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Prosthetic Knee for CURE Kenya

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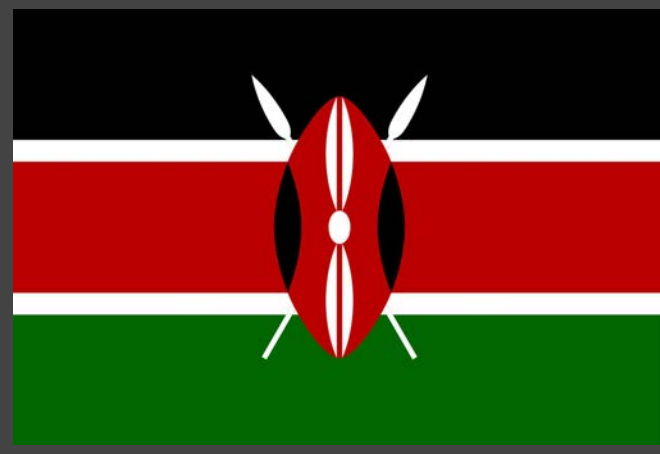
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Prosthetic Knee for CURE Kenya



2021 School of Science,
Engineering and Health
Symposium

Ike Bryner, Sarah Kelchner,
Carter Urich

Introduction & Problem Statement

Partner: CURE Kenya Orthopedic Hospital in Kijabe, Kenya

- There are many lower-limb amputees in the region due to infection and disease
- Through-knee prostheses are very expensive (\$2,500 USD)
- Through-knee amputees often undergo a more invasive trans-femoral surgery out of financial necessity
- There is a great need for affordable through-knee prostheses



Group Mission

This project aims to serve individuals with lower-limb amputations by providing a knee-disarticulation prosthesis that is fully functional, low cost, aesthetically pleasing, and locally manufacturable.



Pictured from left to right: Kay Laura Sindabizera, Ike Bryner, Sarah Kelchner, Nate Jaloszynski, Sam Burgess, Josiah Moyer, Carter Urich

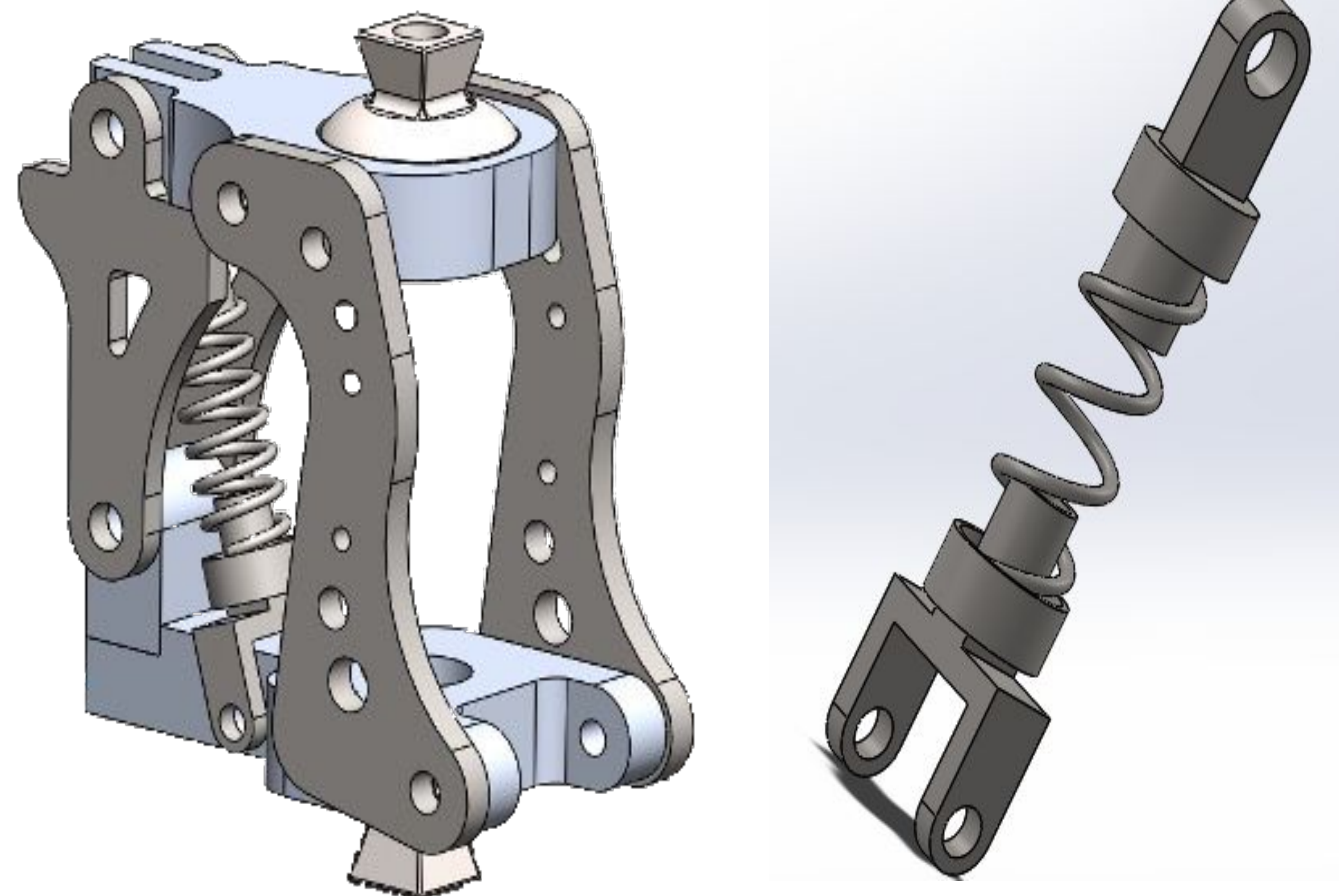
Prosthetic Knee Design

Our design features:

- Polycentric four bar linkage design
- Spring-based passive damping mechanism
- Strategic proportioning to minimize thigh lengthening and closely imitate anatomical knee
- Weight-reducing features

Our damping mechanism features:

- Spring-loaded design validated by SOLIDWORKS motion analysis
- Sleek, seamless integration into interior of knee
- Source of potential energy buildup to hold knee in extended position



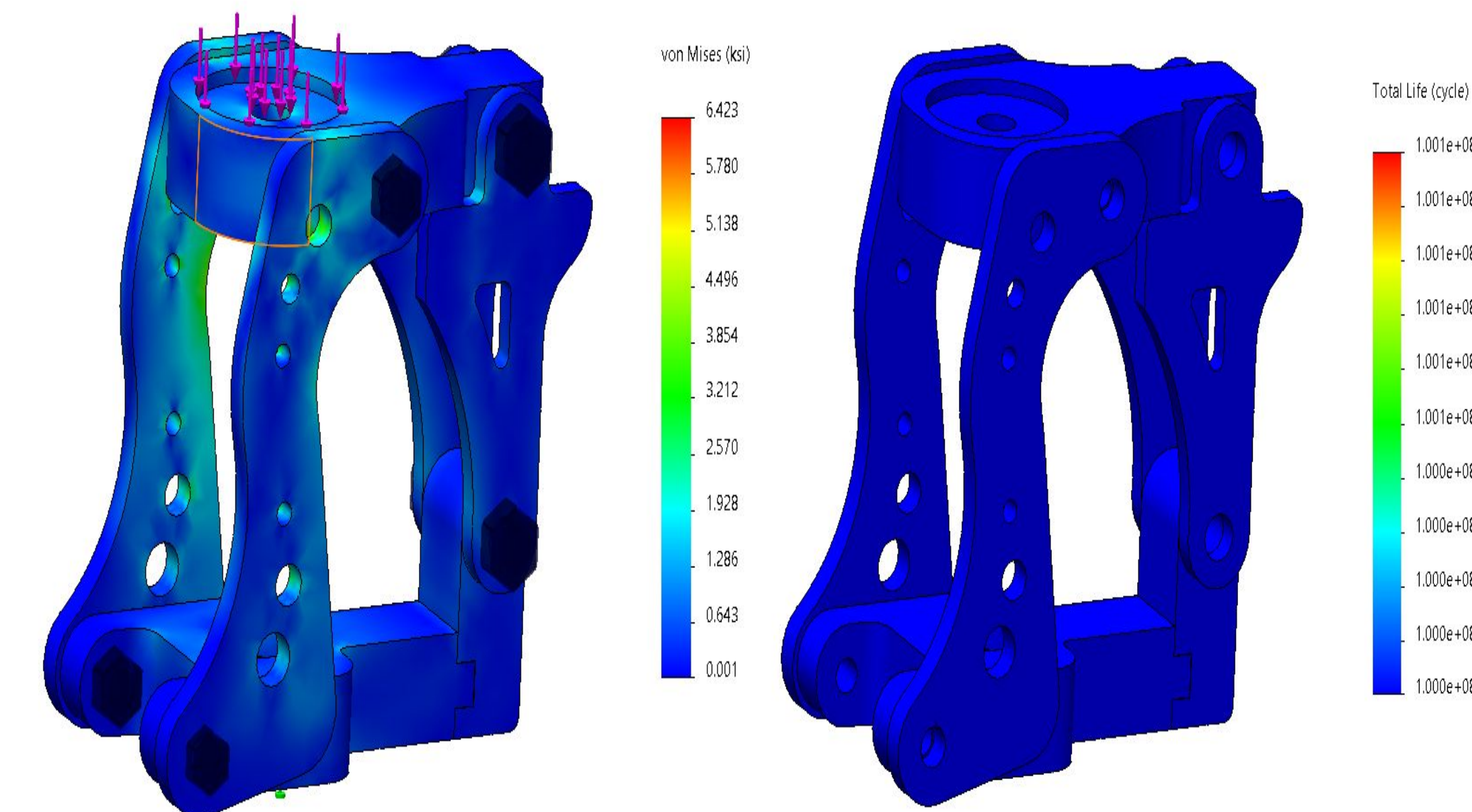
Progress on Manufacturing

We have begun the manufacturing a metal prototype of the main body of the knee.

- The top and bottom platform components will be made of aluminum in the CNC milling machine
- The side bars will be made of stainless steel in the plasma cutter

Initial Testing

We completed SOLIDWORKS static and fatigue testing (below left and right, respectively) on the body of the knee:



The design exhibited sufficient static and fatigue strength to undergo 4 years of cyclic loading with minimal stress concentrations.

Conclusion and Future Plans

We are currently manufacturing a physical prototype and will begin physical testing on the metal prototype next semester. We aim to deliver a functional knee with a manufacturing protocol by May 2022.

Acknowledgments

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- Sam Burgess, Kay Sindabizera, Josiah Moyer - Team Members
- Dr. Jamie Williams - Project Manager and Consultant
- Dr. Emily Farrar - Project Founder and Consultant
- Eric Shoemaker (MS, CPO) - Professional Consultant
- Tim Howell - Project Consultant
- John Meyer - Manufacturing Consultant



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