Getting Them Back on Their Feet: 3D Printing a Prosthetic Foot

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My project was designed to create a low-cost, easily manufactured, water durable, natural gait prosthetic foot. Some prosthetic feet cost $14,000 USD, and it’s too expensive for amputees in developing countries. There are already two low cost feet available, but neither can pass the ISO10328 test, another goal for my foot. I used a desktop 3D printer and free CAD/CAM software to design and build a prosthetic foot of ABS plastic. My first design was made to follow the contours of a natural foot, but collapsed during printing. My second design was made to imitate rocker bottom shoes. This design printed successfully. I redesigned multiple times during testing. During ISO 10328 testing, the foot withstood 265 Lbs. of pressure at 0 degrees and 175 lbs at 15 degrees on the toe. This does not meet the standard, but it is a strong start. Submersion in water showed that the foot is safe for use if allowed a drying period, since it absorbed water, and then lost it again. Gait tests showed that a used bicycle tread on the foot creates a more natural gait. I determined the coefficient of friction of the treaded foot on mud and dirt, and showed that the treaded foot has the same coefficient of friction as a tire on dry pavement. After 22 prints and 8 redesigns, my foot did not pass ISO10328, it did pass the gait, traction and water durability test.

Awards Won: