Smart Agriculture using Image Processing

MINOR PROJECT I

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Problem Statement

- To automate the identification of weed plants among crops in agriculture using artificial intelligence by processing captured images.

Motivation to choose the topic

- Agriculture remains the pre-dominent occupation in India for vast sections of the population. Over the years, several new challenges have emerged before the sector. With fragmentation of agricultural holdings and depletion of water resources, the adoption of a combination of resource efficient methods, dynamic cropping patterns, farming that is responsive to climate change and intensive use of information and communication technology should be the backbone of smallholder farming in India. For a safe and food secure future, the agriculture landscape has to undergo tremendous transformation and shift from the philosophy of green revolution led productivity to green methods led sustainability in agriculture.

Objective and scope of the project

- In smallholder firms, resource efficiency can be brought about through adoption of appropriate technologies. However, use of technology, investment in costly farm machinery or scaling up the existing technology may not economically feasible for small and marginal farmers. Hence, there is need to promote use of environment-friendly high-tech machinery (like robots, drons etc) for the mechanisation of small and marginal farm holdings.

- Robots are quite smart by design. However, to fully understand and properly navigate a task like identification, spraying, cutting and disrooting of weed plants from crops, they need inputs. These inputs can be provided using artificial intelligence.

- The main area of application of robots in agriculture today is at the harvesting stage. Emerging applications of robots or drones in agriculture include weed control, cloud seeding, planting seeds, harvesting, environmental monitoring and soil analysis. According to Verified Market Research, the agricultural robots market is expected to reach $11.58 billion by 2025.

- Disease identification, Plant leaves classification, Seed classification, Pollen leaves classification, Increase Crop Productivity are some of the main areas where image processing can be used.

Methodology

- We will create an Image Classifier which can distinguish whether a given pic is of a weed plant or crop or something else depending upon fed data. To achieve our goal, we will use different machine learning algorithms out there which are used for Image Classification i.e. Convolutional Neural Network, Image Classification using keras etc. So basically a machine learning algorithm is used for machines to understand the features of image with a foresight and remember the features to guess whether the name of the new image feeded to the machine.

Hardware & Software requirements

- Digital Camera Scanner
- Linux/ Windows 7, 8, 10, Server 2008, Server 2012, 64 bits
- Any CPU (Intel i5/ i7/ Xeon recommended).
- Any GPU that is compatible with OpenGL 3.2.
- Small projects (under 100 images at 14 MP): 4 GB RAM, 10 GB HDD Free Space.

Contribution that the project will be able to make

- The project will act as classifier to identify whether a plant belongs to a crop or weed.
- The project promotes use of Agricultural robots in Agriculture to quickly become an exciting high-tech industry, draw new professionals, new companies and new investors.
- Economists have found that as a nation becomes more prosperous, the proportion of GDP contributed by agriculture as well as the proportion of population working in the sector declines considerably. In India between 1950 and 1990, the proportion of GDP contributed by agriculture declined significantly but not the population depending on it as the industrial sector and the service sector did not absorb the people working in the agricultural sector. This is an important failure of our policies followed during 1950-1990.
- Agricultural Robots can help us to reduce this percentage and shift from farm to non-farm activities which is one of the seven strategies recommended by Inter-Ministerial Committee constituted by the Govt. of India to achieve its target of doubling farmer's income by the year 2022.