

Thesis Project Portfolio

Conversion of Manual PM-727V Milling Machine to CNC

(Technical Report)

Protection for 3D Files

(STS Research Paper)

An Undergraduate Thesis

Presented to the Faculty of the School of Engineering and Applied Science
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Bachelor of Science, School of Engineering

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Sociotechnical Synthesis

Modeling, design, and production for 3D objects have become increasingly easy and commonplace as technology has rapidly progressed through the years, especially within the early 2000s. Computer Aided Design (CAD) is the most commonly used software to design 3D objects and saving them into various files. Using the 3D files, one can produce the actual part through many ways, but the primary two are 3D printing and Computer Numerical Control (CNC) milling. The files can simply be dropped into whichever machine and they will be either automatically printed using some sort of plastic or they will be automatically milled out of a metal or wood block.

My technical project consisted of my group and I converting a manual PM-727V milling machine to an automatic CNC machine. This would alter the machine so that the user would not need to control the X, Y, and Z axes using only his hands to turn the wheels to adjust them. Once finished, the user could simply insert their 3D file, adjust a few settings on a computer screen, and click go and their 3D object would then be automatically milled out without them having to touch a thing after pressing go.

My STS thesis looked at the ethical and legal issues with wrongfully obtaining, distributing, or selling 3D files online. At one point in time, before computers, all 3D drawings were done via pen and paper. However, computers have made the whole system revolving around 3D drawings very easy and accessible. While of course this means actually creating and designing the files themselves, it also means that downloading, sharing, and publishing them have very little obstacles now too. Since technology has progressed so rapidly, the US legal system has not been able to keep up in this field and there is little to no protection of original 3D files. Most similar to pirating music and movies online, some people wrongfully steal files,

while others pay for them and distribute them to others for free, except there is even less protection for 3D files than there is for music and movies.

Unfortunately, my group and I were unable to finish our technical project due to time constraints. We underestimated the amount of time the whole project would take, so we were only able to get motors on the Y axis and did not allot enough time to finish the X and Z axes. With my STS thesis, I concluded that the best solution to go about protecting individual's files and hard work, while still allowing a free flow of thought and information, was to create stricter and more protective copyright laws to protect these files.

Finally, I would like to thank Dr. Gavin Garner for helping my group and me work through our technical project and I want to thank Dr. Sean Ferguson for helping me tremendously with my STS thesis. Also, I would like to thank capstone group for spending countless hours on the PM-727V.