

Low-Cost Electronically-Controlled Prostheses for Transfemoral Amputees

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Abstract

There is a large performance gap between low-cost, mechanical prostheses and expensive, electronically-controlled prostheses for transfemoral amputees. A low-cost option with better performance is needed and it should mimic able-bodied gait in order to reduce the metabolic cost to the amputee and to mitigate discrimination that amputees may face. The most critical component of the transfemoral prosthesis is the design of the knee mechanism. The current design is an improvement upon a previous knee design created at MIT by Murthy Arelekatti and Amos Winter. This new design addressed issues identified through user testing in India. The improved design removes the reliance on friction pad damping, reduces backlash, and improves the kinematics of the knee. These improvements were accomplished while focusing on creating early-stance flexion, and improving stance stability and swing-phase control. The final prosthesis includes a modular early stance flexion component, a mechanical latch with a virtual axis, and a hydraulic rotary system within a compact design.