Emerging UAV Applications in Agriculture

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This paper provide a panoramic view about the current status of the emerging use of UAVs in the Agriculture area and present a generic example in one of the application areas with system design and component selection. It also gives a comparison on the advantage of using UAVs in the are of agriculture in contrast to satellite imagery.

I. UAV vs Satellite

Parameter	Drone (UAV)	Satellite
Scalability	Provide a limited way to scale the process	Scalable with a systematic monitoring of land on a large scale
Spatial resolution	Ultra high, can be up to few cm/pixel	Typically in the range of 20-50 cm/pixel
Temporal Resolution and operational flexibility	- Very flexible - Imagery is available on demand - Short revisit	- Limited by the orbital coverage pattern of the satellites. - Unfavorable revisit times, satellite coverage is periodic
Spectral resolution	Narrowband hyperspectral imaging sensors	Limited, lacks the spectral resolution required for many quantitative remote sensing applications
Minimum-area sale requirements	Not relevant	100's to 1000's sq.km need to be purchased per order.
Costs	From 0.5 to 5 USD per hectare per 1 data acquisition+ transportation and accommodation costs of drone operator (i.e 1,000 USD/day)	Typically from 0.01 to 0.5-1 USD per hectare per 1 data acquisition.
Dependency on weather conditions	Decrease dependency on weather conditions (such as clouds), as the operation altitude of a drone is below 500m.	Vulnerable to any limitations on visibility (such as clouds)

Drone vs Satellite.

II. Crop and Weeds management

Crops and weed management in precision agriculture are two key activities for different purposes:

1. yield estimation,
2. herbicide application
3. pesticide control

→ Resulting in cost-saving and minimal environmental impact.

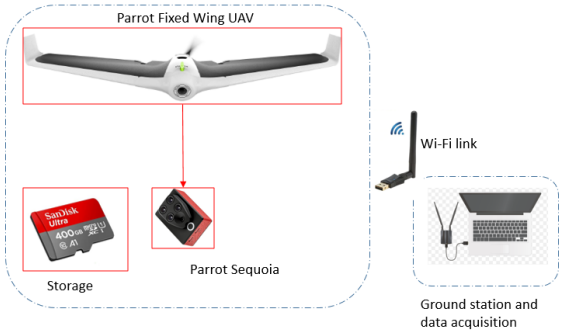
Many applications in crops are oriented to the generation of maps for monitoring:

1. weed infestations and coverage,
2. biomass estimation,
3. yield prediction, or crop stress.

→Hyperspectral imagery used for computing chlorophyll content to characterize spatial and temporal variation in crop production.

III. System Design

The Parrot Disco-Pro frame will carry the multispectral imaging system for remote sensing operation, the systems will have as main component spectral camera and an image acquisition system.



Overview of the multispectral imaging system with the UAV proposed.