Idea/Approach Details

Technology Bucket : Robotics & Drones
Company Name/ Ministry Name: ITC Limited
Team Leader Name : Chetan Chawla

Category: Software
Problem Code : RR1
College Code : 1-3513023243

Smart India Hackathon

Team: Future Gadgets Lab

Drone Doctors

Plant Topography analysis against pest, diseases and water deficiency using Neural Networks and Computer Vision and building a custom drone and integrated software with AI for predictive and prescriptive model against pest, diseases and water deficiency in crop plants for the common farmers as a service

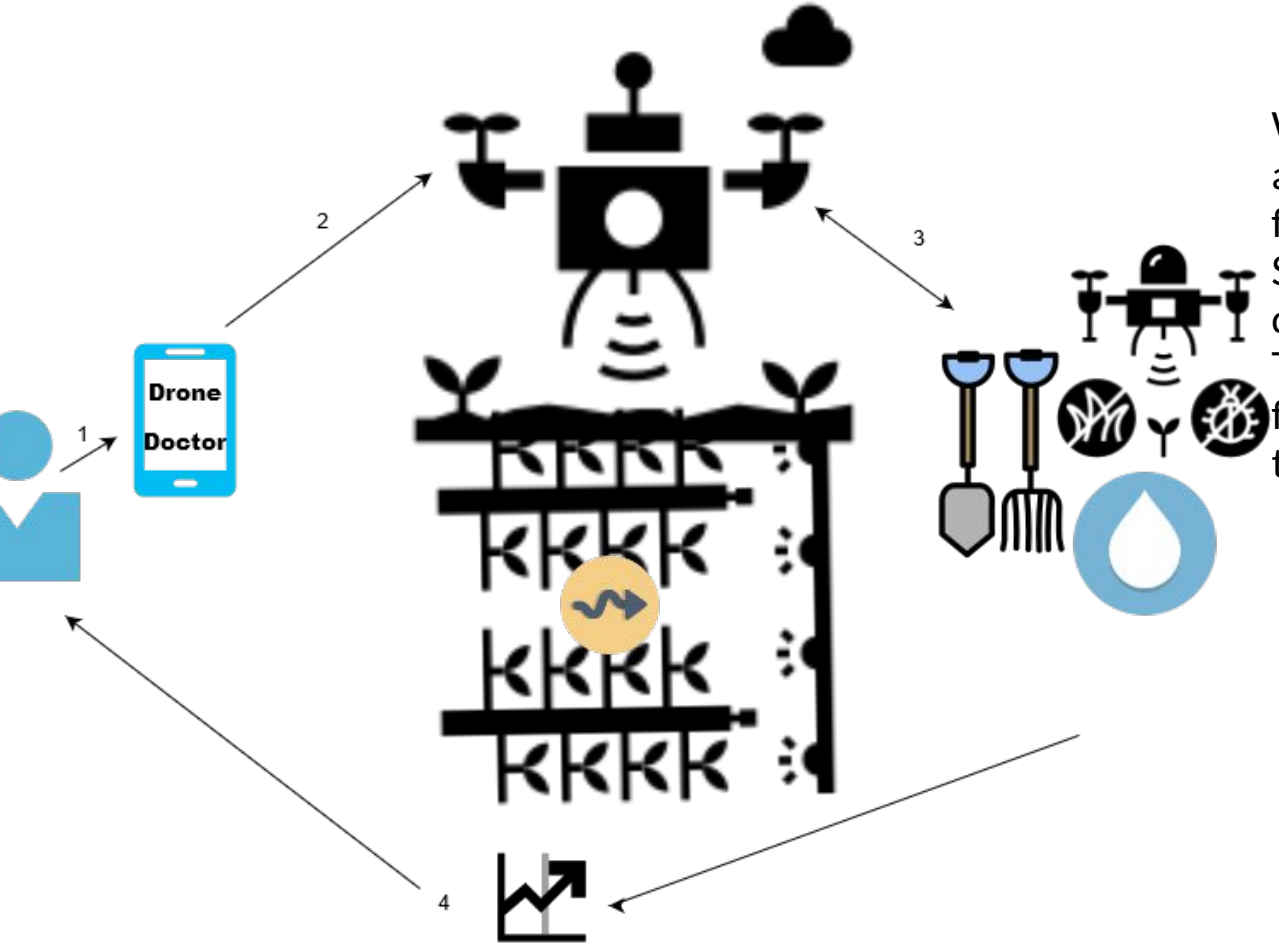
Tech Stack: Deep Learning (CNNs), Unmanned Aerial Vehicles- Path Planning, Computer Vision in Multispectral and Hyperspectral imagery, android/web application development and embedded system designing.

Showstopper and use case

We propose a **cheap alternative** to the Indian Farmers using **normal cameras for multispectral imaging** and cheap thermal cameras to provide **drones as a service**, enabling **farmers to call** for a drone analysis using an android application/SMS, which traverses the field, uses the cameras for pest identification and water and nutrient deficiencies using embedded software, all on-chip, without requiring heavy net connections, and presents an infographic of the current spatial health of the entire field and predicts the future trend of pest and disease spread using Deep Learning algorithms, doing processing post flight, thus having good flight times and uploading the **infographic and prescriptives to the farmer back on his phone**, allowing a cheap way to analyze his whole field in minutes, bypassing highly suggestive manual inspection.

The Solution

The idea is to propose a callable android service to the farmers of a drone equipped with 3 different types of cheap cameras (viz. RGB, near Infrared (modified RGB) and hyperspectral camera) and a thermal IR sensor capturing images while traversing the trajectory of the crop-field, forming an orthomosaic at the end of the flight for all three cameras. We get Normalized Difference Vegetation Index and Red Edge (NDVI & NDRE) and water levels after processing the images on landing of the drone. We use these to notify spatial prescriptives to the farmers. We also use CNNs on the hyperspectral data from open data sources to figure out the potential pests, diseases and elemental deficiencies spatially and forecast using Recurrent units, the chances of having them and offer preventive measures to the farmers on the app using easy to understand infographics.



Flow Chart

Dependencies

We tend to provide the application as the one stop access to the farmers. Hence Android phone (or SMS Service) is the only dependency on the farmer's end. The service on our end has the following dependencies (service to the farmers):

- Hardware sensors: Drone with PixHawk/Primus board, Movidius Camera, Rikola Hyperspectral Camera, Raspberry Pi, AMG833 IR Thermal Sensor 8X8 and GPS module.
- Software: Computer Vision using ODM (Open Drone Map) library, Motion Planning library, Convolutional Neural Networks on chip