Mobile Project: Precision Farming

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I. Introduction

Precision agriculture is defined as the ability to perform each of the tasks of agricultural activity more accurately by means of technology. There are technological tools with which it is possible to carry out a detailed observation of the evolution and results of the crops, to the execution of mechanized operations through agricultural machinery (**?**)

It is important to mention the cycle that makes up precision agriculture, as readers' research covers each of these areas to achieve accurate results (**?**), as the first part of the cycle will collect the data of the plants, later the data are analyzed for example with tools such as Geostatistics, Experience, Classification of data and with the OpenCv library, a tool used by researchers(**?**) .

Currently, the linking of technology with different fields such as agronomy has provided important solutions to reduce the number of people dedicated to the care of a plantation, in Spain a project was carried out to monitor the strawberries in the fields of a company With the aim of saving resources by means of the technology and in turn giving treatment in the indicated time to the plantations, this would avoid the loss of product(**?**).

(**?**) The researchers propose to solve the problem of damaged plants in a plant segment by capturing images from a mobile device for data collection and then later analyzing them using the RGB codes that are obtained from the image filter Which is applied through the Opencv library (**?**). The objective will be to show the statistics of the plant to the producer so that it can be attended with time, it is desirable to create a graph with the number of plants analyzed and their results at the macro level.

II. Related Works

The analysis of the crops in the portions of land dedicated to this can be difficult, we can say that in general the plantations in farms can arrive to measure 2 hectares (**?**), for this reason must be counted on highly qualified personnel so that they are in constant verification of the plants and thus avoid losses. However, through precision agriculture in other countries such as Spain technology is implemented to save human resources and achieve real-time information (**?**).

(**?**)Proposes the capture of images using a Drone and later an analysis with the library Opencv, even presents two techniques that can be used in the evaluation of the image, remember that the purpose is to segment the image so that you can get fast and adjusted results To the reality, in addition they comment us algorithms used implemented from the properties of the bookstore to cut the images by squares, rectangles or circles, it is possible to emphasize that the methodology will depend on the needs of the user (**?**).

The researchers propose taking as input the experience in the development of the tool pCaps, creating a robust Database with the objective of storing the images of the plantation to be evaluated prior to monitoring the Drone (**?**) and once captured the picture boxes check with the stored images if they correspond to the lot lot to be analyzed, this security system recommend (**?**) to achieve accurate results.

During the investigation (**?**) assessed the possibility of storing the pesticides applied in a plantation so that this data will be part of the analysis to the crop portions, however based on the Mobile Crops Apps case study it is determined that the pesticide data are of considerable extension and So it is advisable to process them in a web application, showing results on a mobile device as a client. It can be determined that the databases that store this information must be of a different structure, (**?**) propose the implementation of the SQL engine and the PHP programming language to add security to our application.

A methodology implemented by (**?**) Is the analysis of the RGB codes once the image has been decomposed and shows more precise surfaces of the crop, through the color information we can determine the deficiency of the most common plants such as nitrogen (yellowing of the leaves), phosphorus (Dark green leaves with a tendency to purple and reddish), magnesium (holes in the leaves), calcium (atrophied and deformed leaves), zinc (may present spots at the leaf border), boron (New whitish yellow leaves) (**?**) , for the analysis of the data the USENSE X8 and Openv tool was used (**?**) .

In the figure above we can see the colorations that can obtain a plant according to the deficiency that it presents.

III. Experimental design

Description: In order to validate the result of the present investigation, a series of experiments will be carried out that will expose the efficiency of the developed application. The experiment involves taking a sample of leaves from a crop and evaluating them with the application, it will analyze the images taken based on the data it obtains from the data layer of the system. For the experiment we need the following

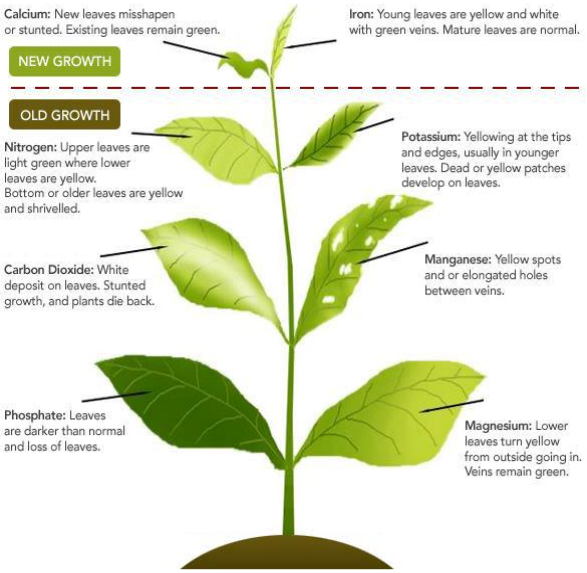

Fig. 1. Nutrient deficiency in a plant

requirements: Para el experimento necesitamos los siguientes requerimientos:

1) Test objects: For this case we will use a sample of 10 leaves (2cm x 6cm) of orange trees.
2) Controlled light conditions: Very high luminous particles can strongly affect the accuracy of the data captured from the images.
3) Deficiency Objective: Data of the deficiency that is evaluated, the scalar data that are obtained must be very precise as they will determine the intensity of the pigmentation that is sought to find in the images.
4) Android Device: A device with an android version greater than or equal to the 4.4 kitkat is required. In addition the device must incorporate a camera with a resolution of not less than 8 mp.
5) Internet connection: A connection is required to send and receive data from the server.

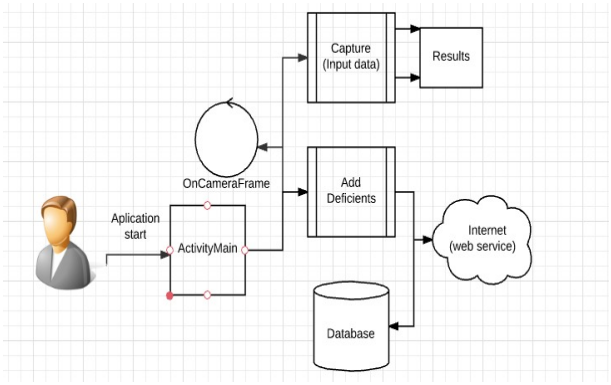

Fig. 2. Procedure diagram

Procedure: Complying with the above the evaluation process is quite simple, it starts by placing the leaf of the selected crop on a white surface (bond sheet), in a room with controlled lighting and the application starts. Once the application is

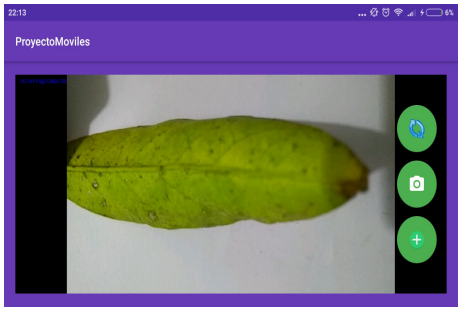

Fig. 3. Take a inpunt picture

started, the image is captured and the image is automatically evaluated to determine if there is a match in each case. If the result is positive, a message will be displayed with the name of the detected deficiency or illness.

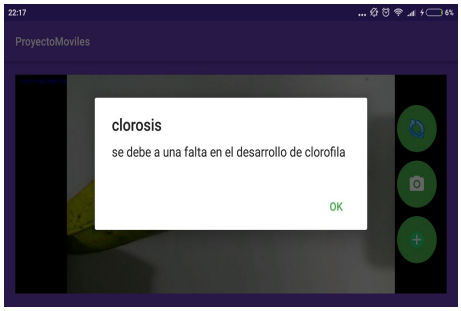

Fig. 4. Get a message with the result

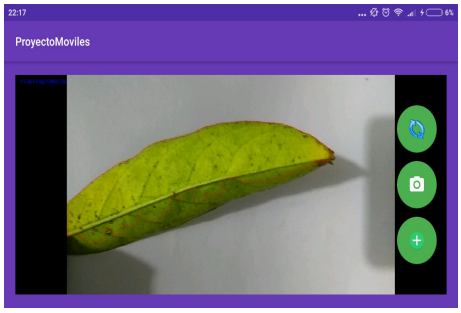

Fig. 5. The detected area is marked with red border

IV. Results

1) Clorosis. Positive result
2) Clorosis. Positive result
3) Clorosis. Positive result
4) Clorosis. Negative result
5) Clorosis. Positive result
6) No clorosis. Positive result
7) No clorosis. Negative result
8) No clorosis. Negative result
9) No clorosis. Positive result
10) No clorosis. Negative result

	Positive	Negative
True	4	1
False	2	3

V. Conclusions and Future Work

It is possible to identify the deficiency of a plant using RGB codes obtained in an image and implementing the Opencv library, however in technical aspects the plants can present the same colors for different diseases, that is why it is advisable to have expert knowledge in the matter And field testing to improve the prototype developed.

It is determined by field tests that it is inevitable not to count a database with the images of the possible deficiencies focused on a silver, since the behavior of these can be variant according to the culture.

It is advisable to implement some strategy to differentiate the deficiencies that are present in the stems of the leaf, this can present problems of some kind mentioned in Fig.1 or can be in perfect condition, to evaluate correctly is required to know about the behavior of the Deficiencies in the evaluated plant.

It is noteworthy that the lack of field knowledge to evaluate the deficiencies in a plant complicates the research and therefore the development since the team work a broad view of the problem and had no knowledge that the deficiencies behaved differently in different crops.