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Näher dran.

Development of remote sensing solutions for locust damage detection in Kazakhstan as part of the project Locust-Tec

In Kazakhstan locusts have been causing a threat to agriculture and environment for a century now. The locust monitoring system by using UAV with multispectral camera is contribution to the tradetional labor intensive locust control systems. Fast and precise detection of actual locust infested areas gives the opportunity to immediately fight them back. For detection of these areas remote sensing (spectral indices thresholding and machine learning image classification) are considered powerful tools, and are therefore implemented. Already in the early nymphal stage of locusts, the locust infested areas can be detected on UAV images as vegetation stress.

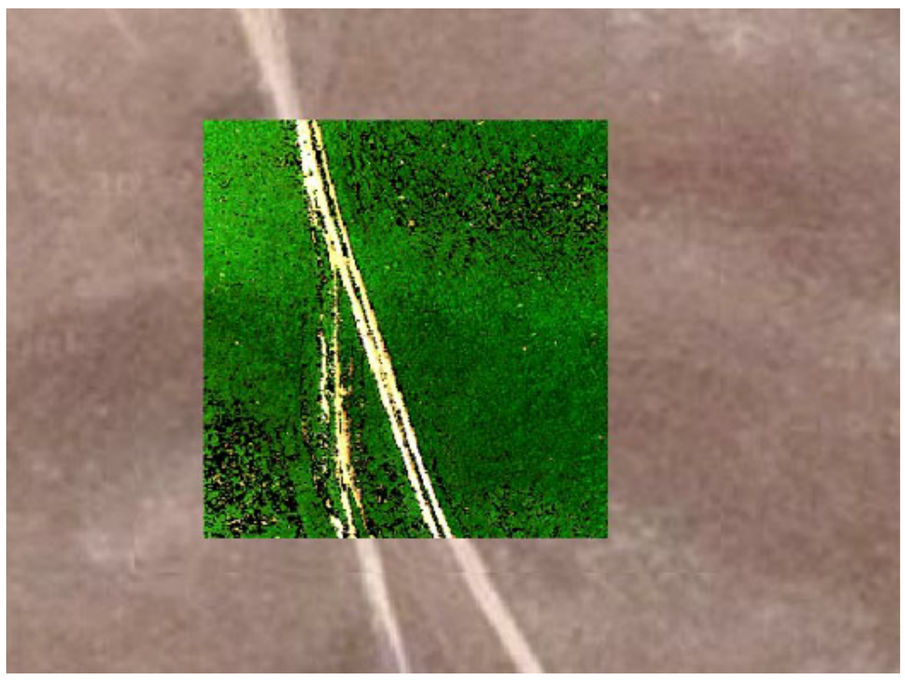

Fig. 1: Georeferenced single image with vegetation stress mask on Google Image basemap.

The research consist of two main distinct tasks: data processing & preparation, and damage detection. The optimal flight parameters such as flight height, flight speed, and overlaps have been established based on collected data during the two field campaigns. The data of the two campaigns have been processed in two different approaches, namely creating orthomosaics and creating single georeferenced images (see Fig. 1). Python script was created to georeference single images and to create vegetation masks for the single images.

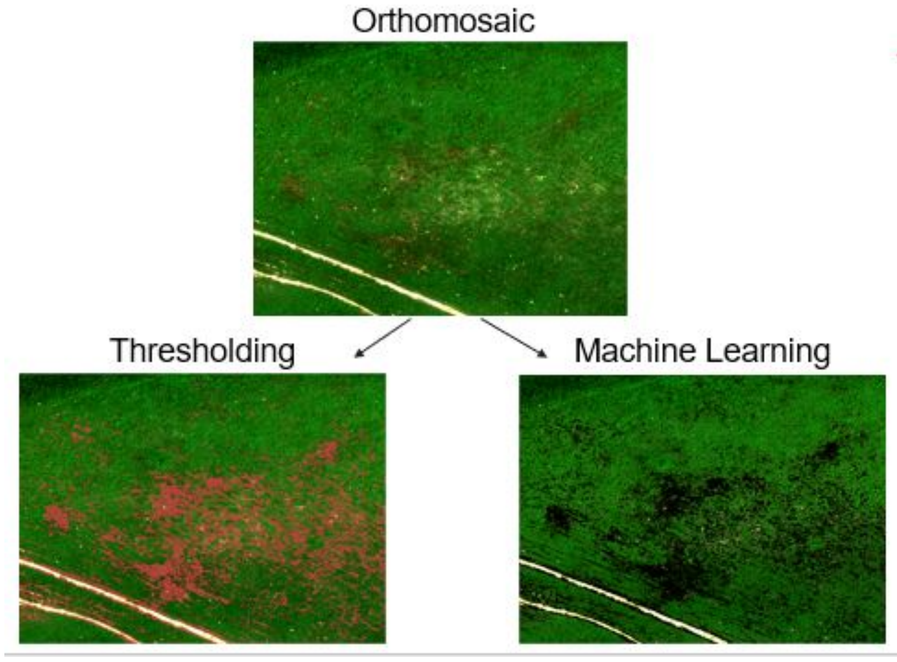

Fig. 2: Comparison of vegetation damage detection with vegetation thresholding and machine learning approaches. The results are very similar.

Pixel values of the images have been normalized by creating vegetation indices. From extracted training areas of the vegetation damage, the thresholds for vegetation indices NDVI and NDVI+VARI have been determined. The same training areas were used for machine learning based classification on stacked image of vegetation indices VARI, NDVI, SAVI, and NDVI (RE). Both approaches revealed similar results as seen in Fig. 2. Fig. 3 shows the distribution of detected vegetation damaged pixels in manually thresholding and machine learning based classification methods (only 2D depiction).

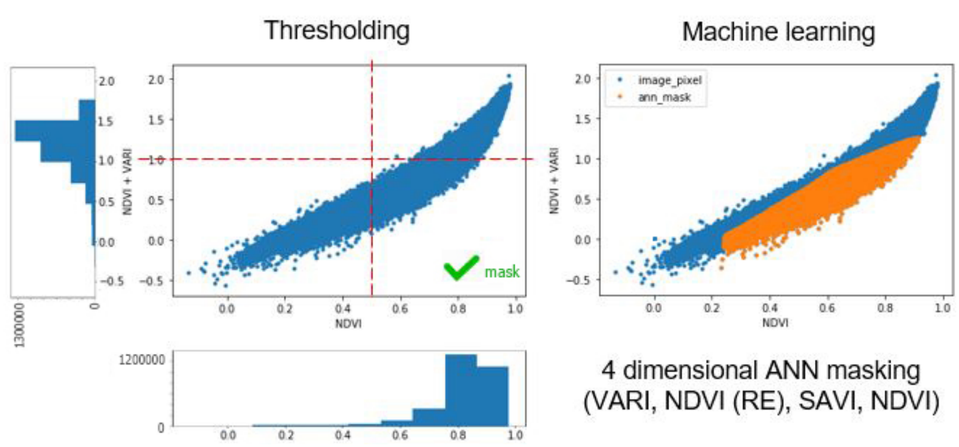

Fig. 3: Graphical illustration of the set of masked pixels on a single image in thresholding (left) and machine learning (right) methods.

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