Designing a Scalable 3D Printer with a Novel Elevation System

Johnson, Liam

This project developed a scalable, low cost FFF 3D printer with a unique leveling system. The bed is coupled with an elevator, forming the Z axis. The printer consists of four identical walls, each with its own set of rails and elevator slide. Together the walls and slides form the complete elevator shaft and the elevator upon which the bed is mounted. A lid houses a gantry and carriage which together form the X and Y axes. The printer is controlled using modified Core XY software, which is installed on a Smoothiboard. The axes are driven by Nema 23 stepper motors, and the entire printer frame can be milled from plywood or a comparable material. The elevator slides and bed are leveled using a method called octagonal bed leveling, which uses a system of cables and tuners to adjust 8 different point along the bed. The leveling system is designed to produce high quality prints by combatting the instability attributed to construction materials such as plywood. Upon completion of the design, two prototypes were constructed at different scales. The initial prototype had a 450 mm by 450 mm by 610 mm printing area, and the later prototype had a 563 mm by 563 mm by 763 mm printing area. The prototypes were then calibrated and tested for both accuracy and speed. Results were optimal as the machine was accurate to 0.6 mm, with a discrepancy error of 0.075%.

Awards Won:

Raytheon Technologies Corporation: Each winning project will receive $3,000 in shares of UTC common stock.