Research Projects in the iMakerspace

Hunter Hinshaw- iMakerspace Manager

Tennessee TECH

iMakerTrack Research Project

Lead Member- McNally Lunn

Abstract

iMakerTrack serves as an online access point to the iMakerSpace that enables students to schedule their 3D prints in an organized queue system. The system facilitates uploading and storing .STL files provided by the students, organizing them by intent, and tracks their progress. Email alerts on the client side are sent at key phases of the process, to alert the user that their print has been received, and when it is available for pickup. Alerts are also generated on the administration side to let iMakerSpace workers know when print requests have been onboarded. The system also allows administrators to specify what stage the print is in, which printer is processing the request, whether it has been denied, or if it has encountered an error. Further, administrative notes can be logged so that workers at different hours are able to communicate notes with their colleagues.
We are able to generate usage reports from the system that dictate how many users make use of the system, how many files are uploaded, how many files are printed, errors vs success, and more. Google Analytics are engaged on the site to track locative and chronological usage.

References:
Currently, the system is being beta tested under the iCube Website at:
https://ttuicube.com/3dprint (Client Side)
https://ttuicube.com/iMakerSpace/Track (Administrator Side)

iMakerSpace
A Place to Make Your Ideas into Reality

CNC Machine Repair Project

Lead Student- Isaac Brewer

Abstract

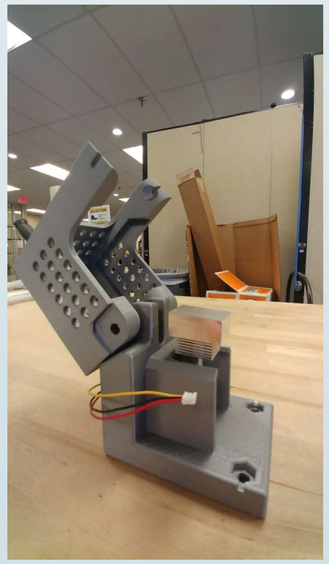
My name is Isaac Brewer. I was tasked with troubleshooting and repairing the ShopBot Desktop CNC Machine we have in the iMakerspace. I have had some experience with electronics but I had never worked with a CNC Machine before so this was a new challenge for me. I welcomed the opportunity and was excited to learn a new skill. To begin, I called the ShopBot technical support line for assistance. After some troubleshooting, the machine seemed to be working, however, with the help of ShopBot technical support, I discovered the entire motherboard needed to be replaced. After a few hours and many screws later, I finally had the broken motherboard uninstalled. Then Dr. Guo assisted me in obtaining a new motherboard, for which I am very grateful. I then installed the new motherboard into the machine and thus completed the repairs. The CNC Machine now just needs a software update and it will be ready to go. The IT Department will be helping to install the new software soon. Once that is completed, the CNC Machine will be up and running. I really enjoyed the opportunity to learn and am very grateful for the experience.

Filament Fusing Device

Lead Student- Warren Sims

Abstract

The purpose of the filament fuser research project was to research, design, build, and test a device that could fuse ends of 1.75mm filament together. The heat source for the current model of fuser is a adjustable soldering iron, while in future renditions an actual heating element controlled by a raspberry pi will be utilized. The two most critical aspects of the design are heat range and hole tolerance. The temperature of the fuser has to maintain a constant 215°C - 235°C for PLA and 230°C - 240°C for ABS. Additionally, the diameter of the hole must be 1.75 mm due to the low tolerances of the 3D printers. The team is excited to continue improving and finding new ways to utilize filament that would have otherwise possibly gone unused.



Machine Learning Research

Lead Student- Anthony Palmer

Abstract

As the Internet of Things (IoT) continues to evolve, the need arises to keep a constant eye on the integrity of the specific implementation to ensure that everything is running as it should. This is especially true in the industrial sector. To fill this need, Machine Health Monitoring (MHM) was created. The primary goal of MHM is to ensure that all devices within an Industrial IoT (IIoT) implementation are functioning as expected at all times. For our specific usage of MHM, we are monitoring various readings from a 3D printer. We have currently implemented an array of sensors, and a live camera feed, with an accelerometer and a power meter soon to come. We have also created a web server running off of a Raspberry Pi 3 to hold our database and provide accessibility to the data. Through this setup, a user could access our storage and view up to the last 60 readings from the sensors in real time. The user can also view the live camera feed. We plan to use that range to implement fault detection with an alert system. We also look to eventually add predictive AI in an attempt to prevent faults before they occur. We believe our implementation provides a more cost effective and scalable architecture for MHM. It also provides large amounts of customizability and adaptability due to our usage of generalized sensor data inputs and storage. The system is also self-monitoring, providing proper detection of its own internal issues.