IC201P Design Practicum - Case Study: Engineering solutions for precision agriculture

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FOOD, FEED, FUEL, AND FIBER: SECURITY UNDER A CHANGING CLIMATE

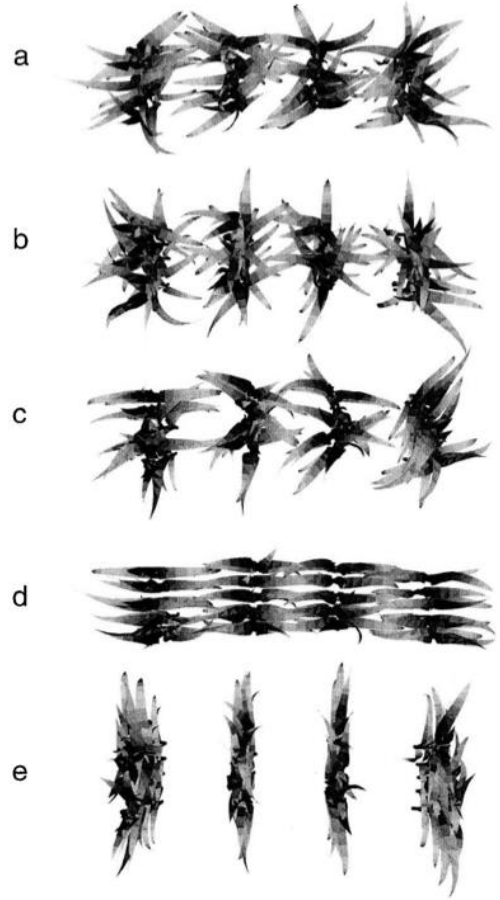
IOWA STATE UNIVERSITY
Center for Crops Utilization Research

Products that use Corn

Adhesives (glues, pastes, mucilages, gums, etc.)
Aluminum
Antibiotics (penicillin)
Asbestos insulation
Aspirin
Automobiles (everything on wheels)
- cylinder heads
- ethanol - fuel & windshield washer fluid
- spark plugs
- synthetic rubber finishes
- tires

Baby food
Batteries, dry cell
Beer
Breakfast cereals
Candies
Canned vegetables
Carbonated beverages
Cheese spreads
Chewing gum
Chocolate products
Coatings on wood, paper & metal
Colour carrier in paper & textile, printing
Corn chips
Corn meal
Cosmetics
C.M.A. (calcium magnesium acetate)
Crayon and chalk
Degradable plastics
Dessert powders
Dextrose (intravenous solutions, icing sugar)
Disposable diapers
Dyes
Edible oil
Ethyl and butyl alcohol
Explosives - firecrackers
Finished leather
Flour & grits
Frozen foods
Fructose
Fuel ethanol
Gypsum wallboard
Ink for stamping prices in stores
Insecticides
Instant coffee & tea
Insulation, fibreglass
James, jellies and preserves
Ketchup
Latex paint
Leather tanning
Licorice
Livestock feed
Malted products
Margarine
Mayonnaise
Mustard, prepared
Paper board, (corrugating, laminating, cardboard)
Paper manufacturing
Paper plates & Cups
Peanut butter
Pharmaceuticals - The Life Line of The Hospital
Potato chips
Rugs, carpets
Salad dressings
Shaving cream & lotions
Shoe polish
Soaps and cleaners
Soft drinks
Starch & glucose (over 40 types)
Syrup
Tacos, tortillas
Textiles
Toothpaste
Wallpaper
Wheat bread
Whiskey
Yogurts

Corn variants and their yield potential



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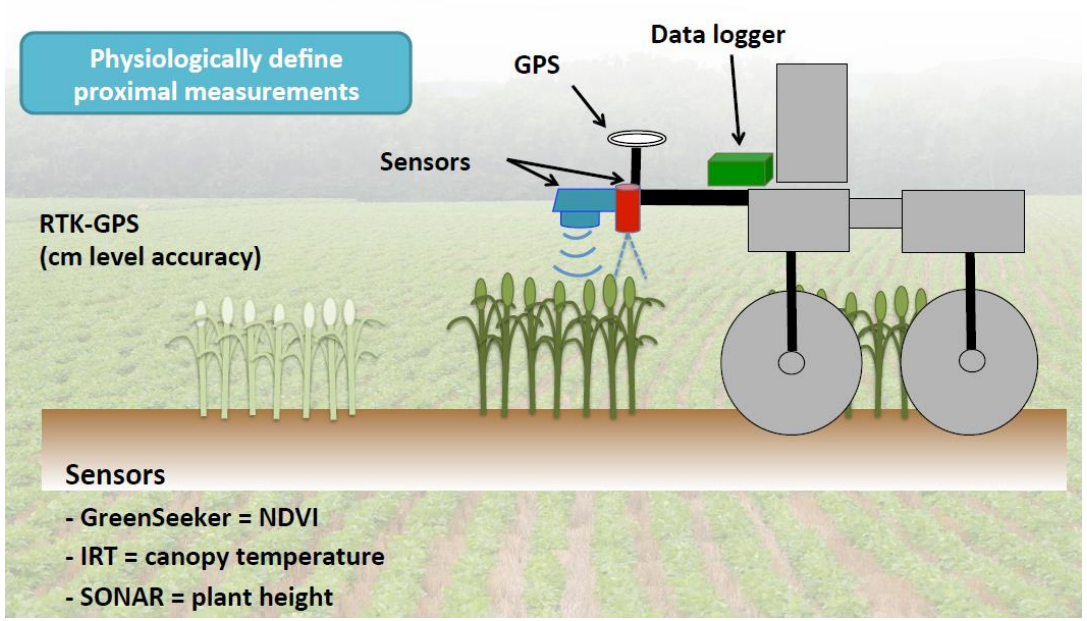
JL Drouet et. al. 1999. Agronomie, 19

Methods of Measurement …



THE UNIVERSITY OF ARIZONA USDA KANSAS STATE UNIVERSITY

… and Smart Farming

Trait measurements for scientific purposes

Crop management: irrigation, fertilizer, pesticide etc

IOT in Agriculture

BUSINESS GUEST

Surprise: Agriculture is doing more with IoT Innovation than most other industries

JAHANGIR MOHAMMED, JASPER DECEMBER 7, 2014 3:04 PM

Image Credit: Arina P Habich / Shutterstock

Venture capitalists invested a record amount in agriculture and food startups in the third quarter this year, totaling $269 million across 41 deals. Conservis, for example, raised $10 million to offer farmers a real-time view of operations. FarmLogs raised $4 million to deliver apps that help farmers increase their productivity and profitability by identifying the crops most likely to sell. In November, Eric Schmidt's Innovation Endeavors and Flextronics Lab IX launched Farm2050, a collective to support "ag-tech" startups whose solutions boost global food production.

JANUARY 30, 2017

The Ag Tech Market Map: 80+ Startups Powering The Future Of Farming And Agribusiness

Product 1: Unmanned Ground Vehicle - Phenobot

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- 3-D imaging
- Geotagging images
- Remote operator

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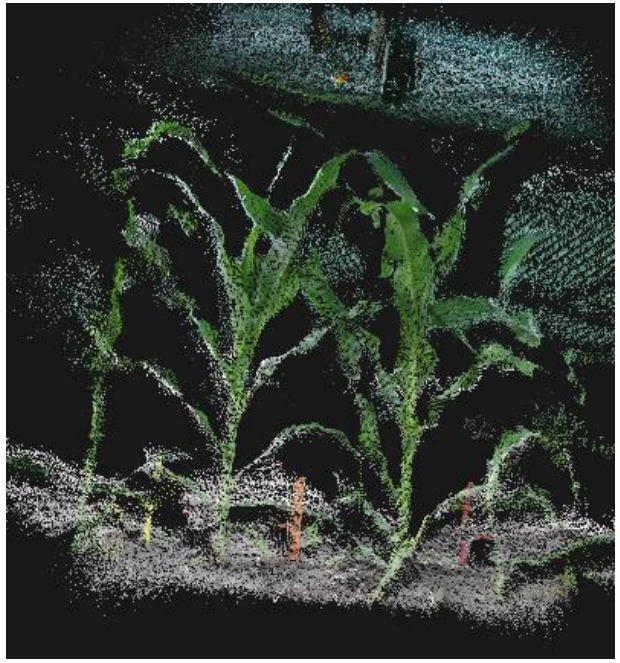
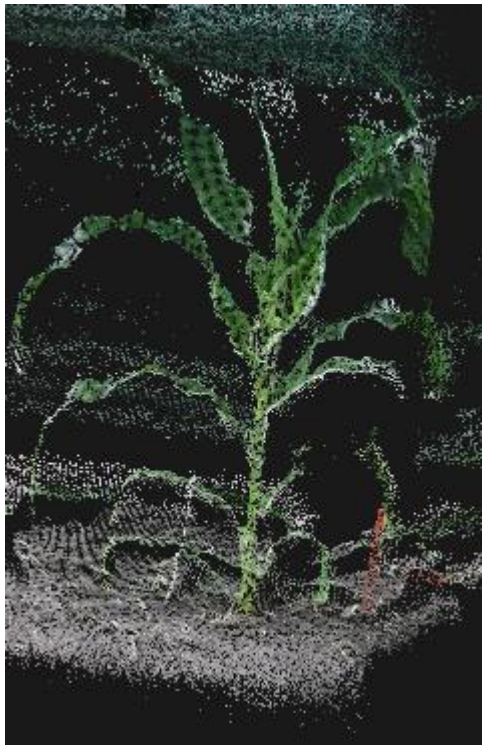
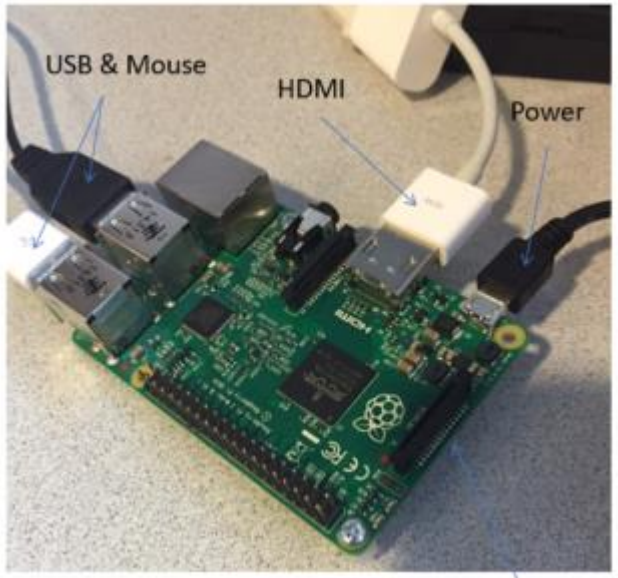




Product 2: Inexpensive Stationary sensors

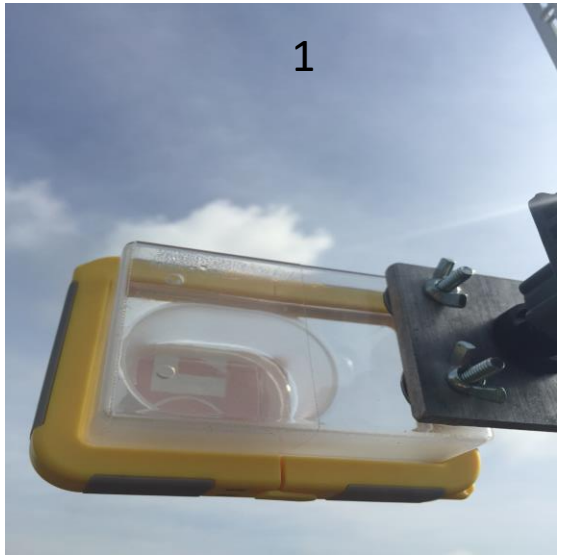


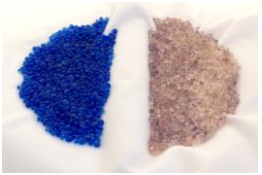
Design Exercise: Example of Data

Design Considerations: Housing and Mechanical

Design Considerations: Temperature

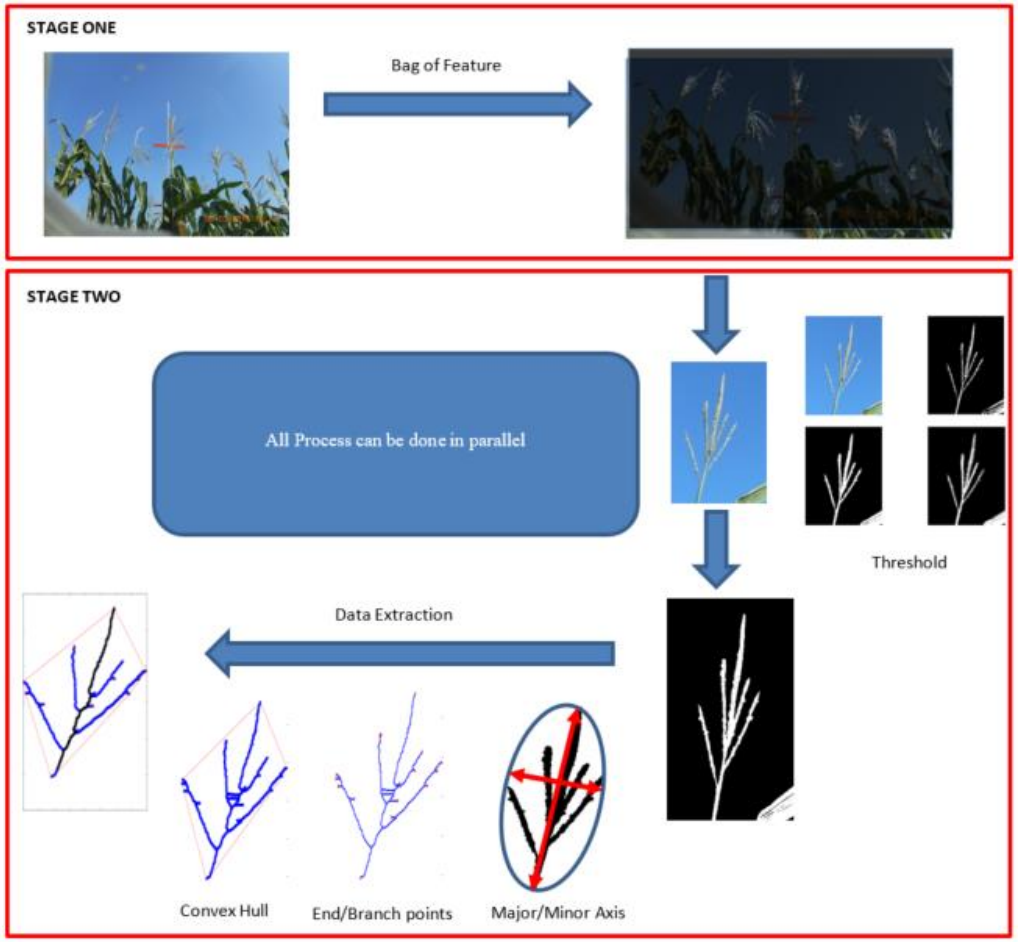
Manual states: Battery could malfunction above **104F** and not charge above **113F**

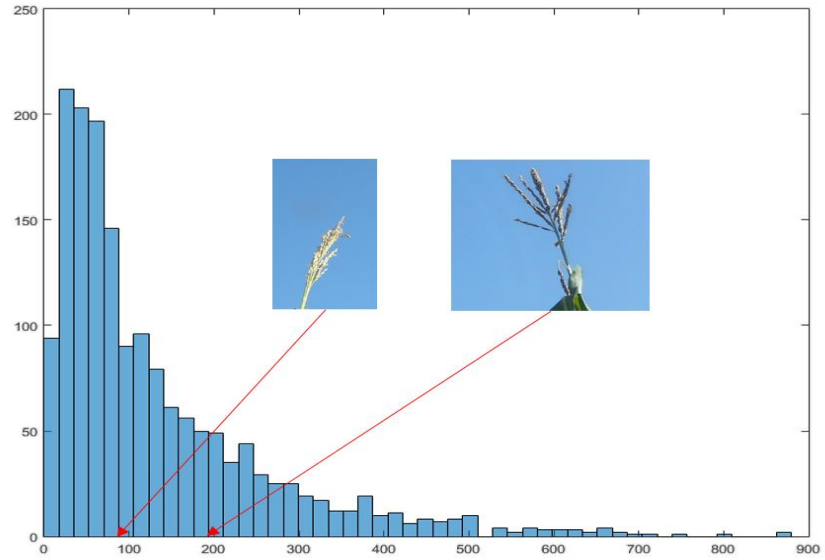




Design Considerations: Power

Initial Results





Histogram of Tassel Width over Diversity

Fast, automated identification of tassels: Bag-of-features, graph algorithms and high throughput computing

KDD 2016 Workshop on Data Science for Food, Energy and Water

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Camera Array

Deployed over 450 cameras in 2015

Over 20,000 images/ day =
~150 Gigabytes /day

Questions?