Digital and Data-Driven Precision Agricultural Applications Using Unmanned Aircraft Systems (UAS)


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Data Link

Ground Control Station

Online UAS Data Processing
UAS - Data Storage - Processor - Web Server - Internet - End User

Digital Connection

Aerial image vs Nitrogen

Summary

Digital Agriculture and Data has played a key role in Precision Agriculture and Remote sensing has been a major source of information. Unmanned aircraft systems (UAS) has provided platform for real time data acquisition. Farmers faces challenges to integrate the data from UAS with other technical and social information to make better management decision. Digital Agriculture with the help of online analytical tool, will provide data in useful format, so that the farmers can make best decisions.
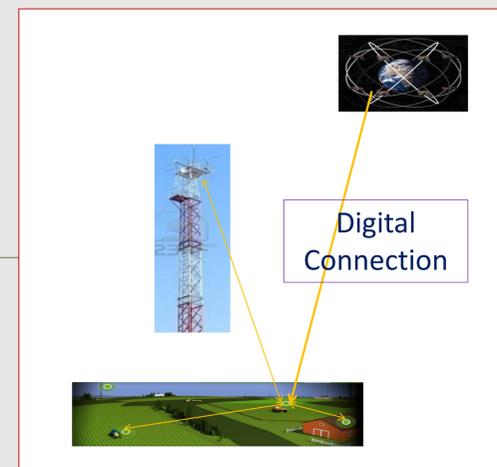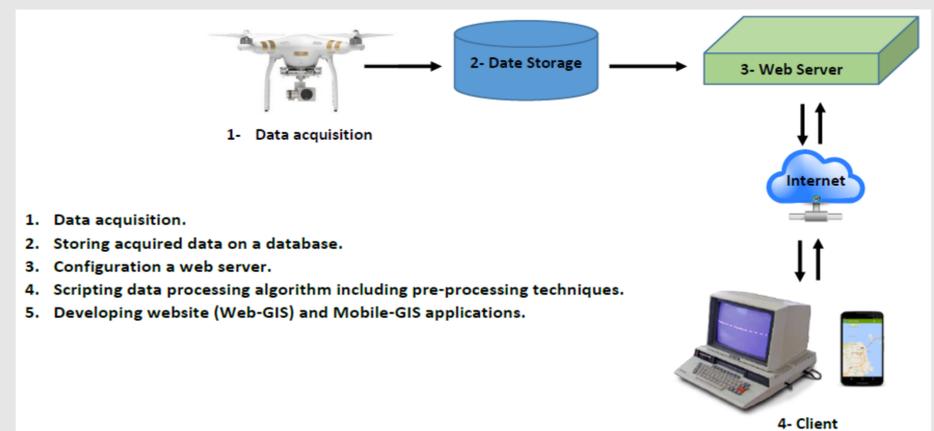
Introduction

- Spatio-temporal data are key in Digital Agriculture
- Major sources of data now include aerial imagery, soil grid data, and data from agri equipment
- Major advances in field and equipment-based sensor and very high resolution data by UAS
- Potential to revolutionize agriculture rests on successfully addressing the challenges relating to acquiring, understanding, and using Big-Data

Approach

- Collecting data from UAS, field sensors, ag equipment
- Develop a web based computer data processing program to analyze the Big-Data and deliver it in useful format to the farmers in real time or near real time
- Deliver the processed product such as prescription map, locations, or useful imagery to handheld devices such as iPad or iPhone in the filed or farm equipment
- Test the processing tool and delivery mode in terms of speed and capacity

1- Data acquisition
2- Date Storage
3- Web Server
Internet
4- Client

1. Data acquisition.
2. Storing acquired data on a database.
3. Configuration a web server.
4. Scripting data processing algorithm including pre-processing techniques.
5. Developing website (Web-GIS) and Mobile-GIS applications.

Why Data Driven and Digital Ag?

- Maximize Profits
  - Less Overlap
  - Reduce Inputs
  - Increase Yields
- Reduce Stress
- Protect Environment
- Feed 7.65 Billion People

Year	Population
1804	1 billion
1850	1.2 billion
1900	1.6 billion
1927	2 billion
1950	2.55 billion
1955	2.8 billion
1960	3 billion
1965	3.3 billion
1970	3.7 billion
1975	4 billion
1980	4.5 billion
1985	4.85 billion
1987	5 billion
1990	5.3 billion
1995	5.7 billion
1999	6 billion
2000	6.1 billion
2005	6.45 billion
2010	6.8 billion
2011	7 billion

Current World Population: 7,647,638,829

http://www.worldometers.info/world-population/

Findings

- UAS imagery collected to evaluate the NDVI at different nitrogen levels
- Base model was established between amount of nitrogen and NDVI values
- The regression model using UAS RedEdge band provides better accuracy
- Estimating nitrogen deficiencies based on the NDVI values and field visualization
- Beneficial to the producers for implementing cost relevant management options

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