Creating a Spherical 3D Printer

Lee, Jay

The purpose of “Creating A Spherical 3D Printer” was to create an additive manufacturing device based on Spherical coordinates. Most current 3D printers are based on Cartesian coordinates. A Spherical coordinate-based 3D printer does not exist. A threaded rod controls rho by raising and lowering an extruder. Two oppositely positioned support bars are rotated by a stepper motor to control theta. A build rod is rotated by a stepper motor to control phi. These components are controlled by an Arduino Mega 2560 with an attached RAMPS 1.4. During prototype development, design modifications were made. For rho, a threaded rod and tube were substituted for a belt system for raising and lowering the extruder. Movement of theta was assisted by a counterweight with a second support bar and a bearing added for stability. Phi was controlled by a rotating bar rather than a semicircular track. The project was successful in creating hardware for a Spherical coordinate-based 3D printer. Open source programs were modified to control the stepper motors and extruder. Objects were printed manually, as software automation was beyond the scope of this experiment. Further extensions of this project include creating software to control the Spherical 3D printer and to convert a CAD designed object to a Spherical coordinate- based stereolithography file. Using Spherical rather than Cartesian coordinates reinvents many aspects of the 3D printer, in both hardware and software.

Awards Won: