Aphid Counter

Application

- Mobile application, developed for Android

- Created to help growers count bug infestations on plants

- Multiple photos taken for a set

- Bug counts from the whole set used to decide if the growers need to deal with the infestation or not

- Provides a real-time estimate in the field

- Information is stored and can be accessed by the grower anytime

Aphid Infestations

Aphid infestations on plants are a big concern for the crop grower. If the number of aphids on a single plant is past a certain threshold, the risk of the plant being destroyed increases. Therefore it is necessary for the grower to know how many aphids are on the plant, in order to determine whether or not to use sprays to clear the infestation. However, counting the aphids by hand can be a rather time consuming process, as the population of aphids on a single leaf can be in the hundreds. In order to remedy this situation, an image processing algorithm was developed for the purpose of taking an image of an aphid-covered leaf, processing it with the algorithm, and having it estimate the number of aphids in the photo. The goal for our project is to use this algorithm in a mobile application that can be taken out to the field and have the user take photos of aphid-covered leaves and determine the aphid count on the spot.

Project and Results

The result our team came up with is an Android application that allows the user to take a series of photos which are all assigned to a specified field, crop type, insect type, and date, and then allow the user to convert the photos and determine the average insect count from all the photos in the set. The most significant task we had to deal with was designing the algorithm, which was originally developed using MATLAB, into code that could run on Android devices. We decided to use the open source library OpenCV, which offers functionality that is similar to MATLAB. Another issue that posed a problem was the amount of time it takes to convert the image. Using an 8 megapixel image which is roughly 3000 x 2000 pixels in size, it takes around 25-30 seconds to convert and generate a bug count from a single image on an HTC Droid Incredible 2 cell phone.

The algorithm continues to be the main focus of development going forward. We are still considering a few ways to speed up the conversion process, such as expanding the multithreading capabilities by using up to four simultaneous threads to convert the image, as opposed to one thread doing the work. Continuing to improve the accuracy of the algorithm's aphid-count estimation is another area of ongoing development. Future work that is possible would be having the algorithm be able to count different types of insects on different types of leaves, instead of only aphids on soybean leaves. We have also considered the possibility of syncing the application to a server, to allow for customization options from the server sent to the application. For example, being able to remotely setting a minimum photo count that will inform the user they must take before converting the photos, in order to get a better average bug count by using more samples.

Photo Processing