









AIRSPACES: AUTONOMOUS INSTRUMENTED ROBOTIC SENSORY PLATFORMS TO ADVANCE CREATIVITY AND ENGAGE STUDENTS – SUMMER 2019

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Introduction

- Objectives
- ° GoPiGo's and Solid Modeling
- Robotics
- Precision Agriculture
- STRIDER
- Farmbot
- Summer Outreach
- Learning Outcomes

Objectives

- 1. To gain content knowledge and active learning in robotics, programming, precision agriculture
- 2. To learn to work in multidisciplinary teams to address critical issues in engineering related to advanced manufacturing and environmentally-friendly agriculture
- To use the knowledge gained over the early part of the summer to support the educational activities during the summer bridge program (July 22nd – Aug 2nd)



Rocket

Learning Experiences with GoPiGo and Solid Modeling

- A complete kit to build your own robot car
- ° Teaching tool for engaging students in robotics
- Runs on either Scratch or a variation such as Bloxter(based on Google's Blockly)
 - ° Can also be programmed on Python
- Used for familiarizing with basic coding languages
- Used SolidWorks and Tinkercad for solid modeling and 3D printing



Adept Cobra S350

- 4-axis robot
- Selective Compliance Articulated Robotic Arm (SCARA)
- Skills learned:
 - Basic Pick and Place operation
 - Familiarity with Teach Pendant
 - Homogenous/ Relative transform
 - V+ Language



Adept Remote in action



https://www.google.com/search?q=precision+agriculture%2Bright+input+right+time+right+place+right +amount&rlz=1C1CHBF_enUS851US851&source=lnms&tbm=isch&sa=X&ved=0ahUKEwjy8PuM9b7j AhVM1VkKHSndCD4Q_AUIESgB&biw=1366&bih=608#imgrc=M953D4d5j2NNyM:

Precision Agriculture

- Precision agriculture is also known as Sitespecific farming.
- A key component of this farm management approach is the use of information technology and a wide array of items such as GPS guidance, control systems, sensors, robotics, drones, autonomous vehicles, variable rate technology, GPS-based soil sampling, automated hardware, telematics, and software.
- Correlation studies of UAV images with leaf tissue analysis

UAV Remote Sensing-Mission Planner



UAV Landing



Mission Planner



Corn Field Samples

• Leaf analyses of corn plants can be very useful when evaluating the adequacy of nutrients required for corn production.

• This process is helpful when determining the sufficiency of the fertilizer program used by the producer.

• The analyses of corn leaves prior to tassel formation can help the producer make decisions regarding additional fertilizer application.



Semi-Autonomous Tracking Robot with Instrumentation for Data-Acquisition and Environmental Research(STRIDER)

- The Strider unmanned autonomous boat is used to collect water samples for United States Department of Agriculture(USDA).
- The boat required modifications with respect to:
 - ° Recalibration of the GPS system
 - Updates to the GPS code
 - ° Software/Physical Maintenance of the Boat
 - Improvement in floatation
- Tested the driving and steering with the remote controller



FarmBox

- Seed, weed, water, and time-lapse photography autonomously
- Radish and Turnip seeds were planted throughout the plot using the FarmBot programming
- Excavated the area surrounding the Farmbot to facilitate hoop house installation

SUMMER OUTREACH PROGRAM

Apollo Soth Vouth Art Contest Unite Unite	9 AM Istelcome Jul 08-Aug08 M,TU,W8,Th 10:30-52 50 MATH 98/308	3-5.80 Orientation Meeting(2042) Engineering Lates 3-30-5 Aviation Lates 3-4	Campus Orientation (1:30-3) Aviation (3-4)	CA0/30 Printing (139-239) Presentation and Technical Writing (239- 539) Aviation (139-439)	CAO/30 Printing (3.30-2.30) Presentation and Technical Writing (2.30-3.30) Aviation (3.30-4.30)	(Value's Carran) Tutoring 2-5.50
		Mark 1 and 281	Designation	weet (sector)	That (Ave. 1)	MILAME2
		Mathen/109 10/30-12/30	MW90/109 10:30-12:30	Math 95/129 10:30-12:30	Math08/109 10:32-12:50	Tutoring 10:30-12:30
		Robetics (1:30-3:30)	Robofics (1.30-3.30)	Robertica (1:30-5:30)	Team Presentation (1.30-4.00)	1.50-5:50 (Meet with Departmental
1 the second sec		aviation	aviation	aviation (Contraction)	Discussion time	School,

Teaching GoPiGo and Solid Modeling

- The students have spent this week learning how to model using Tinkercad and SolidWorks
- The activities challenged the students to learn extrude, cut and revolve designs
- This upcoming week the students will have worked with the GoPiGo robots
- They will gain skills in programming, problem solving, and teamwork.



VISIT TO NASA WALLOPS CENTER

Learning Outcomes

- Gained content knowledge and experience in the fields of robotics, programming, precision agriculture
- We were made aware of critical issues relating to NASA's space and earth science, advanced manufacturing, environmentally-friendly agriculture
- Expanded knowledge and interest pertaining to sustainability issues in food, energy and environment

References

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Thank You

Questions?