Weed and Corn segmentation through Convolutional Neuronal Networks

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***Abstract*—Today the computation stays i**

I. Introduction

I wish you the best of success.

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August 26, 2015

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II. Introduction

During the last centuries, huge progress has taken place in science and technology developments. Significant milestones such as Communications, Numerical Computer Control and the miniaturization of components have benefited social and industrial sectors on its approach to solve specific problems.

Globalization has permitted countries who are not leader technology developers, like Ecuador, to receive bleeding edge technological products in order to satisfy requirements and propose solutions to still-unresolved problems.

Industry transformation is a science evolution example; manufacturing, food, and information industries, among others, are signs of this industrial revolution. However there are fields still unexplored in Ecuador like agroindustry. Agriculture in Ecuador has not changed much since precolombine times; while it is true that there are efficient agriculture practices, the lack of technological resources make it impossible for the country to exploit its true potential as an agricultural producer.

Nowadays, one of agriculture challenges is the development of precision agriculture techniques focused on Weed and Crop segmentation. There are studies that show the impact of Weed in corn crops [1]; its yield is affected by 5000 kg/ha. Currently, growing development of Artificial Vision and Machine Learning algorithms allow researchers to propose solutions for Weed Segmentation in Crops.

One of the first approximations to the algorithms of detection of Crops was developed in 1996[2], this algorithm permitted to segment crops from weed, it could be possible by the use of IR Images, the image is processed by a hysteresis umbral and the method of Min Neighbouring to identify the row of crops. In recent years the implementation of Machine Learning has opened new possibilities for differentiate the Weed from the crops, recently [3] there had been developed an algorithm by the use of Harris Corner detector, Feature Detector and using the DBSCAN (Density-based spartial clustering of apllications with noise) , it demonstrates an effectiveness of 98% in the identification of Weeds in the Rice, Araguez *et. al* [5] performed their segmentation through the analysis of the green hystogram and performing the segmentation of the crop and weed by classifiers not specified in the document.

Hong and Lei [4] developed their approximation by using an optimal method for detection in various types of luminosity, they achived this by the use an ANN for weed and maize classification, with a precision of 92.5%, also there had been developed [6] through binarization methods of OTSU and Watershed for the segmentation of the images, while the classification was given through a areas analysis to perform a thresholding, although the method is computationally effective when the Weed distribution does not resemble the size to the crop plant, its error increases when there is more density of crop than of weed. Romeo *et. al* [7] propose to use a fuzzy clustering approach to correctly segment the crop green and the same algorithm to classify the soil crop.

The segmentation of weed and crops is not closed to color images, using a multispectral camera [8] permitted to obtain RGB and NIR images, for the segmentation and classification, then the images used a light CNN for the first process and a Deep CNN for classification in Crops, its accuracy is up to 98% in the identification of weeds. One of the most dificults things for the identification of crops is the generation of Datasets due to presence of Weed in the images of training, but there could be correctly generated by a Convolutional Neural Network [9] achieving a acceptable accuracy for the generation of Datasets

III. Matherial and Methods

The development of the model for the weed and maize detection algorithm using convolutional neural networks is described below.

A. Hardware

The card used is a Raspberry Pi 3. The camera used for both the sampling and the model was a RaspBerry Pi Camera module v2, which is configured to obtain a video at a resolution of 640 by 480 pixels , In order to improve the performance of image processing.

B. Software

The packages used were OpenCV and c/++, for the acquisition, segmentation of images, Caffe an Cuda for the realization of neural networks,

C. Neural networks

For the training of neural networks we used an AlexNet architecture, but we do quizes with others architectures like Let Net, Inception Ned, but the results wont good.
For the model we have two categories, the first maize in its initial stage, and the second weed, We had a total of 2225 images, of which 1622 images were of maize and 603 of weed

D. Dataset Desciption

Samples were obtained from images captured in maize fields in their initial stage, when there was no exaggerated presence of weeds in the culture, the camera was configured at a resolution of 640 by 480 pixels, to obtain raw samples of the two Categories to be classified.
Then, through a digital image processing, the raw samples were segmented to differentiate them from the soil and other non-plant elements, thereby obtaining unique images from each class.
Once the segmented images were obtained, they were removed those that had a resolution lower than 64x64 pixels, because it/'s the size of the layer of entrance of the network, besides it was not convenient its processing since its total area was much smaller than the samples of corn, Which is the purpose of this document.

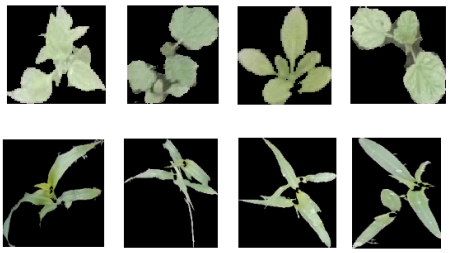

Fig. 1. Simulation results for the network.

E. Convolutional Neuronal Network

After the segmentation of the pictures have been terminated, it is neccesary classify the images of Maize and Weed, a high accurate method of Image Classification is Convolutional Neuronal Networks(CNN), those models are complex but efficient with a highly rate of discrimination and its demostrated that they have good results in Image Classification, Object Detection and Fine-Grained Classification [10]. Their are also applied in Precision Agriculture [8] for the correct identification of plants.

IV. Test

V. Conclusion

The conclusion goes here.

Acknowledgment

The authors would like to thank...

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