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A Study on Data Mining With Image Processing VIA UAV Images

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Abstract: *Data mining is the process of investigating large datas to identify patterns and established relationship to solve problems. This paper studies the survey of data mining with image processing algorithm and recent technology in plant disease, soil contamination and under water image with numerical and categorical data. The study involved with Unmanned Aerial Vehicle (UAV) which is an aircraft that flies without a human pilot onboard, controlled remotely or flown autonomously via pre-programmed flight plans or other automated guidance systems.*
Keywords: *Unmanned Aerial Vehicle (UAV), soil, plant disease, underwater image*

I. INTRODUCTION

An unmanned aerial vehicle (UAV) is a kind of aircraft that operates without a human pilot onboard. Recent technologies have allowed many different kinds of advancement on unmanned aerial vehicles used for various purposes. An unmanned aerial vehicle is also known as a drone.

Agriculture is the mother of all cultures. The agricultural production system is an outcome of a complex interaction of soil, seed and agro chemicals including fertilizers. The focus on enhancing the productivity, without considering the ecological impacts has resulted in environmental degradation. As diseases in plants are unavoidable, detecting disease plays a major role in the field of agriculture. Plant pathogens consist of fungi, organism, bacteria, viruses, phytoplasmas, viroids etc., three components are absolutely necessary for diseases to occur in any plant system and which may infect all types of plant tissues including leaves, shoots, stems, crowns, roots, tuber, fruits, seeds, and vascular tissues. Therefore, detection and classification of plant diseases is an important and urgent task.

The study of crops during the phenological stages enables a correct management of crop production with benefit from the point of view of costs, yield, and sustainability. Crop / Soil segmentation is considered as the first step to generate useful thematic maps for farmers and crop management agencies. This dependency is interesting when one considers that applications vary from the detection of curved and straight crop rows to the identification of weed filled areas. The identification of weeds plays a key role in ensuring a uniform growth of the target crop and for this reason it is necessary to develop algorithms able to discriminate crops, weeds and their foundation soils

Poor visibility of underwater images captured by cameras results in a difficult task for exploring ocean environments and recognizing underwater objects. the underwater applications involves seabed mapping, searching for airplane wreckages, underwater pipe inspection, and studying about hydrothermal vents. All of these applications are achievable as the Automated Unmanned Vehicle have sensors embedded into its system.

II. SURVEY METHODS

Plant disease in UAV images

In this paper for the input data, a fresh and diseased sample of plant leaves like pepper plant, potato, tomato with late blight and leaf spot were taken.

A sample of fresh leaf which is not affected by any disease is shown in **Figure 1.**

Color transformation from RGB to HIS is made .Then image is separated in red, green, blue components. Using the threshold value the green color pixels are changed. After that R,G,B components are mapped to the threshold image.

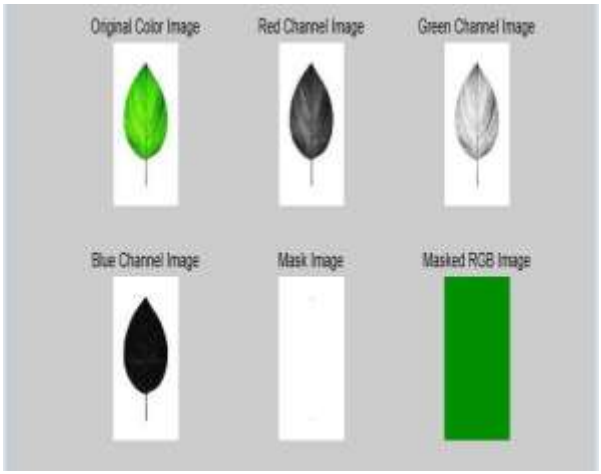

Figure 2: Masked image of Fresh leaf

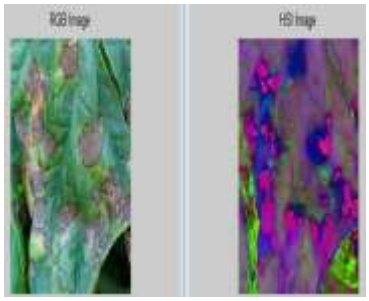

Figure 3: RGB to HSI transformation of the input image

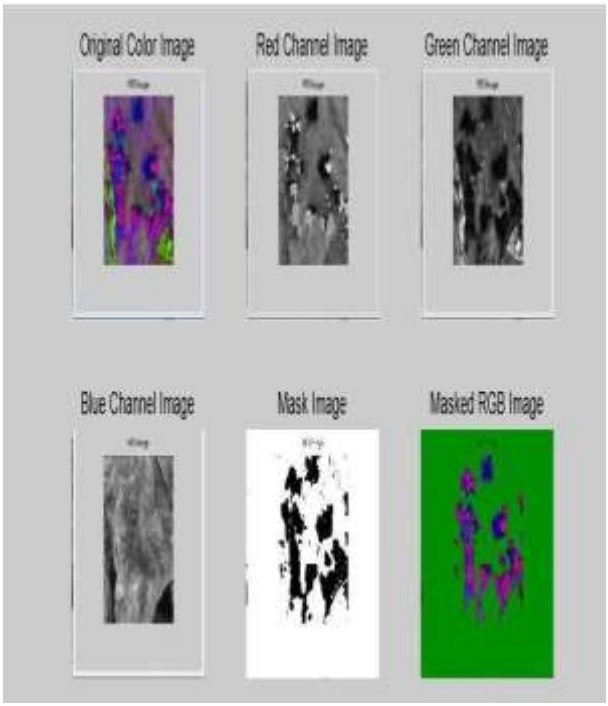

Figure 4: Masked image of defected sample

A pepper plant leaf is taken as a sample which is infected by a late blight disease is given as input to the algorithm is shown in figure 3. Color transformation structure is performed on the input image.Then the green pixels are masked and removed using a specific threshold value and then the R, G, B components are mapped to the masked image.

Figure 5: A sample of segmented image

Image segmentation distinguishes the foreground from the background. Simple thresholding using Otsu's method is used to separate the affected areas using various image parameters is shown in figure 5.

The main characteristeristic of this approach is to recognize the diseases. This paper gives the survey on different diseases classification techniques that can be used for plant leaf disease detection and an algorithm for image segmentation technique used for automatic detection as well as classification of plant leaf diseases has been described later. Therefore, related diseases for these plants were taken for classification. Using very less computational efforts the optimum results were obtained which also shows the efficiency of proposed algorithm in recognition and classification of the leaf diseases. one more advantage of using this method is that the plant diseases can be identified at early stage .

The optimum results are obtained using very less computational efforts which shows the efficiency of proposed algorithm in recognition and classification of the leaf diseases. One more advantage of using this method is that the plant diseases can be identified at early stage .To improve recognition rate in this process Bayes classifier, Artificial Neural Network, Fuzzy Logic and Hybrid Algorithm can be used.

Soil/crop segmentation with UAV images

The area studies about hilly farmland area. The survey is conducted with an AscTec Pelican equipped with the Sequoia multi-spectral camera.

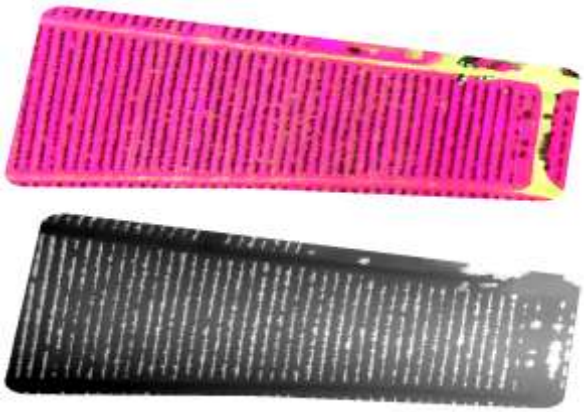

Figure 2 shows the study area and the related DSM.

As a result the orthophoto has a final Ground Sampling Distance(GSD) of 4 centimeters and 0.5 meters of horizontal accuracy.In this paper a kind of Digital Surface Model is used which derives from the ortho-rectification process that is required to output the orthophoto from the set of images acquired by the UAV. The orthorectification engine automatically excludes images that have low quality. The quality of the DSM is strongly affected by the flight parameters and mission conditions .In this image, vineyards dominate the study area with a regular (correlation) distance among the rows. The typical height over ground of tree is no more than 2 meters.

B. Slicing and convolution kernel approach

Extracting a section of the field along the red line x axis as shown in Figure 3

The original extraction of terrain data remains as the blue digitized signal in the background. The procedure completes in few milliseconds due to the integral nature of the filter is quite noise resistant. It is also easy to set for a variety of surfaces:

Once the soil extraction is complete and _ has been calculated, the soil can be removed from the overall signal to obtain the object or in this case the tree field _ . It is useful to define the characteristic function of the _ signal:

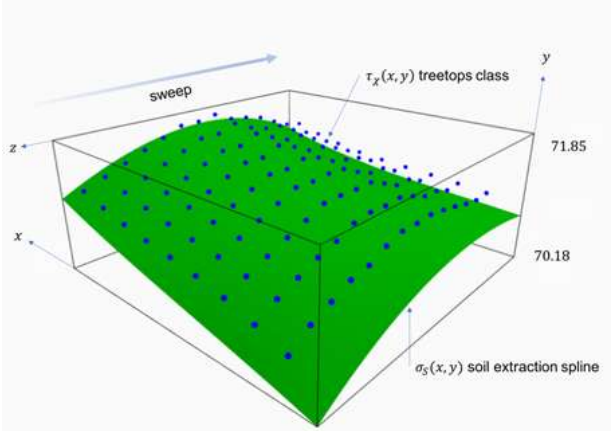

Figure. 3. A three-dimensional representation showing the soil extraction of correlation minima surface as a spline smoothed at the correlation frequency in both directions. Notice that the correlation frequencies for the tree objects are constant everywhere.

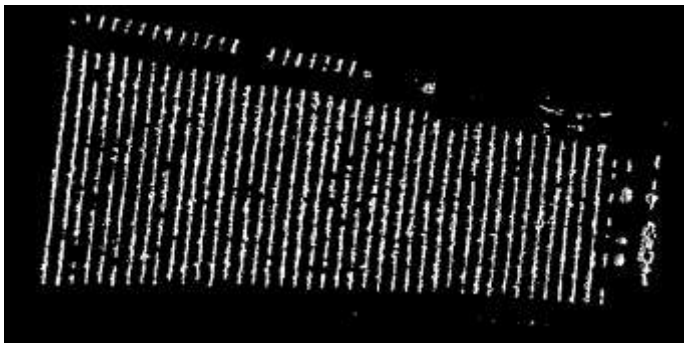

Figure. 4. Segmented image. White means tree, black means soil.

It is apparent, that once a single raster line has been completed, immediately the algorithm will move over to the next one in sequence until the entire surface is dissected .
Figure 4 shows the segmented crop vs soil field obtained by applying a logical OR operation between the slicing and 2D convolution kernel. use of a disk type structuring element is used with a size of 2 pixels.

C. Soil / Tree segmentation by classification approach

Crop segmentation is a typical required step to correctly categorize an agricultural image. Masking out soil is obligatory especially in case of arboreal crops. the soil must be masked out and the trees are used for analysis.

In case of bare soil the classification unsupervised approaches (e.g., k-means) could correctly identify crops vs soil. In case of vegetated soil (e.g., grass) it is necessary to add more features such as the height field, normalized DSM (nDSM) or soil gradients to increase the overall accuracy of the calculation.

Another procedure can be done with supervised approach for the same features .here the defining training sets are additional feature. In this case the definition of training set is an additional step that requires the interaction of a user. The training set definition is often the critical aspect that strongly influences the overall performance index of the filter. The main issue with area coverage is the partiality or imbalance of the dataset that can result if the data does not correctly cover the field of observation.
The K-means algorithm has been selected to perform the unsupervised classification by setting the number of classes equal to 2.

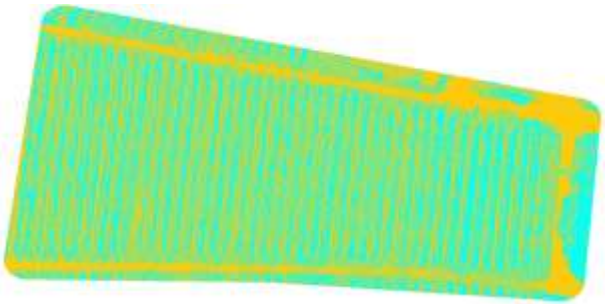

Figure 5 : Unsupervised classified image by using k-means with 2 classes and NDVI index. Yellow means soil and cyan means vegetated areas (e.g. tree)

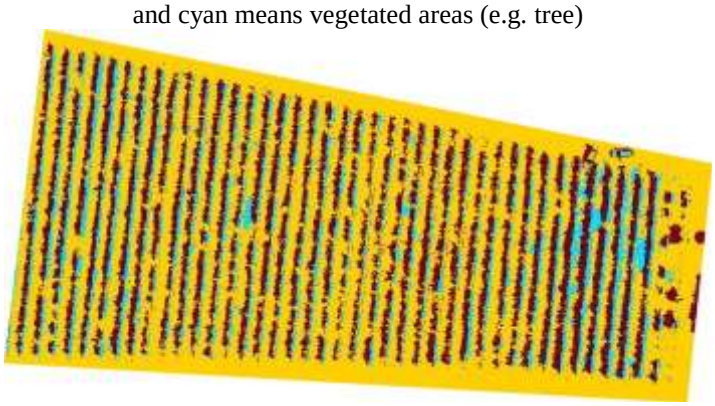

Figure 6. Supervised classified image by using the AdaBoost algorithm by using the G,R,RE,NIR,NDVI. Yellow means soil, brown means shadows, cyan represents tree.

Figure. 7. Supervised classified image by using the AdaBoost algorithm by using the G,R,RE,NIR, DSM. Yellow means soil, brown means shadows, cyan represents tree.

Figure 8. Supervised classified image by using the AdaBoost algorithm by using the G,R,RE,NIR,NDVI and DSM. Yellow means soil, brown means shadows, cyan represents tree.

Both methods require the exploration of the overall image. Performances and computational issues of the 2d convolution kernel. Each slice is independent in this image.this reduce the overall complexity for a soil/surface reconstruction to be merely linear.

Underwater UAV images

An image is formed using the light rays coming through the lens of the camera captured by an image sensor. Then it is converted into electrical signals which can be viewed on the screen. This process losses depth information as a result 3 Dimensional(3D) world is displayed as 2 Dimensional (2D) image on the screen. This is also known as perspective projection.

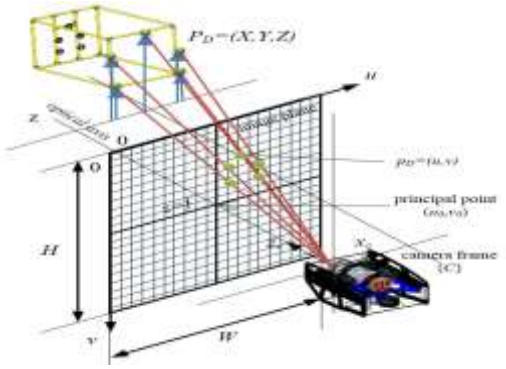

Figure shows the perspective projection of 5 distinguishable feature points from a docking station. In reality the image is inverted and projected behind the camera frame. The camera has intrinsic and extrinsic properties. The intrinsic properties are about how the image is projected on the image plane. In contrast to intrinsic properties, the extrinsic properties of a camera define the camera's position as well as its orientation in the world.

The first performance metric is the smoothness of image motion. As the AUV is moving closer and closer towards the docking station, the depth value should also be changed accordingly. the smoothness of the image motion is increased. Through the use of computer vision by processing the acquired features then measures the ratio between each features.

The second performance metric is the duration taken to the AUV to arrive at the desired location. the final performance metric is the Jacobian condition number which reflects the sensitivity of the developed function towards input error. This checks how sensitive is the system towards error.Here simulation had been conducted using SimulinkTM and the result shows that the developed IBVS system is quite capable to guide the

AUV towards the docking station.

Extended works can be done to improve the performance of the system by studying the effect of the depth between the camera and the target and also by tuning the linear parameter of the IBVS controller to achieve an optimum performance.

III. CONCLUSION

This paper makes a survey on data mining algorithms with image processing using unmanned Air vehicle(UAV) images. The plan diseases are recognized in the early stages so that we can increase the crop yield. The classification is performed using Genetic algorithm. In soil and crop segmentation two algorithms are used which gives better results. Unsupervised approach implements K-means algorithm and supervised approach uses ADABOOST algorithm. Underwater docking system has shown improved performance by using Jacobian matrix technique. Algorithm with more speed and accuracy used in the future works .

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