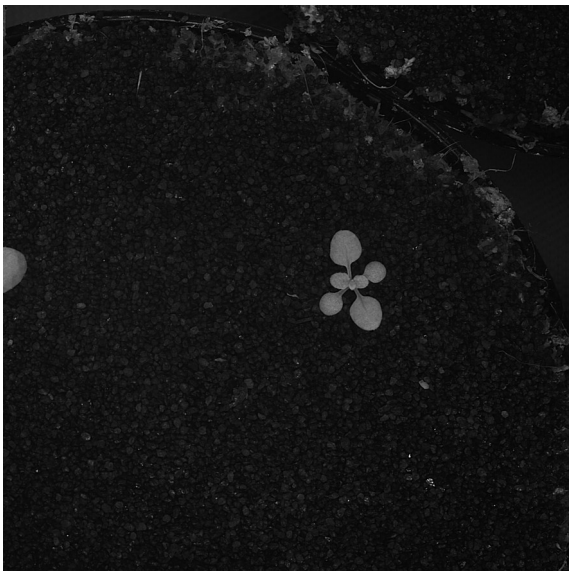

Figure 1- Focus input.

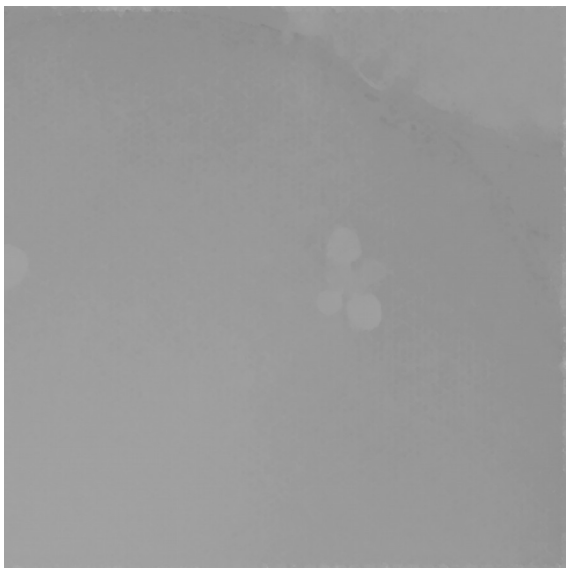

Figure 2- Depth input.

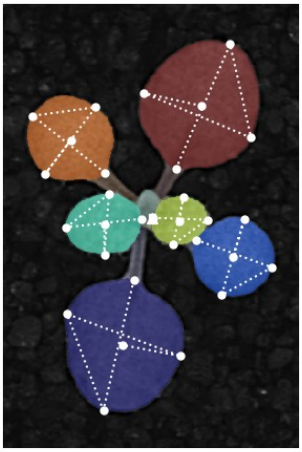

Figure 3- Segmented output.

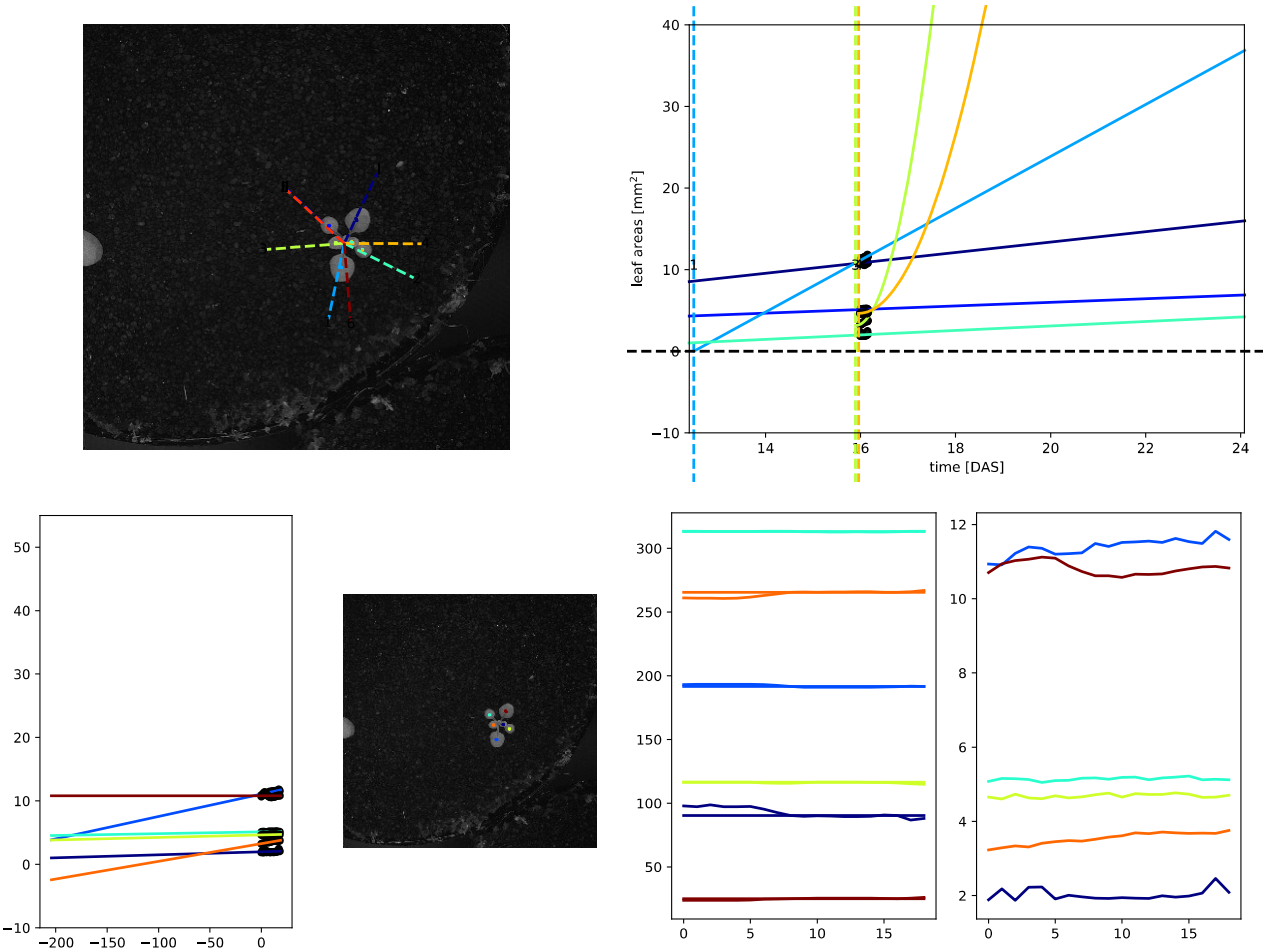

Figure 4- Analyzing results.

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- **Task 3:**

I am now working on this task. I was able to adapt the pipeline to work on the new format and size of the new data. See figure 5 the new input. First I am removing the big noisy spots and replacing it with the mean of the whole image and then cropping the image to focus on only one plant, see figure 6 and 7. The pipeline is being uploaded to Github and you can follow it through this link. I am now dealing with the problem of bad segmentation see figure 8. The goal is to produce results similar to figure 3 and figure 4.

Figure 5- Input focus image.

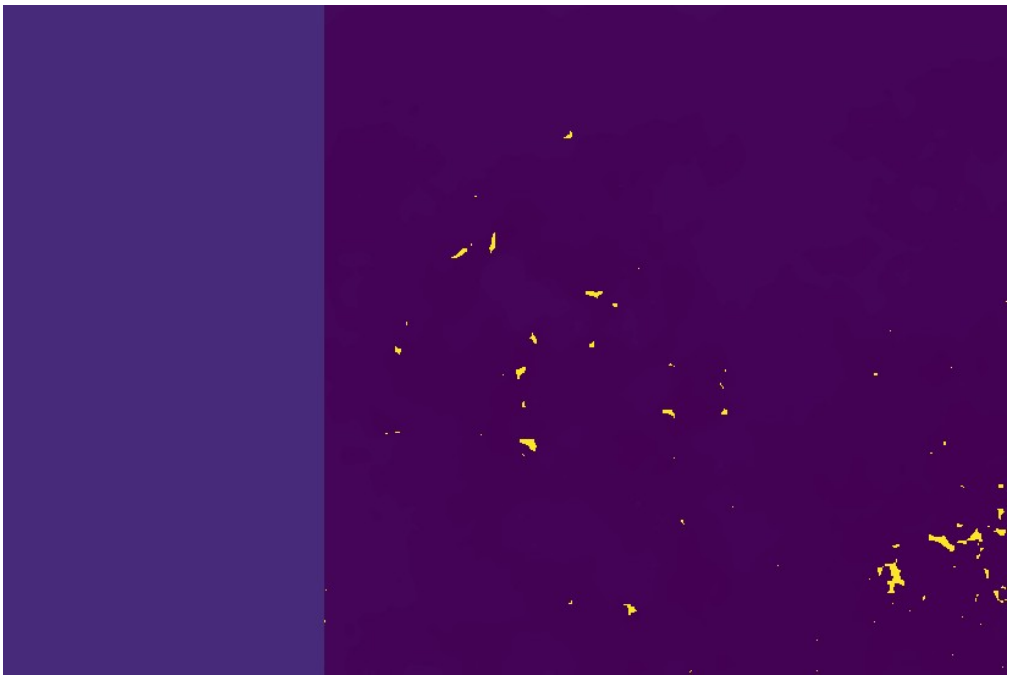

Figure 6- Depth image after cropping and removing the big spot with “COL” on it.

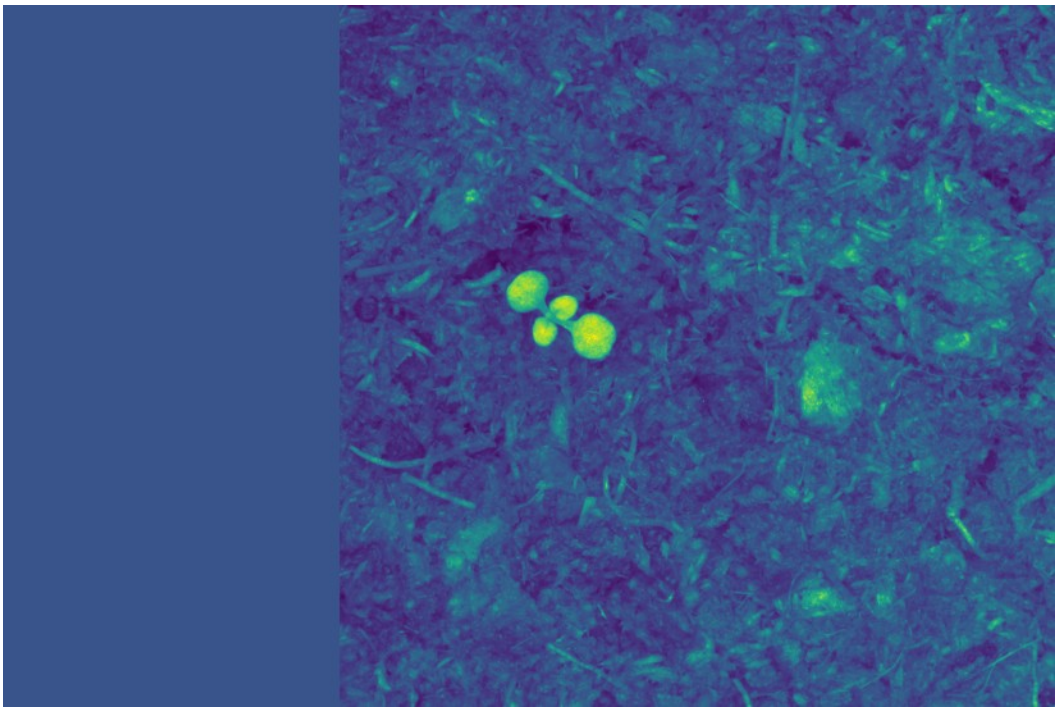

Figure 7- Focus image after cropping and removing the big spot with “COL” on it.

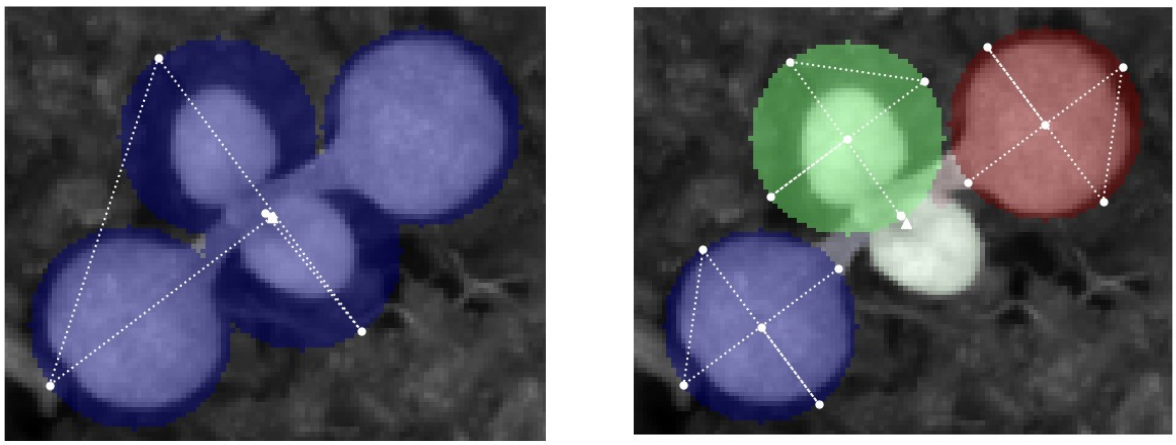

Figure 8- on the left it resulting one segment while on the right it’s resulting 3 segments, in both cases the borders of the segments are not accurate enough.

In conclusion, I will hopefully be able fix all these bugs in the pipeline and produce good and reliable results, then I am excited to work on cleaning up the code and update it to the newer python version. And finally build a robust documentation for everything.