SENIOR DESIGN
PROJECT PROPOSALS 2023 -2024

Kickoff Table No.	Contact Last Name	Contact First Name	Department/Company	Project Type	Project Name	Prototype	Disciplines
1	Kinney	Bud	ABEDA	Industry	Vertical Axis Wind Turbine: Using a Stator to Improve Performance	Yes	Mechanical, Electrical
1	Kinney	Bud	FIERF Forging Foundation	Competition	FIERF Forging Competion 2024 PROJECT: Halligan Bar	Yes	Mechanical
1	Kinney	Bud	U.S. Department of Energy	Competition	Community Energy Innovation Prize	No	Multi-discipline
Q&A 2	Bowman	Cassie	ASU\NASA	Industry	AR/WebXR for Public Engagement	Yes	Computer Science
2	Bowman	Cassie	ASU\NASA	Industry	Web-Based Game for Psyche	Yes	Computer Science
2	Bowman	Cassie	ASU\NASA	Industry	Virtual Reality Space Game	Yes	Computer Science
2	Bowman	Cassie	ASU\NASA	Industry	Asteroid Surface VR	Yes	Computer Science
2	Bowman	Cassie	ASU\NASA	Industry	Optimizing Psyche 3D Printable Files for Accessibility	Yes	Computer Science
3	Duplin	Matthew	CSU EMDiS	Industry	3D Scanning and Integration into AR/VR Demos	Yes	Computer Science, Multi-discipline
4	Blodorn	Katie	CSU University Recreation and Wellbeing	Industry	Farmbot to the Max	Yes	Multi-discipline
5	Culkar	Isabel	CTI Corporation	Industry	Rocky River Shoreline Restoration with Steel By-Products	No	Civil Engineering
6	Bell	Brad	FirstEnergy	Industry	Fire Extinguishing Agent Capture For Recycle Or Disposal	No	Mechanical, Civil, Chemical
	Martin	Chris	Great Lakes Science Center	Industry	Interactive LED Museum Display Exhibit	No	Electrical, Computer Science, Computer Engineering, Mechanical
7	Spagnuolo	Joseph	Holistic Engineering inc	Industry	Carbon Dioxide capture using patent 9435534	No	Mechanical, Electrical, Chemical
8	Mokris	Frank	Integrated Mill Systems	Industry	HMI Auto Generated – Logic and Status Screens	Yes	Computer Science
9	McVey	Iain	M2DCON	Industry	Eco Cycle	Yes	Mechanical
10	Grabowski	Brian	National Safety Apparel	Industry	Automated Cutting Optimization	Yes	Mechanical, Electrical
11	Adams	Michael	Parker Hannifin Corp	Industry	Interconnected Automation Station	Yes	Mechanical, Electrical, Computer Science
11	Corio	Larry	Parker Hannifin Corp	Industry	Alignment of Fitting Bodies	Yes	Mechanical, Electrical
12	Moner	Ronald	Parker Hannifin, Hose Products Division	Industry	Automated Test Rig	Yes	Mechanical, Electrical
13	Juniper	Christopher	Proportion Air	Industry	Proportion Air Plus	Yes	Multi-discipline
14	Orlando	Kate	Rockwell	Industry	Plastics Design for Automated Assembly	Yes	Mechanical
15	Rahman	Shakeeb	Rockwell	Industry	Big Data, Dashboards, Digital Twins, Automated Controls -Aquaponics and Vertical Farming Project	Yes	Electrical, Computer Science, Computer Engineering, Mechanical
16	Presutto	Angela	Safran	Industry	Rotor temperature measurement	Yes	Mechanical, Electrical
17	Koglin	Kimberly	Sherwin-Williams	Industry	Lab & Pilot Scale Latex Reactor Correlation	No	Chemical Engineering
18	Sturdevant	Mike	Virtec	Industry	Motorcycle Engine Stand	Yes	Mechanical Engineering Technology
19	Brancatelli	Brian	Welser Profile	Industry	Design and Build a High Bay Tooling Storage Retrieval Device	Yes	Mechanical, Mechanical Engineering Technology
20	Rowerstein	Jay	What If. LLC	Industry	Residential/Business barrier lift	Yes	Mechanical, Electrical
21	Zhao	Wenbing	Electrical & Computer Engineering	Faculty-led	A Mobile App for Taking Attendance	Yes	Computer Science, Computer Engineering
22	Zhao	Wenbing	Electrical & Computer Engineering	Faculty-led	The Design and Implementation of a Layer-2 Blockchain	Yes	Computer Science, Computer Engineering
22	Zhao	Wenbing	Electrical & Computer Engineering	Faculty-led	A Framework for Personalized and Gamified Learning	Yes	Computer Science, Computer Engineering
22	Zhao	Wenbing	Electrical & Computer Engineering	Faculty-led	A Social Learning Mobile App for Cybersecurity	Yes	Computer Science, Computer Engineering
23	Zhu	Ye	Computer Science	Faculty-led	Eye-Controlled Drone Flight	Yes	Computer Science, Computer Engineering
24	Masoud	Mohamed	Electrical & Computer Engineering	Student-led	Automated Medical Equipment UV Disinfector	Yes	Electrical Engineering
25	Mostafa	Youssef	Mechanical Engineering	Student-led	Conversion of a Gas Motorcycle to Electric Power	Yes	Mechanical

SENIOR DESIGN
PROJECT PROPOSALS 2023 -2024

Kickoff Table No.	Main Contact Last Name	Contact First Name	Department/Company	Project Type	Project Name	Prototype	Disciplines
	Zhang	Jingru	Computer Science	Faculty-led	Algorithms for Maintaining Connectivity of Wireless Network	Yes	Computer Science
	Gu	Yaxin	Computer Science	Student-led	Web-Based Game for Psyche	Yes	Computer Science
	Fu	Yongjian	Computer Science	Faculty-led	ExploreIT	Yes	Computer Science, Multi-discipline
	Thomas	Terry	Electrical & Computer Engineering	Student-led	Weather Station with Graphical Display	Yes	Computer Engineering, Electrical Engineering
	Hizlan	Amy	Electrical & Computer Engineering	Student-led	Classroom Tablet	Yes	Computer Engineering, Electrical Engineering
	Singh	Aditi	Computer Science	Faculty-led	Black Friday Buddy: Your Shopping Companion	Yes	Computer Science, Multi-discipline
	Rahmati	Mehdi	Electrical & Computer Engineering	Faculty-led	Intelligent Water Quality Monitoring Dashboard for Lake Erie	Yes	Computer Engineering, Electrical Engineering
	Zweifel	Sidney	Computer Science	Student-led	A Randomized Educational Computer Science Game for CSU Students and Faculty	Yes	Computer Science
	Murillo	Salvador	Computer Science	Student-led	Non-Lethal Autonomous Fish Hunter	Yes	Computer Science
	Murillo	Salvador	Computer Science	Student-led	Muscle Controlled Robotic Hand	Yes	Computer Science
	Hinojosa Jimenez	Fabio	Computer Science	Student-led	Mute and Deaf Translator	Yes	Computer Science
	Villalobos Garcia	Carmen	Computer Science	Student-led	Smart Assistive Navigation Stick for Individuals with Visual Disabilities	Yes	Computer Science
	McCartney	William	Computer Science	Student-led	In Between	Yes	Computer Science
	Bhavikkumar Patel	Mayurkumar	Computer Science	Student-led	Eye controlled drone Flight	Yes	Computer Science
	Arora	Ramandeep	Electrical & Computer Engineering	Student-led	Food Delivery Robot	Yes	Computer Engineering

Back to Proposal List

Plastics Design for Automated Assembly

Rockwell Automation

Description: Despite being a supplier of automation equipment, many of RA's products are designed to be put together by a human. Redesign two modules from RA's 1756 line to be assembled by an automated system.

Objectives:

1. Research plastics design and automated assembly
2. Study current design of modules
3. Consider feasible build materials (will affect design and be affected by budget/availability)
4. Build, test, and finalize documentation of prototype by end of second semester

Success Criteria:

1. Prototype built and tested
2. Design can be assembled with 1-axis of movement
3. Final design and design process are fully documented in design review

Prototype: Yes

Disciplines/Team: Mechanical

Restrictions: no restrictions

1756 EN4TR

1756 OF8I

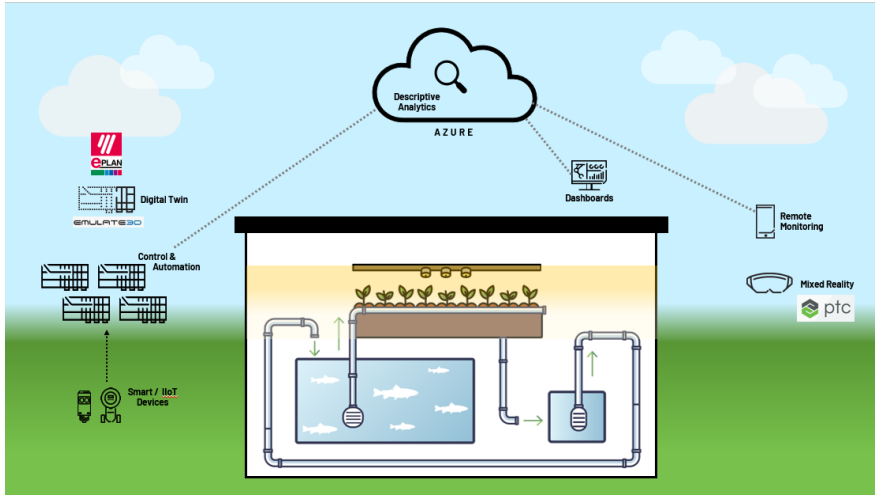
Back to Proposal List

Big Data, Dashboards, Digital Twins, Automated Controls -Aquaponics and Vertical Farming Project

Back to Proposal List

Rockwell Automation

Description: Will leverage the I4.0 technologies and applications and utilize them to highly automate the agriculture industry. This project will leverage digital twins, dashboards, emulations and other state of the technologies with aquaponics and hydroponics. Rockwell Automation controls systems will be used and adding these technologies will unleash new potentials in next generation farming. Additionally, the groundwork is laid for an AR/VR-accessible digital twin of an automated hydroponic system, enhanced by Emulate 3D technology. This innovative expansion aligns with educational goals, enabling interactive learning experiences for students



Objectives:

1. Research prior work in the field of automation and applications in agriculture – hydro and aquaponics in particular
2. Develop an immersive platform incorporating AI, Emulations and AR/VR
3. Create an Innovative Curriculum Design to be used in 3 RA High schools in Cleveland

Success Criteria:

1. Design solution that integrates with basic process of the system.
2. Prototype displays technologies
3. Project report adequately describes the system
4. Educational Partnership Impact/Interactive Educational Experience

Prototype: Yes

Disciplines/Team: can be multidisciplinary – Electrical/Computer/Mechanical

Restrictions: None

Back to Proposal List

ABEDA Group

Vertical Axis Wind Turbine: Using a Stator to Improve Performance

Description:

Prior results indicate that airflow over the stator is favorable but, more performance information is needed and design needs optimization. New work includes improved data sampling (software and hardware) of the 48 inch dual-rotor prototype, profiling vs conventional HWA design, analysis and installation of possible inlet guide vanes.

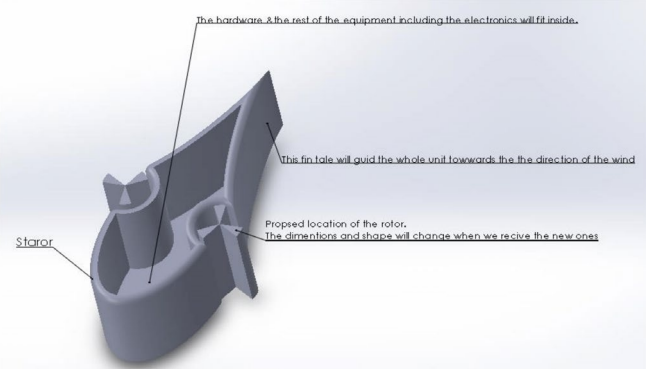
Needed:

Mechanical – Stator/rotor design – drag vs airfoil? Center of effort vs CoG? Speed control?

Electrical- generator selection / interconnection control / data collection – Arduino?

Mechanical / Electrical - Assembly of components to full power generation

All- Testing and verification including presentation and written report

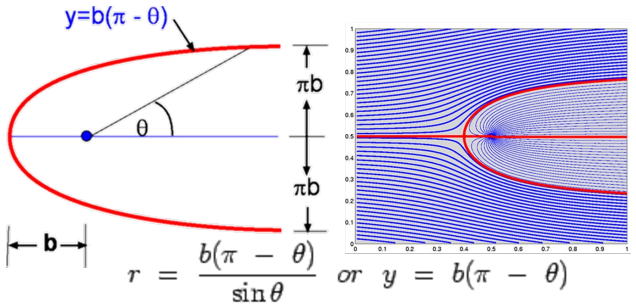


Objectives:

Using available engineering tools design, engineer and modify a working prototype Vertical Axis, Stator Based wind turbine and compare actual results with design expectations. Analyze possible funding and program opportunities, DOE, NREL, 2024 HeroX Competition and for possible path to commercialization

Success Criteria:

- Maximized uniform, directed air flow over both sides of stator thru rotors
- Rotor/generators produce and control 100 watts, or more of power.
- Data to compare vs horizontal wind turbine
- Funding / program path options



Prototype: Yes

Disciplines/Team: Electrical (1-2), Mechanical (2-3)

Restrictions: Confidential Intellectual Proprietary control

Back to Proposal List

Automated Cutting Optimization

NATIONAL SAFETY APPAREL®

Description:
In our manufacturing process we use automated cutting equipment that relies on consistent and efficient vacuum pressure in order to function properly. In order to maintain this pressure, we are looking for a solution to replace a tedious, timing consuming task that is critical to the machines' performance.

Process Steps & Objective:
1. We will share the steps and time involved with the current process, along with video of the current method.
2. Work with current NSA employees to experience the task
3. Develop a unique solution to streamline the process
4. Design, build, and test a prototype.

In order to be successful, it seems as though the team needs to be multidisciplinary, e.g. electrical/mechanical and potentially have thoughts surrounding pick and place robotics? The team will be mentored by a recent CSU engineering grad currently working at NSA as its Manufacturing Engineer. There are no citizenship restrictions.

Back to Proposal List

3D Scanning and Integration into AR/VR Demos

EMDiS Center at CSU

EMDiS
ENTREPRENEURIAL MANUFACTURER DIGITIZATION SUPPORT

Description: CSU has recently acquired an Artec3D Leo handheld 3D scanner for use in the Computer Science Dept. and MakerSpace. With additional VR Cave and AR/VR headset devices, this scanner will help build out augmented and virtual demos for a variety of applications: design prototypes, healthcare, manufacturing, and workforce training purposes.

Objectives:

1. Utilize Artec Leo handheld scanner for capturing select object(s) within College of Engineering or campuswide.
2. Import digital twin(s) into VR Cave and/or Microsoft HoloLens or Meta Oculus AR/VR headsets, using select software programs.
3. Build demonstration around device usage and selected object(s).
4. Write easy-to-use instruction manual of process for future use.

Success Criteria:

1. Clear demonstration of digital twin of selected object(s).
2. Usable instruction manual for future use within MakerSpace and Computer Science Dept.
3. Firm understanding of software integration and AR/VR fundamentals.

Prototype: Demo of digital twin via 3D scanner

Disciplines/Team: CS, All Engineering

Restrictions: None

Back to Proposal List

Motorcycle Engine Stand

VIRTEC

AND

Motogo

Description: Design production motorcycle engine stand

Objectives: Motogo has an inventory of identical motorycycle motors for use in their “bringing shop class back to school” program. This project will result in the production of engine stands to hold a CB350 motor. Various designs will be evaluated for production of 25 identical stands. DFMA techniques, cost analysis, and usability techniques will be used.

Success Criteria:

1. Demonstrate by calculation and testing strength of engine stand.
2. Demonstrate by calculation and testing ability to move an engine, mounted on the stand, onto, and off of both a work cart and a storage rack.
3. Perform DFMA, cost, and usability analysis to show producibility of 25 stands/

Prototype: Yes, at a minimum. Build 25 stands if possible.

Disciplines/Team: MET

Restrictions: None

Back to Proposal List

Eco-Cycle

Description: The Eco-Cycle is a lab scale system capable of disposing hazardous chemical and biological waste through mixing/agitation with provided chemistries.

Objectives:

- Research and analyze various materials to identify the most suitable options for the system's mechanical components
- Select and specify an appropriate motor and blade that can blend various lab items efficiently
- Incorporate ergonomic principles and considerations into the design of the system to optimize user safety, efficacy and ease of use

Success Criteria:

- Develop a working system that is a more cost-effective solution to the current means of hazardous disposal
- Create instructions on how to properly use the system safely and efficiently

Prototype: Yes

Disciplines/Team: Mechanical 4 Team Members

Restrictions: None

M2DCON™

Innovative and Proven Decontamination Technology

Back to Proposal List

Alignment of Fitting Bodies

Description:

Design an automated process to align multiple size fitting bodies on a conveyer for robotic selection.

Objectives:

- Understand / Investigate usage of mechanical means of parts selection and alignment
- Utilize engineering principles and calculations to properly size components
- Identify sensors that could be integrated into the automated process
- Investigate and select appropriate digital controller and interfaces
- Develop a Mechanical layout and design using CAD software
- Create fully functional prototype machine

Success Criteria: Working prototype that meets requirements

Prototype: Yes

Disciplines/Team: Electrical-mechanical

Restrictions: None

Back to Proposal List

Alignment of Fitting Bodies

Description:

Design an automated process to align multiple size fitting bodies on a conveyer for robotic selection.

Requirements:

- Consistently align and place on conveyer batches of up to 50 fitting bodies.
- Fitting bodies will be “dumped” into receiving hopper/drum in lots of up to 50 pieces.
- Fittings shall be multiple sizes (-12, -16, -20) and angled at 90, 45 or 22.5 degrees.
- Fittings shall be aligned consistently on the conveyer, with access for robotic grippers to pick the parts.
- Number of fitting bodies to be picked shall be input on TBD interface screen, prior to starting the machine. Number of picks shall be displayed in real time. Machine shall stop when the number of picked fittings reach the input value.
- Conveyer shall stop and wait when fitting is presented at the end of the conveyer.
- Once end fitting is removed, conveyer shall move next fitting to end.
- Automation changeover is not permitted. Machine shall align and convey all fitting sizes without any mechanical changes.
- If a fitting is not present in the conveyer, the machine logic shall recognize the condition and move the conveyer to the next present fitting.
- Automated process shall permit one fitting selection every 7.5 seconds.
- Automated process shall be designed to be non-jamming.

Back to Proposal List

Alignment of Fitting Bodies

Description:

Design an automated process to align multiple size fitting bodies on a conveyer for robotic selection.

Bonus points:

- Automated removal of fittings from conveyer into moulded “trays” to maintain consistent alignment.
- Moulded trays may be unique to each fitting type.
- Moulded trays are sturdy enough to hold and carry up to 100 fittings.
- System to know where to place the next fitting body.
- Filled tray automatically moved to staging area, and next empty tray moved to filling area.

Double Bonus points:

- Partially filled trays can be moved to staging area, then returned to filling area at another time and automation recognizes where to place the next fitting body.

Back to Proposal List

Automated Test Rig

Description: Air Brake hose is designed to meet specific durability requirements needed to ensure safe operation of semi trucks and trailers. The task of this project is to design and build a test rig that can cycle several samples of air brake hose to simulate the life of an "On Truck" braking application.

Objectives:

1. Research existing test methods and machines.
2. Design and build test rig.
3. Complete battery of tests demonstrating operability of test rig.

Success Criteria:

1. Design is capable of testing several samples at once.
2. Record any test sample failure events during the life of the test.
3. Operate in a safe and unattended manner.

Prototype: Yes

Disciplines/Team: Mechanical and Electrical

Restrictions: None

Back to Proposal List

Interconnected Automation Station

Description: Design and build a configurable automation system coordinating multiple axis. Will include documentation, remote access, and will interface with other CSU lab.

Objectives:

1. Research existing solutions to automation systems, common manufacturing automation needs, remote access strategies, and IoT
2. Design and build a configurable multi-axis automation system
3. Enable the automation system for remote access
4. Connect to other lab at CSU

Success Criteria:

1. The automation system efficiently handles multiple common manufacturing automation situations
2. Registered users can access the control system for status, start/stop, or reconfiguration
3. Demonstrate a meaningful connection to other lab at CSU
4. Project report adequately describes how to operate the system

Prototype: Yes

Disciplines/Team: electrical/mechanical/computer science

Restrictions: none

Back to Proposal List

HMI Auto Generated – Logic and Status Screens

Integrated Mill Systems

Description: Develop algorithm to automatically generate a user-friendly, HMI representation of PLC logic and status directly from the code itself and available software structures.

Objectives:

1. Given: Rockwell Automation, RA, hardware and software platform, running code in ControlLogix PLC, designers to create HMI representation of code on a RA FactoryTalk HMI.
2. Representation to include tag names, descriptions, graphic symbols, and logical arrangements.
3. Real-time status indication will be displayed.
4. Ability to "drill-down" into nested ladder rungs.

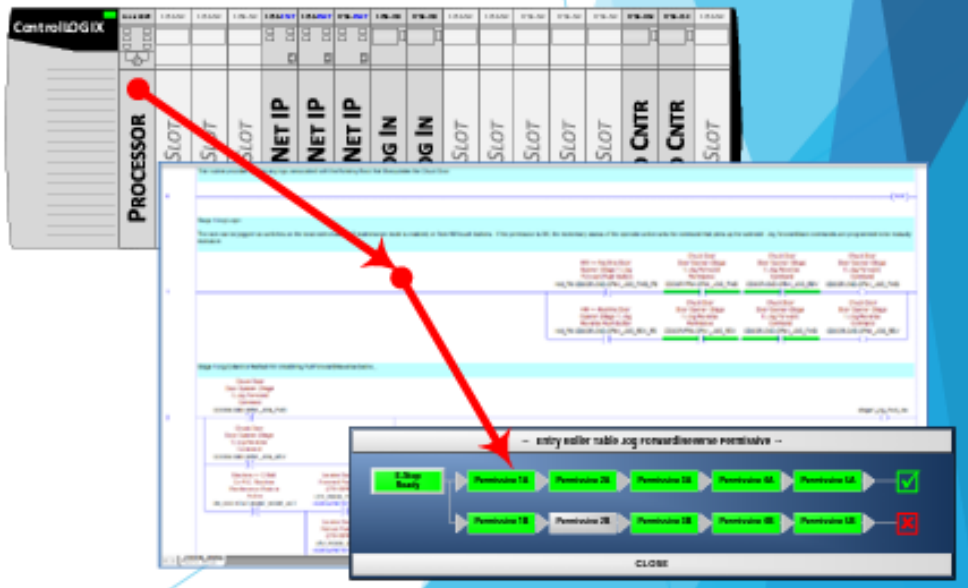
Success Criteria:

1. Download a new, valid PLC task and confirm HMI operation.
2. Design documentation generated and verified.

Prototype: Yes, using RA and generally accepted, OTS software technologies.

Disciplines/Team: Computer Science, Automation

Restrictions: None



Back to Proposal List

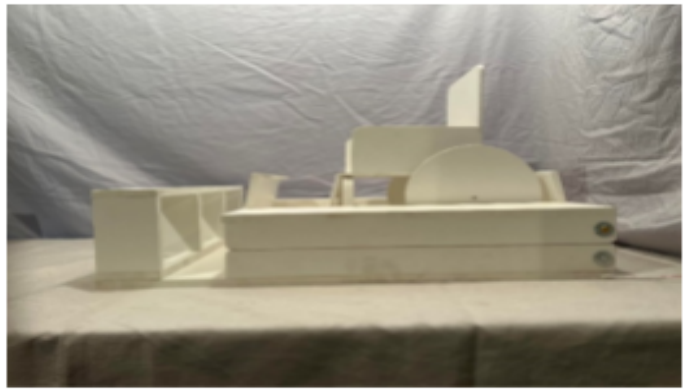
Residential/Business barrier lift

What If. LLC

Jay Rowerstein 216.990.8467

a.s.renovate@gmail.com

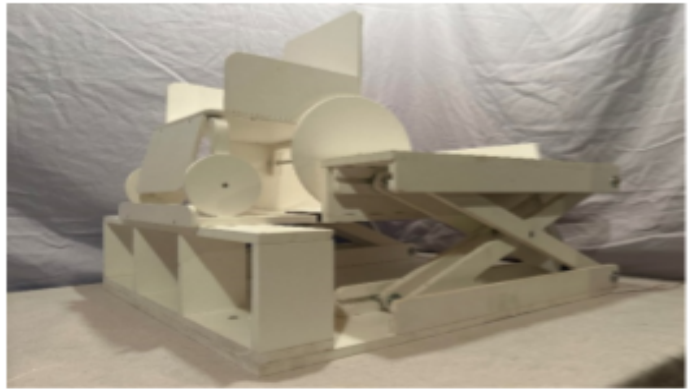
The problem has been that entering a residence or business with a relatively small change in height creates a barrier to moving forward.
A solution is a low threshold, portable service lift that will safely transfer people and equipment to a desired elevation.



Description:

- The lift uses two parallel, narrow scissor type lifts attached to a deck.
- Each scissor lift is controlled by an electric actuator synced in series and capable of collapsing to a minimal threshold height and able to expand to a height of 30 inches.
- The total lifting capacity is 1,200 pounds.

Success Criteria: When all aspects of development are met; mechanical, fabricating, electrical, safety, legal, as well as other compliances the well tested prototype will be suitable for production and marketing.



Prototype: Yes

Disciplines/Team: I am solely responsible for the concept and creation of the first prototype. Various disciplines including but not limited to; mechanical, fabricating, electrical, safety, legal, etc. will be necessary.

Restrictions: None

Design and Build a High Bay Tooling Storage Retrieval Device

For use in a live manufacturing environment

welser profile

Problem Statement: High bay tooling storage allows for condensed storage of roll tooling. However, loading and unloading the rolls is a manual task. Rolls up to 65 pounds must be picked up and moved to location onto the racking for storage. This presents a safety and ergonomic risk of repeated twisting and lifting of a heavy object, typically at arms length.

Project Description: Adapt or replace the existing retrieval shelf on a standup fork truck to improve the ergonomic conditions in the high bay storage area. A device must be designed and built to withstand the weight of the rolls under a cantilever load. While reducing the need for excessive twisting and lifting of the rolls from the shelving.

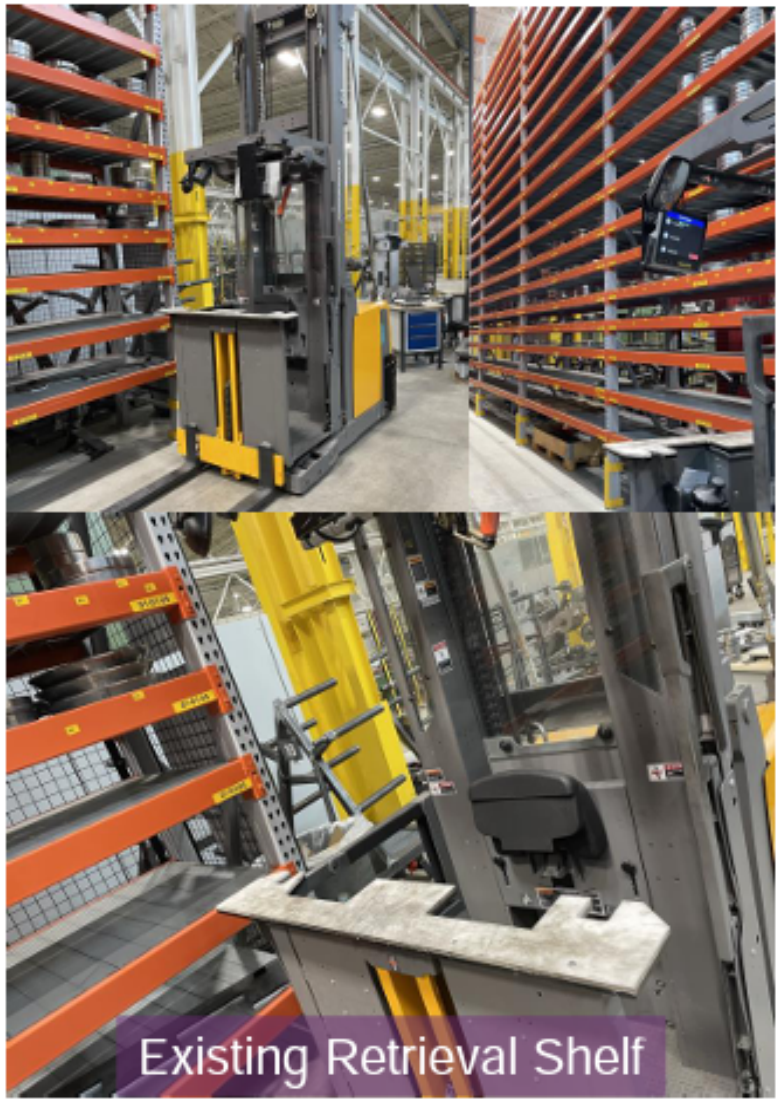
Objectives:

- Develop a solution which can withstand the 65-pound load with a designed safety factor in mind.
- Devise a system which can extend into the shelves that reduces the distance the rolls must be moved.
- Design and build a working system to use in production environment.
- Provide Testing Data to indicate this system can operate in a production environment.

Prototype: The preference is a working production ready device by the end of the term; however, based on design scope, a working prototype will be sufficient.

Disciplines/Team: Mechanical Engineering, Mechanical Engineering Technology

Restrictions: Must be authorized to work in the US.



© Welser Profile

Rocky River Shoreline Restoration with Steel By-Products

CTI and Associates

Description: This project proposes to restore part of the Rocky River Shoreline that has been lost to erosion and create a multiuse space which can improve lake access. This space should include a multiuse trail and swimming areas.

Objectives:

1. Obtain bathymetry of Lake Erie and surrounding coastline
    1. Great Lakes Bathymetry | National Centers for Environmental Information (NCEI) (noaa.gov)
2. Create a grading plan which includes required project features (trail & beaches)
3. Determine regulatory agencies responsible for permits for shoreline protection and engage them to determine fill testing, environmental reviews which are required for a project of this scope.
4. Investigate fill materials which would be appropriate for the project.

Success Criteria:

1. Finished Sheets which depict shoreline, trails, and swimming areas (plan and profile)
2. Description of the regulatory process and testing/permits to complete for approval
3. Suggestions for the structural fill materials which could be used with a pros/cons analysis

Prototype: No

Disciplines/Team: Civil Engineering

Restrictions: None

Back to Proposal List

Questions?

https://
bit.lyASU_NASA_Google_Form

NASA PSYCHE MISSION: UNDERGRADUATE CAPSTONE PROJECTS

Wonder what it's like to be a part of a capstone project for a NASA mission? The NASA Psyche Mission offers capstone projects to undergraduate students at universities across the country! Check out this video to learn more, or fill out our capstone form if you are a student, staff, or professor interested in having a Psyche project at your institution.

Psyche capstone video: https://psyche.asu.edu/gallery/nasa-psyche-mission-undergraduate-capstone-projects/

Back to Proposal List

Back to Proposal List

AR/WebXR for Public Engagement

The NASA Psyche Mission is an orbiter mission to the metal-rich asteroid, Psyche, in the asteroid belt between Mars and Jupiter. The spacecraft, launching in October 2023 and arriving at the asteroid in mid-2029, will study the asteroid from orbit and will not land on the surface. The NASA Psyche Mission has a large-scale 3D-printed model of its target asteroid, Psyche. QR codes on the body of the 3D-printed asteroid allow museum visitors or students to use their smartphone to "orbit" the asteroid and "collect data" by scanning the codes, which currently take them to a series of static web pages. To increase the engagement of this activity, the mission invites multiple teams of students to develop AR or WebXR projects (https://immersive-web.github.io/webxr-samples/) for this model in order to explain something about the mission (one project per team). The Psyche team will provide the themes to choose from to help scope the project. Student who choose to work on this project should have experience with web development and a passion for creating engaging experiences for the public. Once complete, these projects will be incorporated onto the Psyche website (https://psyche.asu.edu) and shared with NASA's Museum & Informal Education Alliance for use in museums and classrooms around the country and the world.

ABOUT PSYCHE CAPSTONE: This is an exciting opportunity to test your design skills, problem solving, and creativity! You will become part of a larger community of students working on a range of projects with Psyche and have the opportunity to meet members of the Psyche mission team. We look forward to having you become part of the Psyche team through this unique capstone project.

Back to Proposal List

Web-Based Game for Psyche

The NASA Psyche Mission is an orbiter mission to the metal-rich asteroid, Psyche, in the asteroid belt between Mars and Jupiter. The spacecraft, launching in October 2023 and arriving at the asteroid in mid-2029, will study the asteroid from orbit and will not land on the surface. Over the past few years, teams from the Psyche capstone program have produced many different styles of games designed to engage students and the public in learning about the Psyche mission. These games are appropriate for many different age levels - some are focused on learning while others are just for entertainment. In this project, your team will select one of the existing games and take it (or at least its content and game mechanics) to the next level - into virtual reality! You'll have the chance to test your experience at public or campus events throughout the year.

ABOUT PSYCHE CAPSTONE: This is an exciting opportunity to test your design skills, problem solving, and creativity! You will become part of a larger community of students working on a range of projects with Psyche and have the opportunity to meet members of the Psyche mission team. We look forward to having you become part of the Psyche team through this unique capstone project.

Back to Proposal List

Virtual Reality Space Game

The NASA Psyche Mission is an orbiter mission to the metal-rich asteroid, Psyche, in the asteroid belt between Mars and Jupiter. The spacecraft, launching in October 2023 and arriving at the asteroid in mid-2029, will study the asteroid from orbit and will not land on the surface. Over the past few years, teams from the Psyche capstone program have produced many different styles of games designed to engage students and the public in learning about the Psyche mission. These games are appropriate for many different age levels - some are focused on learning while others are just for entertainment. In this project, your team will select one of the existing games and take it (or at least its content and game mechanics) to the next level - into virtual reality! You'll have the chance to test your experience at public or campus events throughout the year.

ABOUT PSYCHE CAPSTONE: This is an exciting opportunity to test your design skills, problem solving, and creativity! You will become part of a larger community of students working on a range of projects with Psyche and have the opportunity to meet members of the Psyche mission team. We look forward to having you become part of the Psyche team through this unique capstone project.

Back to Proposal List

Asteroid Surface VR

The NASA Psyche Mission is an orbiter mission to the metal-rich asteroid, Psyche, in the asteroid belt between Mars and Jupiter. The spacecraft, launching in October 2023 and arriving at the asteroid in mid-2029, will study the asteroid from orbit and will not land on the surface.

In preparation for arrival at Psyche, your team will create a Virtual Reality experience of standing on another planetary body, using stereo pairs and color (if available) from the team's choice of:
-- Lunar Reconnaissance Orbiter Camera (LROC) images;
-- HiRISE orbiter camera images of Mars;
-- HiRISE orbiter images of Phobos or Deimos;
-- OSIRIS REx asteroid mission images.
This project will showcase the actual data and what is already known about other non-Earth bodies and prepare for the datasets that will be returned from Psyche in the future.

ABOUT PSYCHE CAPSTONE: This is an exciting opportunity to test your design skills, problem solving, and creativity! You will become part of a larger community of students working on a range of projects with Psyche and have the opportunity to meet members of the Psyche mission team. We look forward to having you become part of the Psyche team through this unique capstone project.

Back to Proposal List

Optimizing Psyche 3D Printable Files for Accessibility

The NASA Psyche Mission is an orbiter mission to the metal-rich asteroid, Psyche, in the asteroid belt between Mars and Jupiter. The spacecraft, launching in October 2023 and arriving at the asteroid in mid-2029, will study the asteroid from orbit and will not land on the surface. To help the public comprehend the mission and its target asteroid, NASA often provides 3D models (digital and physical) from https://nasa3d.arc.nasa.gov/. While multiple 3D-printable files for the Psyche asteroid (three different artistic renditions), the Psyche spacecraft, and some of its instruments exist, these files are not "plug-and-play" for the general public and require specialized knowledge of 3D printing softare, materials, and hardware in order to print efficiently without issues or excessive waste. Your team's challenge is to take these 3D objects to the next level, optimizing them for use for schools, museums, and enthusiasts, designing creative solutions to reduce filament waste, inventing new modular ways to manufacture larger models on small printers, and thinking outside the box about how to scale the asteroid, the spacecraft, and the instruments to demonstrate their relative sizes, along with appropriate documentation. Successful model updates may be posted by the mission on psyche.asu.edu, Thingiverse, and NASA's page for Psyche.

ABOUT PSYCHE CAPSTONE: This is an exciting opportunity to test your design skills, problem solving, and creativity! You will become part of a larger community of students working on a range of projects with Psyche and have the opportunity to meet members of the Psyche mission team. We look forward to having you become part of the Psyche team through this unique capstone project.

Back to Proposal List

FIERF Forging Competition 2024: Halligan Bar

Description: 2024 Forging Competition challenge to creatively design and forge a functioning version of a Halligan bar – a multipurpose tool used by firefighters to gain access to building spaces, vehicles, and for a multitude of other emergency uses.

Objectives: Each bar will be put through a series of tests appropriate to the application. You can expect your bar to be tested in prying, punching, twisting, and striking. All submissions should include your Halligan bar, a project video and technical report documenting the design and manufacturing process.

Prototype: Yes

Disciplines/Team:

1.Teams are limited to 8 members.
2.A university faculty sponsor to help the team.
3.An industrial partner familiar with forging.
4.Including one high school student on the team is encouraged. If the team has a high school student, they should also submit an addition to their report from the student about what they learned, less than two pages.

Restrictions: This is a competition, and registration is required. Comply with scheduled events for competition

Washkewicz College of Engineering

Project Title: Automated Medical Equipment UV Disinfector

Students:

1- Mohamed Masoud, Electrical Engineering.
2- Bryce Lanese, Electrical Engineering.
3- Joseph Kidd, Electrical Engineering.
4- Carter Zeedyk, Electrical Engineering.

Faculty Adviser: Dr. Ihab Wattar

Problem Statement:

- Hospitals usually a sterilizing room or department that is overwhelmed by hundreds of biomedical equipment and tools daily.
- There is usually limitation to how long it takes to sterilize important biomedical equipment and the schedule of when the staff would receive the equipment back.
- Having worked as a BMET, I witnessed the problem firsthand.

Objective Statement:

The main objective is to create an automated medical equipment UV disinfector. The project would implement 3D modeling for the device, utilize UV light for disinfecting, embedded system such as Arduino, coding, and other elements of design and prototype as needed. The device would greatly alleviate the pressure on the sterilizing department. It would help quickly disinfect medical devices such Class II biomedical devices in a short amount of time. The device can be used in multiple hospital departments with the proper training and would provide an effective method of disinfection.

Deliverables:

The end product would be an Automated Medical Equipment UV Disinfector. The healthcare personnel would utilize the device to disinfect medical devices such as Class II devices under 21 CFR 880.6600 (product code OSZ).[8] per FDA. The device is also effective against viruses such as corona virus.

Back to Proposal List

A Social Learning Mobile App for Cybersecurity

Faculty-Led Project by
Prof. Wenbing Zhao

Description: The goal this project is to help reduce the cost, and increase the effectiveness, of cybersecurity training for both IT personnel and non-technical staff by developing a suite of interactive cybersecurity training courseware in a virtual environment. Furthermore, the proposed project will adopt a unique approach to cybersecurity training by cultivating learning communities of varying cybersecurity risk and management needs.

Objectives: Develop of a mobile app that facilitates social learning about cybersecurity.

Success Criteria:

1. Able to develop mobile app with React Native
2. Able to develop a suite of courseware on cybersecurity
3. Able to develop social learning functionalities such as shared workspace, one-on-one chatting, group discussion
4. Able to collect and analyze user data while working on the courseware and doing social learning

Prototype: Yes

Disciplines/Team: Computer Science or Computer Engineering

Restrictions: No

Back to Proposal List

Youssef Mostafa

Senior Design Project Proposal: Conversion of a Gas Motorcycle to Electric Power

Project Overview:

This senior design project aims to convert a 1998 Honda 996 Super Hawk gas motorcycle into an electric-powered vehicle while maintaining a balance between the sport bike and cafe racer aesthetics. The project aims to demonstrate the feasibility of electrifying an internal combustion engine motorcycle, showcasing efficient electric power delivery, increased sustainability, and a competitive budget.

Project Scope:

- **1- Vehicle Conversion:** Transform the gas-powered motorcycle into an electric vehicle using a 6.4 kWh battery, targeting a range of 120 miles. (If managed to acquire two 6.4 batteries; then 240 miles range)

- **2- Motor Selection:** Evaluate and select the appropriate motor option (HUB motor or supplied motor by LAND MOTO) based on performance, efficiency, and compatibility with the project's objectives.
-
- **3- Frame Customization:** Collaborate with "A H Marty Company" for precise frame modifications based on Solidworks 3D designs. CAD-based customization ensures accuracy and optimal integration of battery cells, control unit, and motor.
-
- **4- Solidworks 3D Design:** Utilize Solidworks 3D design software as a pivotal tool throughout the project. Modify designs as needed, contingent upon collaboration with LAND MOTO or any changes in component selection.
-
- **5- Components Collaboration:** Seek potential collaboration with LAND MOTO for specialized components. Depending on their involvement, integrate their components seamlessly into the design.
-
- **6- Technical Guidance from LAND MOTO:** Leverage advice from LAND MOTO experts for programming control units and screens, ensuring optimal system performance and user interface.
-
- **7- Acknowledgment and Involvement:** Extend credit to LAND MOTO for their valuable support and invite their representatives to the final presentation at the culmination of the academic year.
- **8- Cost Analysis:** A detailed cost analysis will be performed to track expenses, ensuring the project remains within the allocated budget. Upon setting up a detailed plan, the project will be presented to CSU requesting additional supporting funds.

-

Youssef Mostafa

Deliverables:

- 1- Fully functional electric motorcycle prototype, featuring integrated components and optimized performance.

- 2- Comprehensive motor selection analysis report, detailing the chosen motor and rationale.

- 3- CAD-based frame modification documentation, showcasing collaboration with "A H Marty Company" and Solidworks 3D designs.

- 4- Potential component collaboration documentation with LAND MOTO, highlighting integrated components and changes in the design.

- 5- Programming documentation for control units and screens, informed by advice from LAND MOTO.

- 6- Safety and performance testing results, validating the efficiency and reliability of the electric motorcycle.

- 7- Cost analysis report, tracking expenses and ensuring adherence to the budget.

- 8- Senior design project paper, encompassing all project phases, findings, and conclusions.

Youssef Mostafa

Timeline:

Month 1 (September 2023):

- Conduct thorough research on motor options, considering factors such as performance, efficiency, and cost.
- Begin procuring necessary components: batteries, motor, control unit, and frame modification materials.

Month 2 (October 2023):

- Finalize motor selection and complete its procurement.
- Start motorcycle frame modification to accommodate battery, control unit, and motor.

Month 3 (November 2023):

- Continue motorcycle frame modification and ensure proper integration of components.
- Begin motor integration and initial testing.

Month 4 (December 2023):

- Complete motor integration and control unit installation.
- Begin gas tank conversion to storage space.
- Initiate aesthetic design finalization based on sportbike and cafe racer fusion.

Month 5 (January 2024):

- Finalize gas tank conversion and overall aesthetic design.
- Conduct initial safety and performance testing, collecting data for analysis.

Month 6 (February 2024):

- Analyze safety and performance testing results, making any necessary adjustments.
- Continue refining the aesthetic design and addressing any unforeseen challenges.

Month 7 (March 2024):

- Continue refining the design and completing any outstanding modifications.
- Begin cost analysis and documentation of the project's progress.

Month 8 (April 2024):

- Finalize cost analysis and prepare comprehensive documentation covering all project phases.
- Prepare the senior design project paper, incorporating testing results, cost analysis, and conclusions.

Month 9 (May 2024):

- Complete the senior design project paper, ensuring all aspects of the project are thoroughly documented.
- Revisit the design and documentation to ensure accuracy and clarity.
- Present the senior design project to faculty and peers, showcasing the transformation of the gas motorcycle into an electric vehicle.
- Submit the senior design project paper for final grading and assessment.

Budget Breakdown:

- 1- Components and Parts: $4,000
- 2- Bike Selection and Procurement: $1,500
- 3- Frame Modification: $800
- 4- Gas Tank Conversion: $200
- 5- Safety and Performance Testing: $500
- 6- Miscellaneous Expenses: $500
- 7- Contingency: $500

This timeline provides the project a 9-month period, ensuring that each phase is efficiently managed while meeting the project's deadline in May 2024. It allows for a balance between hands-on work, testing, analysis, and documentation, while also accounting for any unexpected challenges that may arise during the course of the project.

Conclusion:
The proposed senior design project aims to transform a 1998 Honda 996 gas motorcycle into a sleek and efficient electric vehicle. By converting the motorcycle to electric power, the project aligns with the growing trend toward sustainable transportation solutions. The integration of advanced technology and innovative design will contribute to the success of the project and provide valuable insights into the feasibility of electrifying conventional gas-powered motorcycles. By collaborating with esteemed partners like "A H Marty Company" and

Youssef Mostafa

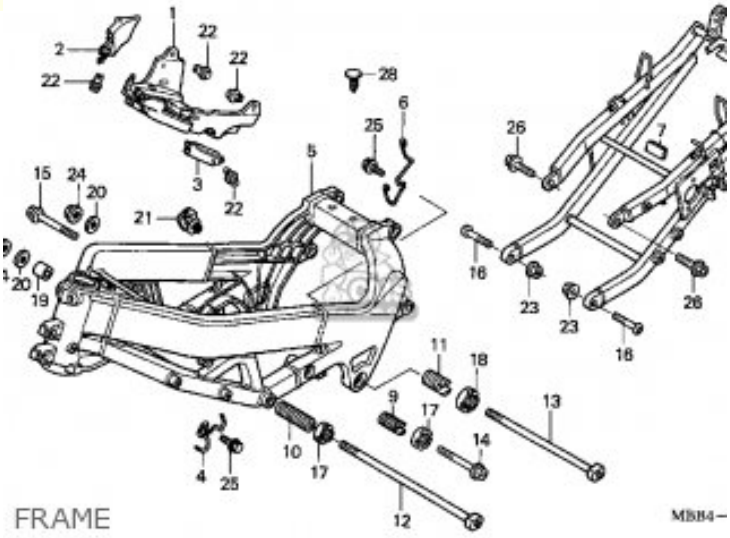
potentially LAND MOTO, this project will exemplify the potential of electric vehicle conversion while contributing to the evolution of sustainable transportation solutions. The use of Solidworks 3D design software and technical guidance from industry professionals will ensure a comprehensive and well-executed conversion process.

Ebay motors: **1998 Honda 996 Super Hawk**
https://www.ebay.com/itm/275975405653?hash=item40416a8055:g:mOoAAOSwV9VkwtgG

Initial bike:

Youssef Mostafa

Bike during teardown:



Youssef Mostafa

Proposed final design:

Back to Proposal List

Youssef Mostafa

Motor and controller:

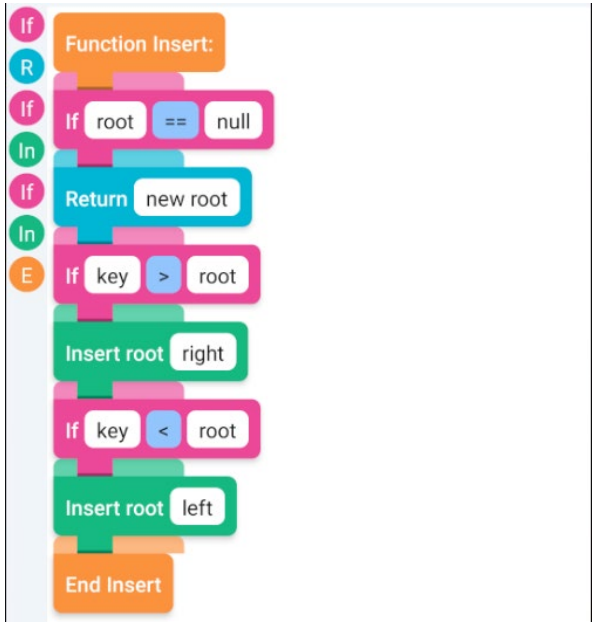
https://www.aliv
express.us/item/2255799874497013.html?aff_fcid=9c68672b9cae4f37b038098c22ab7b93-1691615211846-05560-
_9heiwp&tt=CPS_NORMAL&aff_fsk=_9heiwp&aff_platform=shareComponent-detail&sk=_9heiwp&aff_trace_key=9c68672b9cae4f37b038098c22ab7b93-1691615211846-05560-
_9heiwp&terminal_id=987ebeed79d242c49d0158918cb696d7&afSmartRedirect=y&gatewayAdapt=glo2usa4itemAdapt

For 17inch 12000W motor power train kits, it could be used for electric motorcycle, which could be 96V 157KPH.
e.g. Electric Motorcycle
E-motorcycle weight, approx 182kg+80kg
Speed: peak 157km/h
Climbing slope: 15 degree@262kg
Tire: 190/50-17

A Framework for Personalized and Gamified Learning

Faculty-Led Project by
Prof. Wenbing Zhao

Description: In this project, a framework for personalized and gamified learning with a mobile app and a web app interfaces will be developed. The team could select a particular subject matter (such as data structure and algorithm) as a content substrate for the development. First, a knowledge map should be developed for the subject matter. Then, for each element in the map, three modules should be developed: (1) demonstrate the knowledge, (2) practice, and (3) test. The practice module should be implemented as one or more block-based games with hints and guidance that allow the user to try and observe.



Objectives: This project aims to develop a framework for personalized and gamified learning in the STEM field. While working on the project, students will learn both learning theories and full-stack app development

Success Criteria:

1. Able to develop the proposed framework using React Native or Unity for cross-platform deployment
2. Able to develop components for the knowledge map and several suites of learning modules
3. Able to incorporate machine learning algorithms for providing hints and smart scaffolding

Prototype: Yes

Disciplines/Team: Computer Science or Computer Engineering

Restrictions: No

Back to Proposal List

Back to Proposal List

A Mobile App for Taking Attendance

Faculty-Led Project by Prof. Wenbing Zhao

Description: Coming to lectures in in-person classes is essential for learning. However, taking attendance is tedious and time-consuming. In this project, a cloud-supported mobile app will be developed to make the process much faster and convenient. No additional devices are needed except a projector for displaying a QR code and a mobile app running on smartphones. The app has three components: (1) backend logic running on some cloud service such as Goolge's Firebase, (2) a student-side mobile app (for reporting to class); and (3) an instructor-side mobile app (for managing roster and view attendance reports).

Objectives: The app aims to make the class attendance check fast, convenient, and accurate. While working on the project, students would learn multi-platform full-stack programming.

Success Criteria:

1. Able to develop the proposed app using React Native for cross-platform deployment
2. Able to develop components for cloud-based user authentication, data storage, data analysis
3. Able to generate report automatically on attendance result for each lecture
4. Able to generate a summary report on overall attendance at the end of the semester

Prototype: Yes

Disciplines/Team: Computer Science or Computer Engineering

Restrictions: No

The Design and Implementation of a Layer-2 Blockchain

Faculty-Led Project by
Prof. Wenbing Zhao

Description: Traditional blockchains such as Bitcoin and Ethereum are exemplary decentralized large-scale systems. However, they suffer from limited throughput and high transaction costs. Recently, a higher level small-scale blockchains that are built on top of Ethereum are becoming popular, such as the Polygon blockchain. This type of blockchain is often referred to as layer-2 blockchains. In this project, you will be designing and implementing a layer-2 blockchain, proposing one or few practical applications, and fully characterizing the security and trust levels of the system.

Objectives: Design, implement, and fully characterize a layer-2 blockchain that could be useful for many applications that require higher level of security and trust than traditional systems.

Success Criteria:

1. Able to setup and use Ethereum development environment
2. Able to develop Ethereum smart contracts in Solidity
3. Able to design and implement a layer-2 blockchain running on top of Ethereum
4. Able to characterize the system performance, system security and trust levels

Prototype: Yes

Disciplines/Team: Computer Science or Computer Engineering

Restrictions: No

Back to Proposal List

Senior Design Project Proposal

Project Title:

Web-Based Game for Psyche

Team Leader:

Sidney Zweifel Computer Science

Team Members:

Sarah Ogorzaly Computer Science

Gretta Foxx Computer Science

Yaxin Gu Computer Science

Faculty Adviser: Prof. Fiske

Project Ideas:

1. NASA web-based game for Psyche
2. Environmental sustainability game
3. Computer science education game

Problem Statement:

NASA is preparing for the Psyche Mission, where a spacecraft will be sent to study the metal-rich asteroid Psyche. The asteroid is of interest because the metal indicates that it could have similar components as the Earth's core. The spacecraft is set to launch in October 2023. NASA is hosting a project to develop educational games for the mission that will be fun and informative for people of all ages.

Objective Statement:

This project's goal is to create a web-based game that will educate the public about the mission and demonstrate how the spacecraft will operate. The game will be developed in Unity with the following features:

- Engaging puzzles that could help people learn more about the mission and technologies involved.
- Simulation of the launch process and how the spacecraft will get into orbit of Psyche.
- Scientific models that accurately depicts the spacecraft and the asteroid.
- Gameplay that demonstrates how the spacecraft instruments will operate.

Deliverables:

The expected end product will be an engaging and educational web-based game that accurately provide information related to the NASA Psyche Mission. The main feature of the game will be the puzzle-based gameplay that demonstrates how the spacecraft operates and collects data from the asteroid Psyche. The puzzles will need to be creative and challenging, to give players a fun and educational experience. The game should be enjoyable to people of all ages and help get the public excited about the mission.

Back to Proposal List

Washkewicz College of Engineering

Faculty-Led Senior Design Project Description

Fall 2023 – Spring 24 format (select one):

remote hybrid in-person

Faculty Name/email: Yongjian Fu/y.fu@csuohio.edu

Desired Team Makeup:

- Primary discipline: CS (Computer science)
- Additional (optional, for multi-discipline project):

Project Title: ExploreIT

Project Objectives:

Improve quality
Enhance system features
Updates and maintenance

Project Description:

(Enhancement of the last year project if you continue the last year project:)

This is a continuation of the ExploreIT project. ExploreIT is a Web Application that was developed a few years ago. Explore IT has been a useful source of online information on IT related information available in the region, such as jobs, events, degrees, etc. The next phase of the project is to improve its performance and fix defects.

Success Criteria:

1. The features are implemented and tested
2. Defects are fixed
3. System is updated with current platforms, libraries, APIs, etc.

Assumptions / Risks / Obstacles:

- A steep learning curve in the beginning
- Unexpected technical problems with components updates
- Limitations of current technology in some area such as chat

Back to Proposal List

Washkewicz College of Engineering

Faculty-Led Senior Design Project Description

Faculty Name/email:
Ye Zhu/ y.zhu61@csuohio.edu

Desired Team Makeup:

- Primary discipline: e.g., CS (Computer Science)
- Additional (optional, for multi-discipline project): Computer Engineering

Project Title:

Eye-Controlled Drone Flight

Project Objectives:

The goal of this project is to implement a system that can control drone flight with an eye tracking device.

Project Description:

The popularity of drones has surged dramatically in recent years, transforming the way we perceive and interact with our surroundings. These unmanned aerial vehicles have captured the imagination of professionals, hobbyists, and industries alike, owing to their remarkable versatility and capabilities. Drones have revolutionized fields such as aerial photography and videography, allowing for breathtaking perspectives and angles that were once inaccessible. They've also found vital applications in areas like agriculture, environmental monitoring, disaster relief, and infrastructure inspection, as they can access remote or hazardous locations with ease. The accessibility of drones to the general public has spurred a creative wave of innovation, with enthusiasts customizing drones for various purposes, from racing to delivery services. As technology continues to evolve, drones are poised to play an even more integral role in our lives, making them an enduring symbol of modern technological advancement and limitless possibilities.

But the drone control interface presents a complex amalgamation of technology and user interaction, reflecting the intricate nature of drone operation. It serves as a bridge between the pilot's intentions and the drone's response, encompassing a range of buttons, joysticks, switches, and digital displays. The challenge lies in translating the pilot's commands into precise

and coordinated movements of the drone, often requiring simultaneous adjustments of multiple controls. In addition to basic flight commands, the interface can incorporate advanced settings for camera control, GPS navigation, and autonomous flight modes, contributing to a rich tapestry of functionalities that demand careful navigation. Visual feedback, such as real-time video feeds and telemetry data, adds another layer of complexity, necessitating split-second decisions while maintaining situational awareness. The interface's complexity increases further for professional-grade drones, which may integrate additional tools like tablets or even dedicated software applications. As a result, mastering the intricacies of the drone control interface demands a blend of technical proficiency, practice, and adaptability, making it a skillful art that pilots must develop to harness the true potential of drone technology.

The goal of this project is to improve usability of drones by developing a system that can easily control drone flight with eyes. In this project, participants will have access to latest DJI drones and novel devices for flight control.

Success Criteria:

1. A demo on eye-controlled drone flight.
2. Experiment results on controlled flight.
3. A technical report of the project.

Assumptions / Risks / Obstacles:

Students should be enthusiastic about tech toys and curious to learn. Experiences in Android/Java programming are preferred.

Back to Proposal List

Back to Proposal List

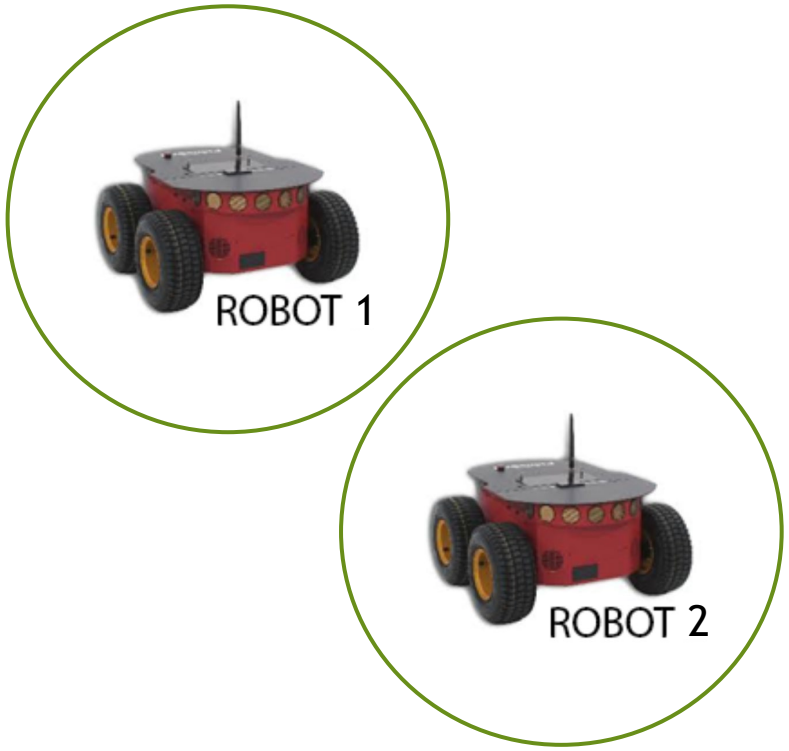
Algorithms for Maintaining Connectivity of Wireless Network

Project led by Dr. Jingru Zhang

Description: Given n mobile robots and a communication radius r, the goal is to move n robots to maintain the connectivity of the network so that the maximum moving distance of the robots is minimized. What is the optimal movement? What is the minimized maximum moving distance? The project is developing software approaches to answer the questions and visualize answers.

Objectives:

1. Study the algorithm designing techniques
2. Develop the algorithmic solutions to answer questions
3. Program to visualize the answers interactively



Success Criteria:

1. The correctness of the algorithms
2. The efficiency of the algorithms
3. The interaction of the software

Prototype: Yes

Disciplines/Team: Computer Science

Restrictions: Familiar with either of C, C++, Java, and Python

Back to Proposal List

Rotor temperature measurement

SAFRAN

Description:

For electrical machine development, it’s critical to know rotor temperature in a generator under different loading conditions while it's rotating. At the moment, there is no way to directly measure this temperature. One solution to this issue would involve the use of a battery-powered data acquisition module, connected to thermocouples embedded in a rotor, that either fits inside the rotor shaft (<1" diameter) or attaches to the end of the shaft. Such a module would require capability to measure 1 - 4 thermocouples and transmit the data to an external device that accepts the transmitted data. The accepting device would log this data directly and/or report out over USB so that it could be logged by a PC.

Objective:

Ability to measure temperature in a generator's rotor while spinning up to 15,000RPM under load up to 30kVA.

Success Criteria:

- Ability to measure/log the rotor temperature wirelessly
- Ability to turn module off (to conserve battery power)
- Maximization of battery life

Disciplines: Electrical/Mechanical

Prototype: Yes

Restrictions: None

Back to Proposal List

Rotor temperature measurement Back-up Information

Students can continue to improve previously designed circuit board and wireless transmission package or start from scratch if a more ideal solution is proposed.

Safran would like to see a prototype than can work while rotating for a minimum of 30 minutes. The previous team's design was not fully developed for high RPM with extended duration.

Safran would like to see a prototype that can be installed on the generator and mounted on a drive stand to validate rotor temperatures.

Washkewicz College of Engineering

150

SAFRAN

Ram Air Turbine Temperature Sensor

Landon Oglesby, Ryan Peck , Richard Sent, Fawaz Aljadi, Steven Rimac

Instructor: Toufik Aidja

Project Sponsor

Safran Electrical & Power

Overview

- Acquire the internal Temperature of a Ram Air Turbine Rotor under operation
- Wirelessly transmit temperature measurements from 4 locations to a receiver

Thermocouple Technology

- The Seebeck Effect
- The voltage difference between junctions.
- Difference is used to measure the temperature.
- Quad design for maximum accuracy.

Wireless Transmission

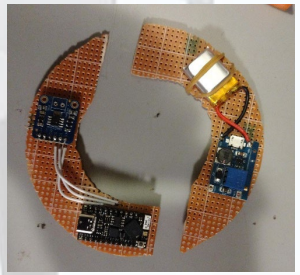
- Esp-32 Microcontroller.
- Bluetooth Signal transition for maximum distance and battery life.
- 25-30 feet transition distance.
- Up to 9 hours of battery life.

Signal Filtering

- LM32 Op-Amp for Quad setup.
- Sallen-Key low pass filter
- RFI Filter

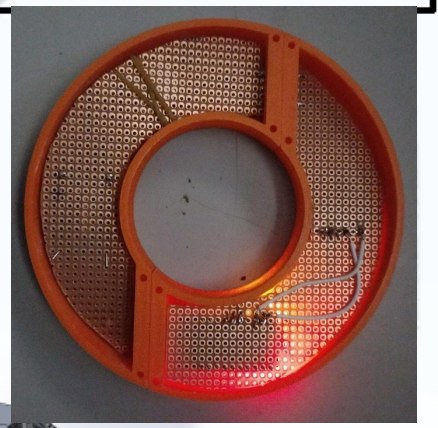
Original Design

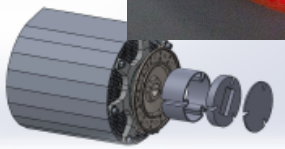
- Donut shaped PCB
- Battery compartment was off center causing off balance



Final Design

- Created more flexibility for PCB by utilizing spacer to extend PCB beyond obstruction
- Battery compartment was centered

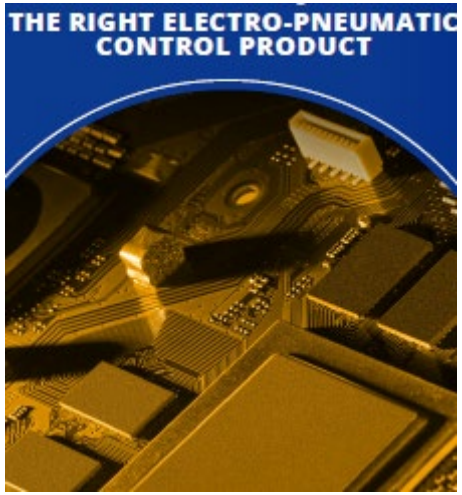




Back to Proposal List

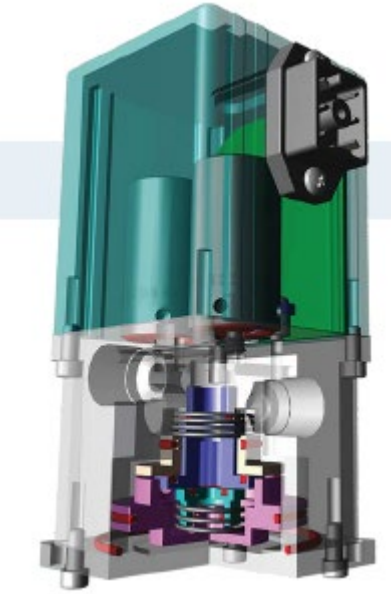
Proportion Air Plus

Description: Elevate a pneumatics start-up kit to a connected trainer for the next gen.



Objectives:
1. Research current state-of-the art in pneumatic trainers
2. Develop a unique upgrade(s) that would benefit future students
3. Design, build, and test prototype of the upgrades, report-out with instructions.

Success Criteria:
1. Modified prototype is built, tested, and deployed
2. Project report adequately describes how to operate, connect, and reprogram.
3. Successful interaction with the host, and deployment of mods to future students.



Prototype: Yes

Disciplines/Team: All disciplines

Restrictions: None

Washkewicz College of Engineering Senior Project Description

September 7, 2023

Sponsoring Organization:
Holistic Engineering Inc

Sponsoring Organization Project Manager Name/Contact Info:
Joseph G. Spagnuolo, PE
joegspags@gmail.com
440-610-0757

Desired Team Makeup (i.e., 4 mechanical students, 2 mechanical and 2 electrical, etc.):
1 Mechanical student, 1 Chemical student or more

Project Title:

Carbon Dioxide capture using patent 9435534

Project Objectives:
Determine the optimum process conditions to capture 90+% Carbon Dioxide from high humidity exhaust streams

Project Description:

Prior CSU work determined operating conditions for capturing energy, particulate, and carbon dioxide from high humidity exhaust streams such as coal fired power plant scrubbers.

Additional modeling is needed to determine operating conditions to meet proposed new discharge standards of 90+% carbon dioxide.

Pressure, pH adjustment, and chemical addition options will be evaluated to achieve the carbon dioxide capture.

Back to Proposal List

Assumptions / Risks / Obstacles:

1. **Assumptions**
    a. **High carbon dioxide capture can be achieved**
2. **Risks**
    a. **None**
3. **Obstacles**
    a. **Obtaining sufficient coal fired power plant operating data for calculations**

Special Restrictions:

- **U.S. Citizenship/Residency required?**
    - **NO**
- **Are you currently working with any of our students and you would like them be assigned to this project? If yes, please provide the name(s) of the students.**
    - **NO**

Back to Proposal List

Fire Extinguishing Agent Capture For Recycle Or Disposal

FirstEnergy BETA Laboratory

Description: Design and furnish an apparatus to capture dry chemical agent discharged from portable fire extinguishers for easier recycle or disposal.

Objectives:

- Apparatus MUST be able to withstand discharge pressures up to 350 PSI while allowing for the dissipation of expellant gas
- Apparatus MUST have a minimum storage capacity of 200 pounds (~4 each 5 gal buckets) of dry chemical
- Apparatus SHALL allow for the connection of quick disconnect adapters
- Apparatus SHALL be constructed in a manner to contain dry chemical fines
- Apparatus SHALL allow for the controlled transfer of dry chemical from collection device to a smaller container for ease of disposal
- Apparatus SHALL allow for the controlled transfer of dry chemical from collection device to a 5 Gallon bucket to allow for recycling
- Apparatus should be portable and light weight
- Apparatus should be easily operational for one employee
- Apparatus should protect from corrosion of dry chemical

Prototype: No

Disciplines/Team: Mechanical, possibly civil or chemical

Restrictions: None

Back to Proposal List

Back to Proposal List

Farmbot to the Max

Description: Design and implement a major upgrade to an existing Farmbot on the roof of the Rec Center.

Objectives:
1. Research existing Farmbot and other urban farming solutions
2. Develop a unique solution(s) to improve and expand the capabilities of the CSU Rec Farmbot
3. Design, build, and test your maximized Farmbot mods

Success Criteria:
1. Your design solution is unique and is a major improvement/upgrade to the existing state-of-the-art
2. Report-out includes detailed description and operation instructions

Prototype: Yes

Disciplines/Team: All disciplines

Restrictions: none

Senior Design Project 2024

Lab & Pilot Scale Latex Reactor Correlation

Back to Proposal List

Sherwin-Williams

Description: Correlation of lab scale and pilot scale reactor set-ups with respect to design and process capabilities, for water-borne emulsion polymerization processes. Formulating a basic latex to be used for the generation of in-process data. Further, using generated data to suggest reaction optimizations.

Objectives:

1. Formulate a basic latex polymer (model polymer formula, not IP protected)
2. Run lab scale latex batches and record heating & cooling, torque, power, and mixing capacity data.
3. On the pilot scale, recording corresponding heating & cooling, torque, power, and mixing capacity data.
4. Interpret generated data and create correlation excel workbook with process optimization calculation capabilities.
5. Perform statistical analysis
6. Write a report of the overall process and results.
7. Create a small-scale model reactor for presentation
8. Make a Presentation/poster effectively communicating project steps and results.

Success Criteria:

1. With Correlation, the lab scale reactor adequately reflects the dynamics of the pilot reactor.
2. Excel spread sheet created by generated data functions as process variable calculator
3. Project report sufficiently communicates conclusions drawn by analysis of results and defines steps to take moving forward.

Prototype: No

Disciplines/Team:

Chemical Engineering: Lyndsey Lacey, Mia Disalvo, Kierstin Clark, Daniel Patten, Marybeth Duke

Restrictions: Proprietary information

Weather Station with Graphical Display

Group: Leader: Thomas Terry Electrical Engineer
Jacob Dorsey Computer Engineer
Andrew Schelb Computer Engineer
Johnathan Andrews Electrical Engineer

Problem: Have you ever wanted to know specific details of the weather outside of your home or when you have no cellular service? With our device, you will be able to tell specific details about what the weather is like right outside, instead of using a weather application or weather channel to get a rough estimate of what the forecast is like in the city you are currently in. Some limitations could be that the inclement weather is too severe that the device might have some issues or that the device gets damaged due to water getting in it.

Objective: Our device is designed for the average person to use. It will be able to:

1) Read the temperature and environment of outside.
2) Display the readings to the user.
3) Get users input for any customizing they might want to do.

Deliverables: The device is expected to be able to get many different readings of the environment outside and be able to display these readings in a unique way. Some features it will have are readings for things such as: detecting gusts of wind, if the wind is constant or not, the amount of rainfall or snow, and temperature. Some other things that can be added to the device is a compass, making it to where it is a low power system, and an LED display that shows a picture of what the environment looks like, i.e., rain falling.

Back to Proposal List

Project Title: Classroom Tablet

Amy Hizlan
Malik Shahin

Problem Statement:

College can be very difficult for a student to make their way through, from the smallest college campuses to the biggest. With ever-growing universities there is an ongoing need for information on a classroom and class being taught there.

Increased accessibility of information can not only make guiding the halls of large college campuses easier but can also provide students quick and useful information on a class being taught. Currently, classrooms at Cleveland State University are only distinguished by their room number and the way you look, which innately provides little to no information on what is taking place there and at what time. Consequently, when a professor decides that the current classroom, they are teaching in is unfit for their class, they are unable to migrate without going through a time-consuming process of finding another class. If professors were afforded the ability to see what classes are being taught and where, they could smoothly relocate the class like never before. Students could also find their classes and view course information more easily.

Objective Statement:

We propose an affordable but effective tablet that can be placed on each classroom door and provide important information regarding classes to students and professors. A system like this would help prevent confusion for students when finding their classroom, can prevent people from entering the wrong class or confusing their class time, and can display important information regarding the class to the student. This system would also help professors navigate their course schedule, make sure they are in the correct classroom, and reach out to students.

Deliverables:

This system will display information such as class times, class schedule, current class, professor, office hours, syllabi and any other information that the professor chooses to include. Perhaps one might even add notices regarding homework, exams, or days on which the textbook is needed.

Back to Proposal List

Intelligent Water Quality Monitoring Dashboard for Lake Erie

Back to Proposal List

Intelligent Water Quality Monitoring Dashboard for Lake Erie

- **Description:** While different aspects of the Internet of Things (IoT) have been extensively discussed in the literature, there are many aspects of IoT that need to be studied in different applications, such as water quality monitoring, where the nodes differ with respect to (i) the type of sensed data, (ii) the source of energy for operation, (iii) the mode of data communication and its cost, and (iv) the data analysis and visualization in the central unit for decision making and closing the loop. Here in Cleveland, Lake Erie has a crucial role in providing drinking water for a large number of populations; however, it faces many challenges in terms of water quality. There is a need for an IoT network over the lake to monitor various parameters in real-time.
- **Objectives:** This project trains the students in this regard and provides the required knowledge and skills for implementing an IoT project. It involves deploying a network of sensors to collect data on various parameters of water quality, transmitting that data to a central system for processing and analysis, and visualizing the results to monitor and access the quality of water. Machine learning will be applied to the data for decision-making purposes.

Washkewicz College of Engineering

Faculty-Led Senior Design Project Description

Fall 2023 – Spring 24 format (select one):

remote hybrid ✓ in-person

Faculty Name/email: Aditi Singh a.singh22@csuohio.edu

Desired Team Makeup:

- Primary discipline: CS (Computer science)
- Additional (optional, for multi-discipline project):

Project Title: Black Friday Buddy: Your Shopping Companion

Project Objectives: Create a mobile app called "Black Friday Buddy" to enhance the Black Friday shopping experience by providing real-time information, personalized recommendations, and interactive assistance to users. The app aims to streamline the shopping process, help users make informed decisions, and offer a convenient shopping assistant for the holiday season.

Project Description: The "Black Friday Buddy" app aims to transform Black Friday shopping. It offers features like deal search, personalized recommendations, real-time price tracking, chatbot assistance, store mapping, price comparison, crowdsourced ratings, shopping list management, and price history analysis.

(Enhancement of the last year project if you continue the last year project:)

Success Criteria: The app's success criteria include providing real-time Black Friday deals, personalized recommendations, and accurate price drop alerts. It must efficiently assist users with a chatbot, offer store maps, reliable price comparisons, and crowdsourced reviews. Additionally, it should enable easy list management and offer historical price data for discount evaluation.

Assumptions / Risks / Obstacles:

Assumption: Users will actively engage with the app and provide sufficient data for personalized recommendations.

Risk: Technical challenges in implementing real-time data updates and efficient search algorithms.

Obstacle: Ensuring user data privacy and implementing effective content moderation for user-generated content.

Back to Proposal List

Interactive LED Museum Display Exhibit

GREAT LAKES Science Center
Stay Curious.

Description: As part of the new renovation project at The Great Lakes Science Center, a new interactive installation will take place on the second floor. The exhibit will be interactive to guests, operating on LED lights that are controlled by motion sensors, while providing an educational demonstration on the science of light.

Objectives:
1. Implement programming onto hardware to make a functional display
2. Design an interactive model for children and adults to use
3. Have a fully-functional museum exhibit completed by the end of the second semester

Success Criteria:
1. LED lights are controllable by sensors activated from human movement
2. Use group's design process to successfully build a large-scale model
3. Prototype is successfully installed in building

Prototype: No

Disciplines/Team: Computer Science, Computer Engineering, Electrical Engineering, Mechanical Engineering | **Tyler Carr, Lillian Chan, Logan Kendall, Zachary Mosley**

Back to Proposal List

Restrictions: none

Washkewicz College of Engineering
Student Proposed Senior Design Project Description

Student Leader Name/Email: Salvador Murillo

Faculty Advisor: TBD

Team Makeup:

Primary Discipline: CS

Project Title: Non-Lethal Autonomous Fish Hunter

Project Objectives:

- Create an autonomous drone capable of submersing itself underwater, move around at sufficient speeds for hunting/capturing, operate in the varying low depths of Lake Erie, and maintain connection with surface team.
- Drone must be able to identify species of fish, especially fish invasive to Lake Erie.
- Capturing mechanism must be efficient enough to consistently capture fish. Capturing mechanism must capture the fish non-lethally and humanely.
- Drone is capable of capturing and holding fish at least the size of an Alewife (10-15 inches long, weigh less than a pound).
- (OPTIONAL) Drone is capable of patrolling waters on its own.

Project Description:

Goal of the project is to construct and design an autonomous fish trapping drone capable of removing invasive species of fish found in Lake Erie via pursuit and capture. This drone will be designed to submerge itself underwater, navigate efficiently, and capture target fish species in a humane and non-lethal manner, all while maintaining a connection with the surface team for monitoring of the drone. The core functionalities of this drone include the identification of fish species, especially those invasive to Lake Erie, which will utilize machine learning models to distinguish the fish and the capture of targeted fish. Additionally, the project may explore the

optional capability for the drone to autonomously patrol the lake's waters without assistance and input from the surface team.

There are a variety of invasive species of fish found in Lake Erie that threaten the indigenous wildlife and ecosystem biodiversity. Without a dependable natural predator consistently thinning the invasive fish populations, there numbers will continue to grow and threaten other lake ecosystems within the Great Lakes region. Invasive species like the Alewife compete for food with native fish and predates on native fish. Removal of invasive species will help protect the local ecosystems, but a complete removal of a species isn't an easy task. Although measures to removing and preventing invasive species is already undergoing in Lake Erie, this project will serve to explore an autonomous drone's usefulness and efficiency in removal efforts.

Success Criteria:

Capturing performance of decoy fish is satisfactory. Submersible mechanisms working adequately under average Lake Erie depth (around 60 ft). Speed of drone performs well enough for pursuing fish. Able to maintain connection to drone while it's submerged. Capable of identifying species of fish. Capture and retrieval of at least one Alewife (or other invasive fish if possible) from Lake Erie.

Assumptions/Risks/Obstacles:

Construction of a submersible capable of fish-like speed underwater. Developing an identification model for fish species. Develop a pursuing system that focuses on capturing the identified target. High-speed capture mechanism (or other kind of capture that doesn't depend on speed) capable of capturing and holding the fish underwater without harming it.

Fund Requested from EECS Department:

TBD

Budget Justification:

Cost of materials, equipment, and services to construct drone and its test environment. Cost to acquire a fishing license in Ohio, if necessary.

Back to Proposal List

Student Proposed Senior Design Project Description

Faculty Adviser: Professor Robert Fiske

Team Makeup:

- Sidney Zweifel (GL)
- Sarah Ogorzaly
- Gretta Foxx
- Yaxin Gu

Project Title: A Randomized Educational Computer Science Game for CSU Students and Faculty

Project Objectives:

- Successfully make a PC game in Unity that uses multiple “escape room”-esque levels to teach people important computer science concepts in an engaging way
- Create an engine for the game that assists in providing players a replayable experience with randomization so that they can be sure they understand concepts rather than memorizing concepts
- Develop a game that can easily be built upon by creating new levels or modifying existing ones that meet a classes or students needs
- Provide easy to read documentation
- Successfully work in a team of individuals inspired in blending the boundaries of STEAM (Science, Technology, Engineering, Arts, Mathematics)

Project Description:

The **computer science themed escape room game** will be level based. With a total of **four levels**, the difficulty of the concepts will increase respectively. Difficulty will range from basic concepts such as variable assignments and conditional statements, to complex algorithms and machine learning. The concepts will be based on what was taught in computer science courses at Cleveland State. A rough breakdown of how concepts would be broken up per level (escape room) is as follows:

Level 1 (CIS 151): Java or Python Language

- Print statements (“Hello World”)
- Assigning variables
- If-Else
- Loops (for, while)
- Logical operators (=, <, >, AND, OR, XOR)

Level 2 (CIS 260, first half 265):

- Simple object oriented
- Inheritance
- Simple Algorithms (selection sort, insertion sort, merge sort)
- Data structures (hash tables, arraylists, dictionary, etc.)

Level 3 (CIS 265 second half, 390, 340, 345, 424):

- Complex algorithms (graph search algorithms: DFS, BFS, binary search trees, A*)
- Dynamic programming
- Basics of other programming languages (Prolog, SQL)
- Systems programming and file organization concepts

Level 4 (CIS 492, 467, 345):

- Artificial intelligence (machine learning)
- Internet of Things
- Multi-threading

Players have to solve computer science themed puzzles to escape rooms and advance to the next level. Each level will have 4 puzzles. Some of the puzzle types we plan to develop include drag and drop, logic puzzles, and programming challenges. Each puzzle will act as a mini game. All of the puzzles per level must be solved in order to move on to the next level or escape room.The first inspiration picture down below provides a visual representation of this concept. The ultimate goal for the player is to complete all the puzzles on each level to escape and beat the game. Each team member will work on one puzzle per level as a start. We will add more puzzles as time allows.

A key component of our game will be randomization. We plan to implement a game engine to be called whenever a puzzle is being solved. The randomization component would be used to generate random numbers every time the puzzle is played to allow for replayability. For example, if the player was prompted to create a “for loop”, we would want the bounds of that loop to be different each time. This is so a player does not rely on memorization and learns how to apply the key concepts. Our engine would be built to create this randomization for all of our puzzles. It is our aim to build the randomization engine so that it may be flexible for others to modify it to their needs.

It should be noted that due to the nature of computer science concepts many of the concepts per level can be explored simultaneously through puzzles. For instance, object oriented concepts can be taught in conjunction with inheritance and data structures. Although both of these concepts can be challenging at first and do not seem

inherently related, it will allow students to combine their existing knowledge giving them the confidence to solve real world issues where problem solving with multiple tools at a time is vital to success.

We are planning to use the popular game engine Unity which is programmed in C# to develop the project. Although, for our randomization and modifying aspect we anticipate utilizing a scripting language such as XML. A majority of puzzles will be direct to certain algorithms, but there is also room for developing clever puzzles that are based on computer science theory. For the environment and in game assets we will either build our own in Blender or some other similar software. However, we will use royalty-free assets available for Unity as a foundation to build on. Code and information will be shared on Github to keep members updated.

Current state of the art in the area of computer science and programming games include Human Resource Machine, Code Monkey, and Scratch. The gameplay of Human Resource Machine uses blocks of commands that the player can reorganize to control automated human characters to accomplish tasks. Code Monkey is specifically aimed at educating kids K-8, allowing them to see their programs come to life with vibrant animations. Scratch is another block based programming software which allows users to create games while enhancing their knowledge of problem solving through programming. All games provide a suitable basis point for anyone to start learning programming in a simple and fun way.

Our project expands on previous programming games as it aims to not only teach some basic programming skills to students, but also provide puzzles that will teach more conceptual computer science topics, all while stressing replayability with the ability to slightly change the logic of puzzles so that players can be sure they are actually learning rather than memorizing. We will strive to make our game as organized as we can with thorough documentation so that any future developers can easily add their own puzzles and levels to the game to suit their needs.

Success Criteria:

Performance will be evaluated based on the ability of our game to be run without crashing and also how well it successfully teaches concepts of computer science. An overall goal of ours is that this game could be used in the classroom to teach students these concepts in a beginner-friendly/fun way. The ultimate goal would be an aesthetically designed game that runs without issues and has engaging and accurate puzzles at each of the four levels.

The bare minimum success criteria of the game would be to successfully implement Levels 1 and 2. This would include player interaction with the game environment through typing in code, clicking and manipulating assets to reveal clues and hints, and implementing features for replayability with random number generation. No matter what level we are able to implement, a successful project will teach us the

game design fundamentals, reinforce computer science principles, and provide our team with a rigorous project that will teach us more about developing a real world project.

Assumptions / Risks / Obstacles:

- Inexperience making a game, but it is assumed that each team member will take the time to learn game development basics from Unity courses and tutorials both through Unity and from other online tutorials during the first half of Senior Design so that they may be a valuable member of the team in the second half.
- Possible storage issues as Unity files take up a lot of space
- Developing levels that teach the player while also keeping the player engaged to learn more.
- Final goal is to make our own assets, but it is assumed that royalty-free assets will be used as the primary goal is to build the framework for the game. The visual customization of the game is one of our last priorities.
- Build an engine that allows for ease of slightly tweaking puzzles. The game must be able to generate puzzles with different numbers and be able to check the correctness of the player's answer. This could be relatively simple for sorting algorithm puzzles, but the complexity increases with more complex algorithms and challenging theoretical concepts.

Fund requested from EECS department:
Unity Cloud Service (Plastic SCM) - First 5 GB free

<u>Seats (4 group members):</u>
$7 / seat / month = $32 per month

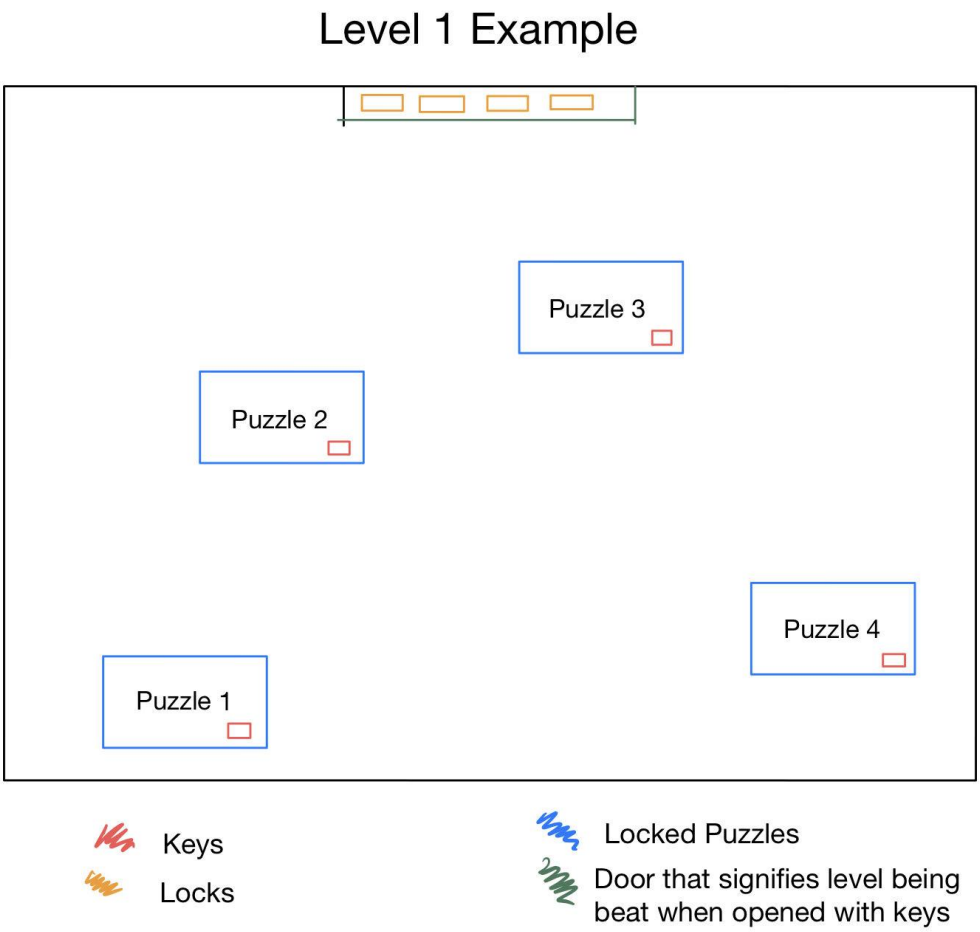
<u>DevOps Storage (If project goes over 5G):</u>
$0.00019 / GB / hour

<u>Budget Justification:</u>
Unity has a cloud based service (Plastic SCM) that will allow our group to collaborate and work together on our game. This allows for ease with merge requests.

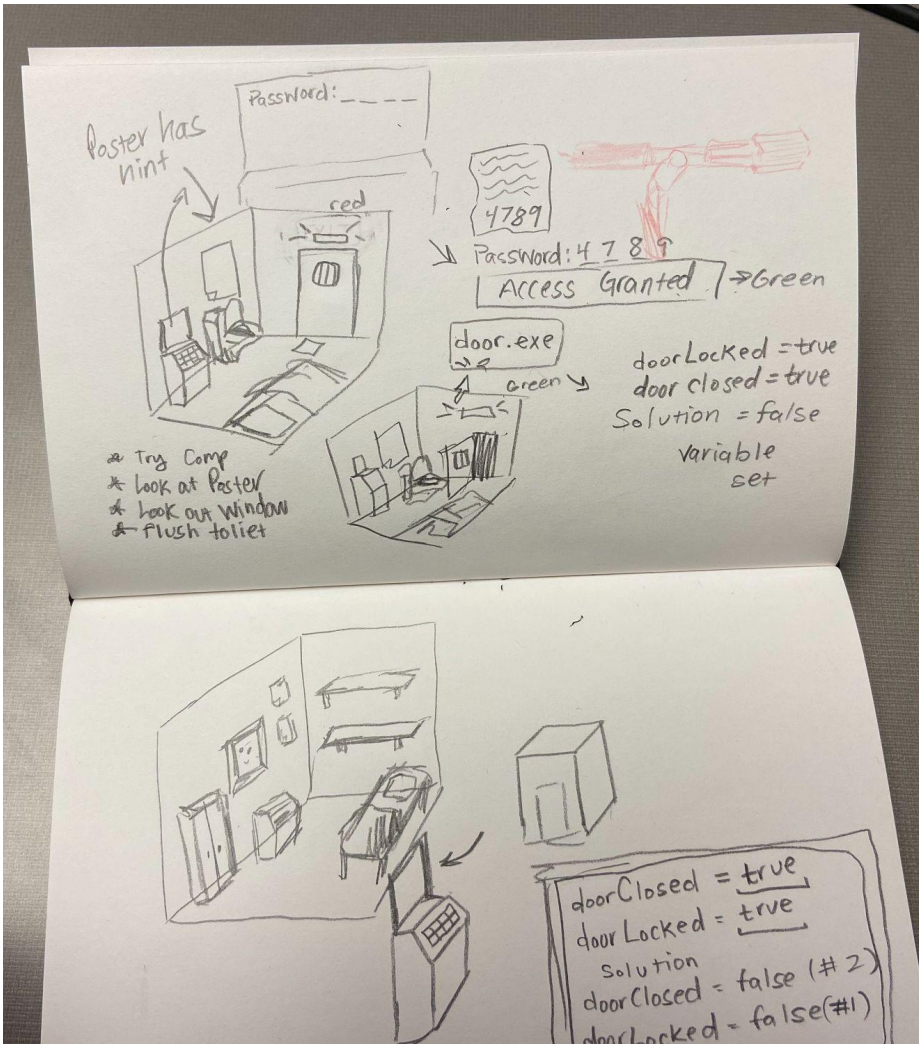
https://unity.com/solutions/version-control#:~:text=Your%20first%20three%20users%20and,sales%20about%20Unity%20Version%20Control.

The first three users and 5 GB of monthly data storage are free. After that, pricing depends on your monthly active users and total cloud storage:
https://unity.com/products/unity-devops#pricing

Inspiration Pictures:



A simplified diagram of how we plan the game to work. In the same vein of an escape room, we will have 4 mini-puzzles to solve that will all contribute to the larger overarching goal of moving onto the next level. (Courtesy of Sidney)



A concept sketch that shows a simple puzzle to start off the game. The player looks around their environment for clues to solve the puzzles. Once they find the required password they may unlock the door. (Courtesy of Gretta)

Inspiration picture for the game's aesthetic. Because our game is an escape room, our planned theme is to be a futuristic cyberpunk prison. The art style will be more simplified but this displays the general idea of a 2D background. (Source: https://www.patreon.com/DroidCartographer)

Inspiration pictures for game's aesthetics. We plan on making it a grunge prison break type of story. This level of detail will not be the focus, however. (Source: Rime Escape Game)

Inspiration pictures for the game's aesthetics. This is a visualization of how we plan to display puzzles to the users. We plan on having a combination of the user typing in, the user manipulating blocks of code, and the player solving puzzles that are specific to the algorithms or data structures. (Source: Human Resource Machine)

Back to Proposal List

Washkewicz College of Engineering
Faculty proposed senior design project description

Fall 2023 format: in-person
Student Leader Name: Mayur Patel,
Faculty advisor -
Team makeup-
Fnu Manish - Computer Science
Amritraj Dhillon- Computer Science
Harsh Patel - Computer Science

1. **Project Title** : Eye controlled drone Flight

Project Objectives:

The main idea of this project is to develop a system which can command drone flight with an eye tracking device.

Project description:
Drones have rapidly transformed the way we interact with the world around us. These versatile and increasingly accessible flying machines have found applications across a wide spectrum of industries and activities, fundamentally reshaping how we gather information, conduct operations, and experience the skies. Drones have found their place in countless industries. They are used for aerial photography and videography, agriculture for crop monitoring, search and rescue missions, environmental monitoring, infrastructure inspections, surveillance and security, delivery services, and even recreational purposes. Drones equipped with various sensors, including cameras, LiDAR, and thermal imaging, have revolutionized data collection. They provide high-resolution, real-time imagery and data, making them invaluable tools for scientific research, disaster response, and land management. Drones offer precision and efficiency in tasks that were once labor-intensive or logistically challenging. For instance, in agriculture, drones can pinpoint areas needing irrigation or pest control, leading to resource savings and increased yields.
The core of this project involves creating a robust and responsive eye-tracking interface. This interface will accurately capture the user's eye movements and translate them into commands for controlling the drone's flight path, altitude, and actions. Implement real-time data processing algorithms to interpret the eye-tracking data and convert it into actionable instructions for the drone. This step involves the integration of machine learning and computer vision techniques to ensure accurate and responsive control.

Success Criteria:

The drone's control system should exhibit precise and predictable behavior. Success criteria include maintaining specified flight paths, altitude control, responsiveness to user inputs, and technical report of the project.

Assumptions/Risks/Obstacles:

Alongside their benefits, drones also pose challenges. These include issues related to airspace management, potential for misuse in illegal activities, and the need for robust security measures to prevent unauthorized access and hacking.

Fund requested: No funds requested.

2. Project - 3D Scanning and Integration into AR/VR Demos

Project Objectives : The project's main goals include a comprehensive strategy for integrating technology and disseminating knowledge. In the first place, we want to use the Artec Leo handheld scanner's skills to find and collect particular objects, whether they are dispersed over the campus or inside the College of Engineering. We then want to use specialized software programs to import these digital twins into immersive settings, such VR Cave, Microsoft HoloLens, or Meta Oculus AR/VR headsets. The development of a captivating demonstration that demonstrates the useful uses of the device in combination with the selected objects is another crucial goal that will help people comprehend its potential on a deeper level. Finally, to ensure the longevity of this project, we will create an easy-to-follow guide detailing the entire procedure for future usage and reference, encouraging continuing knowledge diffusion and real-world use.

Project Description : The Artec3D Leo handheld 3D scanner was purchased by CSU, adding an interesting new resource to its collection. This cutting-edge tool is expected to be essential to both the MakerSpace and the Computer Science Department. The scanner will be essential in producing immersive augmented and virtual demos across a wide range of applications, together with further VR Cave and AR/VR headset technology. These applications cover crucial fields including healthcare, manufacturing, and workforce development in addition to design prototypes. The capabilities of CSU in the area of 3D scanning and immersive technologies are expected to be greatly improved by this acquisition.

Success Criteria : Our main goals include developing a clear representation of chosen objects through digital twinning, writing an approachable instruction manual for ongoing use within our MakerSpace and Computer Science Department, and developing a firm understanding of software integration along with the foundations of AR/VR technology.

Fund requested: No funds requested.

3. Project:- HMI Auto generated- Logic and status screens

Description:- In this project we have to develop an algorithm to automatically generate a user-friendly, HMI Representation of PLC logic and status directly from the code itself and available software structures. In modern industrial automation, Programmable Logic Controllers (PLCs) are essential for controlling processes. Human-Machine Interfaces (HMIs) provide a visual representation of these complex PLC logics and statuses, enabling operators to monitor and control systems efficiently. However, creating and maintaining HMIs manually can be time-consuming and error-prone. This project aims to develop an algorithm that automates the generation of user-friendly HMI representations directly from PLC code and existing software structures.

Objectives:

1. Rockwell Automation, RA, hardware and software platform, running code in ControlLogix PLC, designers to create HMI representation of code on a RA Factory lalk HMI.
2. Representation to include tag names, descriptions, graphic symbols, and logical arrangements.
3. Real-time status indication will be displayed.
4. Ability to "drill-down" into nested ladder rungs.

Success Criteria:

1. Download a new, valid PLC task and confirm HMI operation.
2. Design documentation generated and verified.

Expected Outcome:

- Reduction in development time and effort required for creating HMIs.
- Enhanced accuracy and consistency in HMI representations.
- Improved operator efficiency and system control in industrial settings.
- A scalable and adaptable solution capable of working with various PLCs and software structures.

Fund requested: No funds requested.

Back to Proposal List

Washkewicz College of Engineering
Student Proposed Senior Design Project Description

Student Leader Name/Email: Salvador Murillo /

Faculty Advisor: TBD

Team Makeup:

Primary Discipline: CS

Project Title: Muscle Controlled Robotic Hand

Project Objectives:

- Construction of a hand prosthetic that is comfortable to wear during long periods.
- Hand should be able to perform fine motor tasks with some level of precision, such as picking up objects of varying size, grasping delicate items without breaking them, and performing tasks that require both dexterity and accuracy such as writing with a writing tool.
- Hand should be able to be controlled via electrocardiogram (ECG) or electromyography (EMG) sensors.

Project Description:

In response to the pressing need for an advanced prosthetic hand that seamlessly combines comfort, precision, and innovative control options, our project is dedicated to designing and constructing a groundbreaking Comfortable and Precise Prosthetic Hand with ECG or EMG Control (decision on which sensor to use is still being determined). This ambitious endeavor seeks to empower individuals with limb disabilities by offering them a prosthetic solution that not only meets their functional requirements but also ensures sustained comfort even during prolonged use.

Success Criteria:

The prosthetic hand must be comfortable to wear continuously for prolonged use without causing discomfort, skin irritation, or pressure sores. User of the hand should be able to conduct various tasks with the hand such as writing, grabbing objects, and other tasks people normally perform with their hands. User should be able to easily control the hand with the muscle sensors to some extent.

Assumptions/Risks/Obstacles:

Construction of a complex hand with several motor functions. Mapping of muscle actions to hand for ease of use.

Fund Requested from EECS Department:

TBD

Back to Proposal List

Washkewicz College of Engineering
Student Proposed Senior Design Project Description

Student Leader Name/Email: Fabio Hinojosa Jimenez

Faculty Advisor: TBD

Team Makeup:

Primary Discipline: CS

Project Title: Mute and Deaf Translator Glove

Project Objectives:

- Create a wearable glove that will translate sign language.
- Output sound through a speaker that will be the medium of communication to people that aren't proficient with sign language.
- Sounds must be understandable to everyone.
- Must be able to translate to one the English language.
- Gloves must be easily wearable.

Project Description:

Having a background in voluntary work with deaf and mute children, one cannot help but witness the challenges and obstacles they face. Among these, one of the most pressing concerns for those hailing from economically disadvantaged communities is their access to education. Many of these children are limited in their means of communication, often relying solely on sign language, and some may even lack the ability to write.

Considering that the majority of the world's population does not understand sign language, these children face a formidable barrier when it comes to communication. The overarching aim of our

project is to dismantle this barrier, ensuring that every disabled child can converse with people worldwide.

The core focus of this project revolves around the adaptation of a pair of gloves to enable a computer to receive input from them. This transformation will be accomplished through the use of motion sensors or alternative methods for capturing hand movements and gestures. Subsequently, the computer will analyze these movements and translate them into text. The generated text will then be conveyed through a speaker integrated into the gloves. All of this will occur within a matter of seconds, facilitating smooth and meaningful conversation to these children.

Success Criteria:

Conduct meaningful conversations using the gloves.

Assumptions/Risks/Obstacles:

One of the obstacles is that the computing power will be enough to translate at a speed that will be comfortable to have a normal conversation. Also, a different way of input will be use. It is thought that sign language will be very hard to translate, thus, the use of another variation of motions will be used to get a translation.

Fund Requested from EECS Department:

TBD

Budget Justification:

Cost of materials, equipment, and services to develop gloves and its test environment.

Back to Proposal List

Food Delivery Robot:

- Team Members
    - Ramandeep Arora, CE,
    - Carissa Templeton, CE,
    - Luke Palos, CE,
    - Connor Robertson, EE,
    - Alexis Marrero, EE,

Problem Statement

Many restaurants have waiters/waitresses that carry heavy trays of food/drinks every day. Their arms may get tired and/or they accidentally drop a full tray of food, wasting product. We currently haven't started working on this project. Many college campuses have food delivery robots. Since our campus is located downtown with lots of traffic, we want to start smaller and just focus on having one in a restaurant. If time permits, we would love to get a robot working throughout the innerlink at Cleveland State. We have 3 CE majors that can focus on the software portion, but can also help with the hardware. We have 2 EE majors that will focus on the hardware portions.

Objective Statement

A food delivery robot would be able to carry trays for the waiters/waitresses. It would learn to follow them around the restaurant. This would cause less accidents/spills in the restaurant, which saves the restaurant money. The restaurant would not have to waste food by remaking a tray of food that was accidentally dropped on the ground. The robot would also have to be able to travel through small puddles if a customer accidentally spills something, or the floor was recently mopped. We would meet with dining services to see what they would expect, and do our best to meet their needs.

Deliverables

The end product is expected to follow a waiter/waitress from the kitchen, where food is loaded onto the trays, to the tables, where the food/drinks are given to customers. To follow the waiter/waitress the robot would have a sensor. Another possibility would be to have sensors on all the tables and have the waiter/waitress select a table number for the robot to deliver to. The robot would need to last for the full hours of operation for the restaurant in a day. It would also need to be able to follow 1 person around, without getting distracted in a crowd/busy restaurant.

Back to Proposal List

In Between

Back to Proposal List

be IN tween

Description: this project is a social media app. This apps exclusive feature is to be able to take multiple people's location and find places in between them.

Objectives:

1. Find a way to use google maps to find central locations
2. Design, build, and test prototype of the app

Success Criteria:

1. Design a solution to the centralized map…
2. Get the front end up and running with base users…
3. Bring outside users in to test and respond to feedback…

Prototype: Yes

Disciplines/Team: Computer Science

Project Title: Smart Assistive Navigation Stick for Individuals with Visual Disabilities

Team leader: Carmen Villalobos Garcia, Computer Science,

Salvador Murillo, Computer Science,
Leonid Negomedzyanov, Computer Science,
Fabio Hinojosa, Computer Science,

Problem Statement

The issue is the lack of an efficient and informative navigation aid for individuals with visual disabilities. The cane technology so far is limited in its ability to help users understand more in deep the nature and proximity of obstacles in their path.

To support with data, according to the World Health Organization, there are approximately 253 million people worldwide living with visual impairment. Traditional white canes primarily serve as mobility aids but lack the capability to provide detailed information about obstacles. The National Federation of the Blind reports that blind pedestrians frequently encounter various obstacles, leading to accidents and discomfort during their daily activities.

Objective Statement

We want to propose a solution that aims to address the need for enhanced mobility and safety for visually impaired individuals during navigation by developing an innovative assistive technology.

I. Develop an obstacle detection system capable of providing real-time information about the nature and proximity of obstacles in the environment.
II. Create a user-friendly interface that conveys obstacle-related information to visually impaired users effectively.
III. Ensure the system's adaptability to various environments and obstacle types.
IV. Investigate the feasibility of integrating multiple sensor technologies to improve accuracy and reliability.
V. Conduct user testing and feedback sessions to improve and optimize the assistive technology based on user preferences and needs.

Deliverables

Main Features/Functionalities:

- **Obstacle Detection**: The device will employ a combination of sensors and computer vision technology to detect various types of obstacles.
- **Obstacle Identification**: It will classify and identify obstacles, such as stairs, pedestrians, and more, to provide users with a clear understanding of their surroundings.
- **Distance Measurement**: The device will measure the distance between the user and detected obstacles, allowing users to scale their proximity.
- **Audio Feedback**: A speaker or audio feedback system will send the related information to the user in a clear and understandable manner, offering guidance.
- **Adjustable Sensitivity**: Users will have the ability to customize the device's sensitivity settings to match their preferences and specific environments.
- **Ergonomic Design**: The device will have a comfortable and user-friendly design, ensuring ease of use.
- **Adaptability**: The system will adapt to different environments, ensuring reliable performance indoors and outdoors, day or night.
- **Battery Efficiency**: A power management system ensures that your device's battery lasts longer, so will last all day without worrying about running out of power.
- **Safety Alerts**: In addition to obstacle detection, the device may incorporate features like proximity warnings to enhance user safety.

Back to Proposal List