Experiential Learning in Automation and Robotics

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Outline

- Robotics
  - iRobot Create 2
  - Adept Cobra s350
- CAD/3D Printing
  - Three finger Gripper
  - Two finger Gripper
- Outreach
  - Summer BRIDGE Program

Robotics at UMES
Objectives

- Research
  - Content knowledge in Robotics/Applications/Programming skills
- Effective Communication
  - Oral presentation
  - Abstract writing
  - Conference Proceeding American Society of Engineering Education (ASEE) Annual Meeting 2019 (Future)
- Outreach
  - Summer BRIDGE Program (supported by MDSGC)
    - CAD/3D Printing
    - Robotics

Robotics Automation Manufacturing (RAM) Lab
Robotics

- iRobot Create 2
  - Mobile Platform
  - Programmable Roomba
  - Wrote movement code for the robot using BreezyCreate2 Library\(^1\) in Python
  - Collected data using a light sensor and a temperature and humidity sensor
  - Currently working on wall sensor code to avoid obstacles using the Pycreate2 Library\(^2\)

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Robotics

Raspberry Pi with GrovePi Board and Sensors

iRobot Create 2 Collecting and Transmitting Data
Robotics

- Adept Cobra S350
  - 4-axis robot
  - High-performance Selective Compliance Articulated Robotic Arm (SCARA)
  - 3D printed gripper
  - Skills learned:
    - Relative transform
    - V+ Language
Robotics

Pick and Place V+ Code

Relative Transform

Relative Transform V+ Code
CAD/3D Printing

• Underactuated Robotic Gripper
• Followed the framework of *An Open-Source 3D Printed Underactuated Robotic Gripper*³
• Interfaced the gripper on the Adept Cobra
• All parts were 3D printed at UMES

Robotic Gripper

Arbotix MX-28 Motor

Exploded Presentation of Slider Crank Gripper

Two-Finger Gripper
Robotic Gripper

- ArbotiX-M controller
- MX-28T servo
  - Programmed the servo
  - Followed the sample code provided by the Arbotix-M libraries

Arduino sketch coupled with the Matlab function required to drive the gripper

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Outreach - BRIDGE

Exposed the incoming freshmen to robotics, CAD, 3D printing, and aviation sciences to prepare them for college level STEM courses.
Outreach - BRIDGE

Scratch program compiled by students
Internship Outcomes

**Academic Skills**
- Increased knowledge of robotics
- Further development of software skills
  - SolidWorks
  - V+
  - Python
  - Arduino
- Honing of oral presentation and writing skills

**Life Skills/Civic Responsibility**
- Adapting to a new campus environment
- Fostering interdisciplinary collaboration and team building skills
- Enhancement of pedagogical skills through mentor/mentee experiences
- Exposure to small Unmanned Aerial Systems (sUAS) and Autonomous Surface Boats (ABS)s
- Awareness of sustainability and environmental stewardship
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Questions?

https://www.huffingtonpost.com/barbara-jacoby/asking-questions-is-really-hard_b_7052722.html