CPTR309 – Software Engineering

**3DSim Assignment**

**Statement of Problem**

3DSim Solutions Inc. has created the hardware for a 3D SLA printer, but they have no software to run it. Your job is to make the printer fully operational by implementing both the host (desktop software) and firmware (printer software) components of the printer. A detailed printer specification is available on eClass (see 3DSim Datasheet).

**Requirements**

Users should be able to choose a GCODE file from disk and fully print the model on the printer. This means that you will need to control every aspect of both the host-side and firmware-side functionality. The host must query and display the firmware version on the main menu. The sample F-35\_Corrected model must print in under 100 seconds from the time that the build plate descends from the limit switch until the time that it returns to the limit switch.

The software development process must be well documented and include a requirements specification, architectural diagrams, UML and other design drawings as needed, a test plan, and final test results.

**Visual Studio Project**

You will need to install Visual Studio 2017 on your computer for development purposes.

The 3DSim directory (from eClass) has 3 sub-directories:

**3DPrinterSim** – This is the main solution/host-side project directory. It has a file called Program.cs that has the beginnings of the host software component. This file should be modified to contain your code, but do not change the thread start-up code for firmware and hardware. All communication with the printer from this host-side component MUST take place ONLY through the WriteSerialToFirmware and ReadSerialFromFirmware APIs.

**Firmware** – This directory contains the firmware DLL source. You should use the code in **Firmware**.**cs** as a basis for your firmware-side solution. This project already references the Hardware.dll which contains the low-level APIs described in the printer’s datasheet.

**SampleSTLs** – In this directory you will find sample STL and GCODE files that you can print. It will contains the **F-35\_Corrected.gcode** file, at a minimum.

**GCODE**

GCODE is used to specify the movements of the 3D printer that are needed to re-create the given model, layer by layer. It is in ASCII text format and can be viewed in most editors. For our printer we use RepRap GCODE. This GCODE is designed for extrusion printers and our is an SLA printer, but we can still get the information that we need from it.

The GCODE is grouped by layers. All of the first layer commands are drawn first, then the second layer, etc. Between each layer you will find a G1 Z command (eg. G1 Z0.500 F7800.000). This is used to set the next Z layer height (Z is the up/down axis). The height is in millimeters. You can ignore the “F” part of this command.

The only other command that you need to implement in the GCODE is the G1 X Y E command (eg. G1 X-4.800 Y13.265 E4.54639). The X and Y coordinates are in millimeters and assume that the center of the build plate is 0,0. The “E” part of the command is how much filament to extrude. Since our printer is an SLA printer and does not have “extrusion” we simply use this part of the G1 command to control our laser. If E is non-zero then the laser should be on. If it is zero, the laser should be off.