DIVISION OF ENGINEERING PROGRAMS

Virtual Engineering Project Review

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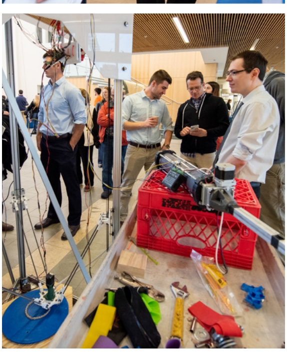

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SENIOR DESIGN I

Team 1

Collapsible Electric Bicycle

Sarah Kisiel (ME), Armando Pavon (ME), Patrick-James Piescor (ME),
Joshua Pisano (ME), Nolan West (EE)

Advisor: Professor Ken Bird
Co-Advisor: Dr. Reena Dahle

Abstract

The objective of this project is to design and build a collapsible, electric bicycle. The team's goals are to demonstrate the compactness, functionality, and safety of the design. This foldable electric bicycle will be designed to mitigate the hassle of carrying and transporting a bike by significantly reducing the size and weight. The weight of the entire bicycle will be at most 50 lbs. The collapsible wheel design will decrease the diameter from a typical 24 inches to 14 inches when fully retracted. A rolling prototype will be constructed out of Polyvinyl Chloride (PVC), a synthetic plastic polymer. The prototype consists of 3D printed components using Polylactic Acid (PLA), which will be used to reduce the prototype cost and give the ability to produce parts in a timely manner. This prototype allows for physical testing of our computer-aided designed components, such as the hinges, brake rotor mount, and the overall folding aspect of our bicycle frame. The electrical system of the prototype will be designed using a compact, 80 Nm motor and 36 V battery system for easy maneuverability while still offering 250 W of power assist. Additional components such as speed, brake, and gear sensors along with an LED display will be integrated within the circuitry to increase the overall performance of the bicycle. The information provided from this project can be used as a basis for future bicycle designs, specifically iterating the wheel design and reducing the weight and cost by using different materials. Future plans for the project include the design and implementation of an effective gear train, throttle control and data acquisition system, and testing.

Engineering SENIOR DESIGN I Fall 2020

Team 2

Induction in 3D Printing Applications

Jevon Hewafonsekage (EE), Christian Olmoz (ME), Vishesh Patel (ME),
Bennett Terrill (ME)

Advisor: Dr. Rachmadian Wulandana
Co-Advisor: Dr. Ping-Chuan Wang

Abstract

For this project, an induction 3D printer was constructed. Induction heating is the process of using rapidly alternating magnetic fields to produce Eddy currents. Using this concept and applying it to 3D printing assists in allowing for materials with higher melting points to be printed. This has two benefits. The first being that metal prints are much more durable than plastic components and can be used as a finished product in the prototyping process. The second being that metals are much easier to recycle than plastics, thus eliminating waste caused by current print technologies.

Team 3

Remote-Control Robotic Bobber

Farzana Akhter (ME), Afridi Bhuiyan (ME), Waliur Bhuiyan (ME), Md Emtiaz (EE), Fairooz Haque (ME), Tanvir Khan (CE)

Advisor: Dr. Julio Gonzalez
Co-Advisor: Dr. Varad Karkhanis

Abstract

Our team will design a remote-controlled bobber for fishing. Our project is to create a robotic bobber that will be able to move according to the user's desire. We want to control the bobber at a specific spot with a physical remote-controlled device that the user uses to control the bobber. If the bobber moves, so does the fishing hook connected to it. The main objective of this project is to be able to make fishing more automated and reliable by utilizing robotic technology. This way, fishing will no longer simply rely on a person's throw and luck. Our group has finished a small amount of programming, wiring and built a very basic prototype design on SolidWorks. We did this because one of our goals is to have a basic prototype by the end of this semester and to also gain a basic understanding of the steps necessary to reach the final goal.

Through testing and research, we found out how to make the bobber float and that is done through Bernoulli's principle. This is important to note because a bobber needs to float to function. We also found that based on the motor we choose, we must determine if this bobber can withstand a temperature of 40°C. This will determine what type of insulation or cooling systems are needed. This project is important because it gives us a look into how we can insert robotic/RF technology into an activity that doesn't require any electrical/robotic devices. If this is possible, people will no longer rely on just luck—technology will be able to close the gap to make fishing more streamlined in the future.

Engineering SENIOR DESIGN I Fall 2020

Team 4

Low Cost Ventilator for Developing Countries

Sarah Abdo (EE), Nataniell Ilyayev (ME), Melissa Keefe (ME), Olivia Kelsey (ME), Eric Migliaccio (ME)

Advisor: Dr. Julio Gonzalez
Co-Advisor: Dr. Heather Lai

Abstract

In the beginning of the COVID-19 pandemic, many patients were hospitalized due to their respiratory complications. With over 50 million cases worldwide, there has been an increasing demand for breathing ventilators to assist COVID-19 patients. This inspired the research into the other uses for low cost ventilators in the medical field, which became the purpose of this Senior Design project. A medical grade ventilator can cost more than $20,000. With this knowledge, the goal is to develop a low-cost innovation solution. Regarding the consideration of cost, the prototype ventilator to be designed for this project is projected to cost under $1,000 for all the materials and supplies needed to operate efficiently. The ventilator is a feedback control system that utilizes a volume controlled positive pressure system. This volume-controlled system was chosen to mitigate common health risks associated with medical ventilation and functions with the use of a flow sensor, DC motor, Arduino, and MATLAB. With user defined inputs, the motor will compress the ventilation bag at a desired rate and that will result in an output flow to the patient. The flow is then regulated by the script to ensure that the tidal volume patient requirement is met at the right inhale to exhale ratio. Using a graphical user interface, this project will input the physiological constraints of the human body and output patient vitals.

Team 5

Load-Bearing Assistive Exo-Suit

Kevin Thomas Kurian (ME), Enrico Licata (ME), Xavier Manuel (ME), Carl Pascarella (ME), Thomas Spreitzer (ME)

Advisor: Dr. Heather Lai

Abstract

Bodily wear and fatigue are something that plague thousands of workers who are employed in jobs that require them to lift and move heavy objects throughout their daily shifts. It is the wear and tear from this repeated lifting that diminishes the health and wellness of those whom work in these occupations. By transferring the weight of the load, the worker is carrying away from their arms and onto the core of the body, the worker's arms and shoulders are relieved of the stress which causes the wear and tear. When properly distributed onto the body, the workers load becomes much more manageable and will result in less wear and tear on the body. The goal of this project is to design a lightweight and flexible exoskeletal device that shifts an amount of weight of a load from the arms of the wearer to their body through a frame which attaches at the arm and connects to a frame worn on the torso. The torso frame is attached to the wearer by a harness that will distribute the weight. Additionally, this device will use a power system to support the load and mitigate the load on the user.

Team 6

Digital Regulator Phase Control Board

Sarah Denatale (EE), Adam Greenberg (EE), Kenneth Hauser (EE), Yuriy Langer (EE), Ian O'Connor (ME)

Advisor: Dr. Mohammad Zunoubi
Stakeholder: Scott Nelson, P.E., Neeltran, Inc.

Abstract

To research and develop a digital phase control board that will be used in conjunction with a pulse rectifier system that utilizes thyristors for AC-DC rectification. The digital controller will be used to produce a 3, 6 or 12 pulse rectifier system. This system will serve to replace the outdated analog control systems Neeltran presently produces for their clients and provide a product that exceeds current industry standards.

Upon testing of the original prototype, it is a fully functioning digital regulator but not optimized. Testing and reverse-engineering of each aspect of the system is occurring to determine which parts need to be improved or are unnecessary.

The original prototype is updated and improved upon in order to produce a product that meets or exceeds current industry standards. Upon successful completion the board will be placed into production. As such, each individual hardware component is examined to confirm that they are not obsolete and in full serviceable order. In addition, the software used—ANSI C—needs to be amended for additional functionality and modernity.

Neeltran Inc.

Team 7

Kinesthetic 3D Audio Mixer

Kiera Cavanagh (ME), Susan Ko (ME), Maxx MacRae (EE),
Matthew Muller (EE), Seth Pearl (ME)

Advisor: Dr. Heather Lai

Abstract

Three-dimensional audio is a powerful way to enhance virtual reality by immersing the user in a 3D soundscape, but mixing and creating 3D audio often requires difficult-to-use or unintuitive software tools. This project intends to make 3D audio more accessible and intuitive by allowing users of different experience levels to create and mix 3D audio. The project consists of designing a device that allows the user to change the location of a sound source in 3D space by dragging their finger over the surface of a physical sphere. The addition of a physical sphere makes 3D audio much easier to create, mix, and visualize, and as such, the device is intended to be useful for inexperienced users and sound engineers alike. A camera array within the sphere connected to a microcontroller tracks finger position, and a computer vision algorithm translates the location of the user's finger on the sphere to a location of the sound source in 3D space. A 3D-printed enclosure houses all the electronic components. A digital audio workstation (DAW), in conjunction with Ambisonics Toolkit, is used to produce the 3D audio.

Engineering SENIOR DESIGN I Fall 2020

Team 8

Hybrid Dual-Sport Motorcycle

Bshara Dababneh (CE), Kyle Harkin (CE), Wilfredo De Leon Maldonado (ME),
Joseph Vara (EE), Brian Vigilante (ME)

Advisor: Dr. Mahdi Farahikia
Co-Advisor: Dr. Mohammad Zunoubi

Abstract

Among technologies whose popularity is overgrowing is hybrid technology. Hybrid technology is evolving with better and higher qualities being innovated. The goal of our Senior Design Project is to design and build a prototype of a hybrid motorcycle. This project's motivating factor is to introduce the benefits of hybrid power systems to the motorcycle market. Using such technology in a two-wheeled vehicle will help to reduce dependency on fossil fuel and will also help to increase the driving range of the vehicle as the driver will have the option to choose either electric or fuel mode.

Chassis designs will be made using CAD software, and 3D printed to arrive at the final design constructed of metal tubing in the fall semester. A hybrid system converting the mechanical power of an engine to electrical power will be designed and implemented in the spring semester. The project will be handled using two different controllers for two different functions from the electrical and computer perspective. Controllers are other essential devices used in Hybrid Electric Vehicles. The system will be controlled by an STM32 NUCLEO and ATMega2560 controllers. An STM32 NUCLEO board will handle the engine control and control of the hybrid system; it is used to control the amount of current to be supplied to the servo or stepper motor. Furthermore, the STM32 board will control the amount of power regulation and ensure a smooth power delivery system. An ATMega2560 controller will play an active role in controlling and displaying the data to the operator. Applying these concepts, an efficient and practical C program can be generated to emulate the desired project on both controllers, or more specifically, STM32 NUCLEO and ATMega2560.

Team 9

Wireless Pressure Sensor for Radon Mitigation System

Konrad Brzoska (EE), Reese Robinson (EE), Quinn Santangelo (ME), Gurnaz Virk (ME), Daniel Waligurski (ME)

Advisor: Dr. Reena Dahle

Abstract

Implementation of ambient Wi-Fi backscattering into a wireless pressure sensor in a home for Radon mitigation is an Internet of Things (IOT) application which seeks to eliminate the need for batteries in everyday sensors and constant human monitoring. A U-tube manometer will be fitted with transmission lines and an antenna capable of utilizing the vastly available network of Wi-Fi signals common in today's home, school and business environments to relay information regarding the status of such a sensor.

Radon is a naturally occurring gas produced by radioactive decay of uranium. It is toxic to humans and is one of the leading causes of lung cancer. Radon buildup is an important issue in many states across the country. Radon gas is invisible and usually enters through large cracks in building walls and flooring. Natural uranium deposits can be difficult to detect and homes built on soil with a high uranium concentration may be subject to radon buildup. To combat this buildup, many homes are equipped with a radon mitigation system, essentially an exhaust system that continuously exchanges stale air from areas that may otherwise not have adequate ventilation. These systems are typically monitored by a U-tube manometer, a very primitive apparatus used to detect changes in pressure. The manometer indicates whether the radon mitigation system is working properly or not by displaying a fluid level. This is very old technology, and it requires visual monitoring to verify the system is working. The wireless pressure sensor's antennas tuned to 2.4GHz will utilize backscatter in order to eliminate the need for an individual to manually inspect the system. Signals reflected by the antenna will be received and processed by an Arduino. This will eliminate the risk of an unnoticed system failure. Once a system failure is detected by the drop in pressure, a Short Message Service (SMS) notification will be sent to an individual informing them of possible danger. The passive device that is being developed would be easily adaptable to most Radon mitigation systems, as well as cost effective due to its relatively small size. The dielectric constant of the materials in the U-tube in addition to the size of copper tape for said antennas will be taken into account when designing the device to optimize signal transmission. Alternating current signals will be processed to see if reflections are generated from a mismatched load. Ideally the system will be lossless with zero reflections.

Engineering SENIOR DESIGN I Fall 2020

Team 10

Pure Sinusoidal Wave Inverter/Single to Three-Phase Power Converter

Nikiforos Fokas (EE), Caroline Kucher (EE), Matthew Smith (EE)

Advisor: Professor Mike Otis

Abstract

The project objective involves generating a pure sinusoidal wave from a DC source, splitting this single-phase generated wave into a three-phase balanced system, and filtering and amplifying the signal to drive a load. In the Fall 2020 semester, our team successfully designed a phase splitter which can transform a single phase input with a phase angle of 0˚ and an amplitude of any value between 0V to 15V into a three phase output with phase angles 0˚, 120˚, and 240˚ where the output amplitude follows the input amplitude. The output phase angles are variable, meaning the angles can be changed anywhere between 0˚ and 180˚ per phase. In the spring 2021 semester, our team plans to further improve the design by adding in a low pass filter at the three phase outputs to filter higher order harmonics as well as a power amplification device. We also plan on incorporating a generated pure sinusoidal wave from a DC source as their input. This project not only challenges the team by its complexity and broad scope of engineering disciplines learned over the academic years, but also serves as a potential learning instrument for future electrical engineering students, as it will demonstrate how three phase power drives a load. In addition, there is a rising demand for cheap, reliable pure sinusoidal power. With the new microprocessor technology available, we hope to capitalize on this demand.

Team 11

Laticrete Tool Development for Resinous Coves

Haris Deljanin (ME), Matthew Miraval (ME), Ivan Radonjic (ME), Mark Shkolniy (ME), Devin Ursprung (EE)

Advisor: Dr. Kevin Shanley
Stakeholder: Matthew Carli, Director of Innovation and Strategic Planning, LATICRETE, International Inc.

Abstract

Installation of resinous flooring is a labor-intensive task. Specifically, coves are a manual and challenging part of installation. When installed by cove trowel, this portion of installation can be very laborious to apply resinous material with zero variability. LATICRETE, International Inc. tasked the SUNY New Paltz senior design team with developing a tool to distribute material in a manner that will form smooth coves at the proper angle and depth. The final product must be cost effective, easy to use, easy to clean, and easily able to transport to job sites.

The overall goal of the project will be to design an automated system to properly mix resinous material and deliver said material to coves within a specific set of parameters. Automation of mixing and delivering material to coves should significantly reduce time spent building proper coves. This will meet LATICRETE's expectations for reduction of variability and labor.

Team 12

Gyroscopic Self-Balancing Mechanism

Terence Costigan (ME), Michael Cunney (EE), Randy Earl (ME), Schuyler Mann (ME), Ryan Martinez (ME), Patrick Pfeiffer (ME)

Advisor: Dr. Ping Chuan-Wang with Kevin Kolvenbach
Stakeholder: Dana Jones, CEO, Accessadoor, Inc.

Abstract

This Senior Design Project presents the design and development of a one-dimensional self-balancing apparatus for those who lack muscle functionality and mobility, due to neuromuscular disorders. Currently, there is only one self-balancing exoskeleton prosthetic that exists on the market and it is very expensive and bulky. The theoretical concepts of a spinning gyroscope are introduced to produce a new methodology for self-balancing. The design consists of a helicopter bearing that acts as a gyroscopic belt mounted around the user's waist, which is driven by three electric motors. The high rotational speed of the bearing generates a large angular momentum so that kinetic energy can be stored and harnessed for stabilization. Due to the governing physics of gyroscopic precession, as an external force is applied, the maximum reaction occurs 90 degrees out of phase in the direction of rotation. Since the precession rate and range of precession helps reduce the required rotational speed of the bearing, as well as the mass that needs to be added to the system, linear actuators will be implemented to induce active precession to the gyroscope. Accelerometers mounted to the person/object being balanced will measure the roll and pitch angles which will, in return, dictate the direction and magnitude of the external actuation forces that are required for stabilization.

Team 13

Music Practice Timer

Edgardo Campos (EE), Juan Cardenas (ME), Rumi Dutta (EE),
Nikki Maher (CE), Daniel Perez (CE)

Advisor: Dr. Baback Izadi with Dr. Eric Myers (Physics)

Abstract

Music Practice Timer is a cost-effective device designed to autonomously document how long a musician has practiced an instrument. Without any subscription, it will be possible for musicians to monitor the efficiency of their practice sessions both in real time and on an app.

Utilizing pre-determined commands, this device will engage a clock based on whether it feels an instrument is being played. The system will be utilizing an IR sensor with an analog sound sensor, ultimately controlled by an Arduino to be able to make its decisions. Musicians will be able to read real time data on the LCD screen, as well as be able to see quantified data on the application.

Learning an instrument can be both difficult and stressful, that's why Music Practice Timer will help musicians of all ages and experience monitor their playing habits. Featuring a rechargeable internal battery (to minimize the battery waste), the apparatus will be small, sturdy, lightweight, and hard to fool. Although early tests revealed differentiating between voices and instruments to be difficult, we started to overcome this challenge by analyzing plots generated by the Arduino interface and modifying our code to meet those specific needs. Just like string instruments, brass and many other instruments behave differently to that of vocal cords; and therefore, it should be possible to differentiate the lot. More data in the spring of 2021 is to be collected to see whether a new approach is needed for both the physical device and app.

Team 14

Recycled Plastic 3D Printing Filament Extrusion System

Meagan Blair (ME), Alex Jaquin (ME), Amal Jiji (ME), Kevin Nelson (EE),
Jazmine Remache (ME)

Advisor: Dr. Ping Chuan-Wang

Abstract

3D printing has dramatically increased in popularity among engineers and other professionals and performs a crucial role in manufacturing, medicine, architecture, custom art and design. As enterprises incorporate 3D printing into their manufacturing and developmental processes there is consequently an increase in plastic waste. Waste produced by 3D printers is in the form of support material, bed adhesion (rafts & brims), and failed or unwanted prints. An electromechanical system will be engineered to successfully recycle common 3D printing materials such as PLA and PETG so that they may be reused for future prints. The plastic is pre-processed by reducing the plastic into small pellets or granules. The pellets are processed through a single screw extruder where they are melted, mixed, and pushed through a nozzle at a constant pressure. The plastic filament is post-processed by cooling fans and wound around a spool. Both the temperature and dimensional accuracy of the filament will be monitored and displayed to the user throughout this process by implementing the use of sensors and electronic components. Although this project has been attempted before, our team aims to design an improved and more robust system. In doing so, we can improve dimensional accuracy and eliminate jamming. These improvements are necessary to create a system comparable to current forms of this system used in industry. This system is an ideal solution for enterprises utilizing 3D printing at a high volume and individual owners of 3D printers looking to lessen their environmental footprint.

Team 15 and Team 16

Electric Race Car

Syed Alam (ME), Jason Becker (ME), Thomas Grogan (ME), James Keshecki (ME), Aibel Kurian (ME), Sam Mani Mathew (ME), Anthony Maurice (ME), Justin Simon (ME), Michael Staudigel (ME)

Advisor: Dr. Rachmadian Wulandana with Professor Mike Otis

Abstract

The Shell Eco-marathon is an international, world leading engineering competition with the focus of developing energy-efficient vehicles. This project focuses on designing, analyzing, and constructing an electric race car within the constraints of the Shell Eco-marathon rules. A chassis and vehicle shell will be developed using modeling software, such as SolidWorks and ANSYS. Each design iteration will be analyzed in terms of load capacities, stress capacities, and aerodynamics using the finite element method, analytical methods, and physical testing when applicable. Furthermore, the team will develop an electrical system consisting of an electric motor, motor controller, battery storage, and battery monitoring system. Power requirements will be determined through analytical methods based on the desired velocity and the vehicle mass. Energy efficiency will be the forefront of the component selection in the electrical system. Lastly, additional systems, such as the brake assembly, steering assembly and axle shaft assembly, will be designed and configured using similar methods. All aspects of the electric race car will result in foundational knowledge in efficiency and alternate means of energy generation, following trends of the changing world.

Team 17

Automated Ground Delivery Robot

David Betolatti (ME), Nicholas Cullen (ME), Mario Lema (ME), Christopher Maggio (EE), Jordan Scocozza (ME)

Advisor: Dr. Mahdi Farahikia

Abstract

The purpose of this project is to design an autonomous ground delivery robot. The robot's primary function will be to travel from one point to another autonomously on SUNY New Paltz's campus to deliver packages to students, faculty, and staff. By automating package delivery, several benefits for the local SUNY New Paltz community begin to emerge. For example, an automated ground delivery robot would provide a contactless transaction for the consumer—something that is essential in this day and age to mitigate the effect of COVID-19 and other infectious diseases. In addition to maintaining public health and safety standards, an automated ground delivery robot would spur interest for students who are contemplating whether they would like to study Science Technology Engineering and Mathematics (STEM), giving students an opportunity to see what can be accomplished with a quality engineering education. For the Fall semester, heavy emphasis has been placed on the design of the mechanical and electrical systems of the robot. The robot consists of an Arduino Mega microcontroller board, four Sharp infrared proximity distance sensors, four 150-Watt Direct Current (DC) motors, and an aluminum frame. The sensors will constantly scan for any obstructions in the robot's path, and then communicate that information to the microcontroller. If there is an obstruction, the microcontroller will send a signal to the DC motors to halt all motion. In the future, the team plans on integrating a Liquid Crystal Display (LCD), where the robot will be able to clearly communicate with the user, developing the software necessary for the robot to travel autonomously, and designing a locking system to safely secure packages.

Team 18

Wearable Device Smart Shirt

Daniel Benjamin (ME), Hiba Iqbal (CE), Stephanie Matos (EE),
Ronald Mera (EE), Tawfiq Shamsudeen (ME), Jordane Thomas (CE)

Advisor: Dr. Damodaran Radhakrishnan
Co-Advisor: Dr. Ping-Chuan Wang

Abstract

Our goal is to develop a user interface that is more natural for people to use, this took us in the direction of wearable technologies. In the form of a wearable, the device is a smart shirt with integrated electronics. The shirt's primary function is to collect and respond to data. While advances in printed circuit board (PCB) technology have made it possible to put entire advanced computing systems into a shirt form factor. Other engineering constraints such as heat transfer and material science make it difficult to imbed a complete computing platform into a shirt without potential harm to the user. Therefore, integrating a two-part system consisting of a mobile application that serves as the primary visual interface, and heavy-duty computing device along with a smart shirt, will act as a sensor and actuator hub. The user's phone will effectively control the smart shirt. The shirt itself will be collecting and responding to data from body temperature and heart rate monitoring devices, posture correction feedback, vibration (motors) notifications which will also be used for vibration therapy for stress relief and posture adjustment. Communication between the smart shirt and smartphones will be via bluetooth and touch detection integrated into the shirt. The mobile app acts as both a visual interface for the wearable, and a brain for intense computation. Once worn, the integrated sensors will monitor and provide functionality to the user effortlessly while giving feedback. This information in the user's hands serves to help them maintain and keep track of their health. The functions the wearable brings plays a big role for the situation the world is currently in. With the current COVID-19 pandemic changing how everyone operates on a daily basis, this non-invasive device can be the start of something big.

Team 19

Automatic 3D Part Dispenser

Michael Orlando (ME), Christopher Reale (EE), Skyler Rubin (EE),
Steven Scribani (ME)

Advisor: Dr. Ghader Eftekhari
Stakeholder: Aaron Nelson (Hudson Valley Additive Manufacturing Center)

Abstract

In this project, a machine will dispense SUNY New Paltz students' 3D printed parts that are ordered and printed at the HVAMC (Hudson Valley Additive Manufacturing Center). It will ultimately be located and utilized in the lobby of the Engineering Innovation Hub. The dispenser will utilize a rotating carousel design to secure and rotate 3D printed parts to a locked door which will only be accessible to the correct student. The dispenser will require keypad entry of order numbers provided by the HVAMC database to retrieve the part from the locked door of the machine.

A scaled down version of the dispenser was created to demonstrate the intended function of the machine and how it interacted with the computer program and part database. A cubic frame was utilized to gain experience with material selection and manufacturing processes in order to better design the final machine. The program and stepper motor together allow for angular position control of the carousel and database tracking of active orders. A gear train was designed and related mechanical to electrical components, and the prototype will be further manipulated to achieve correct performance depending on the final components selected.

HUDSON VALLEY
ADDITIVE MANUFACTURING CENTER
at SUNY NEW PALTZ

Team 20

Mechanized Leveling Device

Austin Bartlett (ME), Damian Flash (ME), Julio Rebolledo (EE)

Advisor: Professor Ken Bird

Abstract

The mechanized leveling device seeks to provide safety to tools and equipment, such as a ladder. The design of the project is centered around a leg that will extend, using an actuator, until a level working surface is contacted. The design utilizes an I-beam structure as a leg to be extended out using an actuator that will be able to support a minimum of 250 lbs. A 12" Stroke 180 lb. Thrust Heavy Duty Linear Actuator was chosen because it meets the technical requirements, such as being able to hold 500 lbs. of static load and has three potentiometers to provide feedback to the microprocessor. The current leg design uses 3D printed with PLA components. This mechanism will be controlled using a microprocessor and a triple-axis accelerometer that will provide feedback telling when the extension leg (actuator) has achieved stability. For this project, a triple axis accelerometer will be used to provide feedback of where the device is in space to determine when the device has been leveled. All aspects of the design described above are of great importance as they form a system that will increase the safety of a variety of dangerous tools. This prototype learning will be used in Senior Design 2.

Notes:

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