Context

Prosthetic design and fit is key for amputee's comfort, an uncomfortable prosthesis can lead to health issues and pain. Socket fit is affected by stump volume changes over time, changes in contact pressure and rubbing skin.

Research gap

there is a lack of quantitative data on stump pressure distribution and its variations over time, which could greatly benefit prosthetists, doctors, and designers to make decisions with the goal of improving patient comfort.

Towards user comfort with knowledge based design: integration of sensor system in a smart prosthetic socket

Research approach

This study explores the use of Force Sensitive Resistors (FSRs) to measure and visualize stump pressure distribution. The research involves testing an experimental prototype equipped with FSRs on a cyclic loading machine, followed by a comparison of the results with a simulation**.**

Results

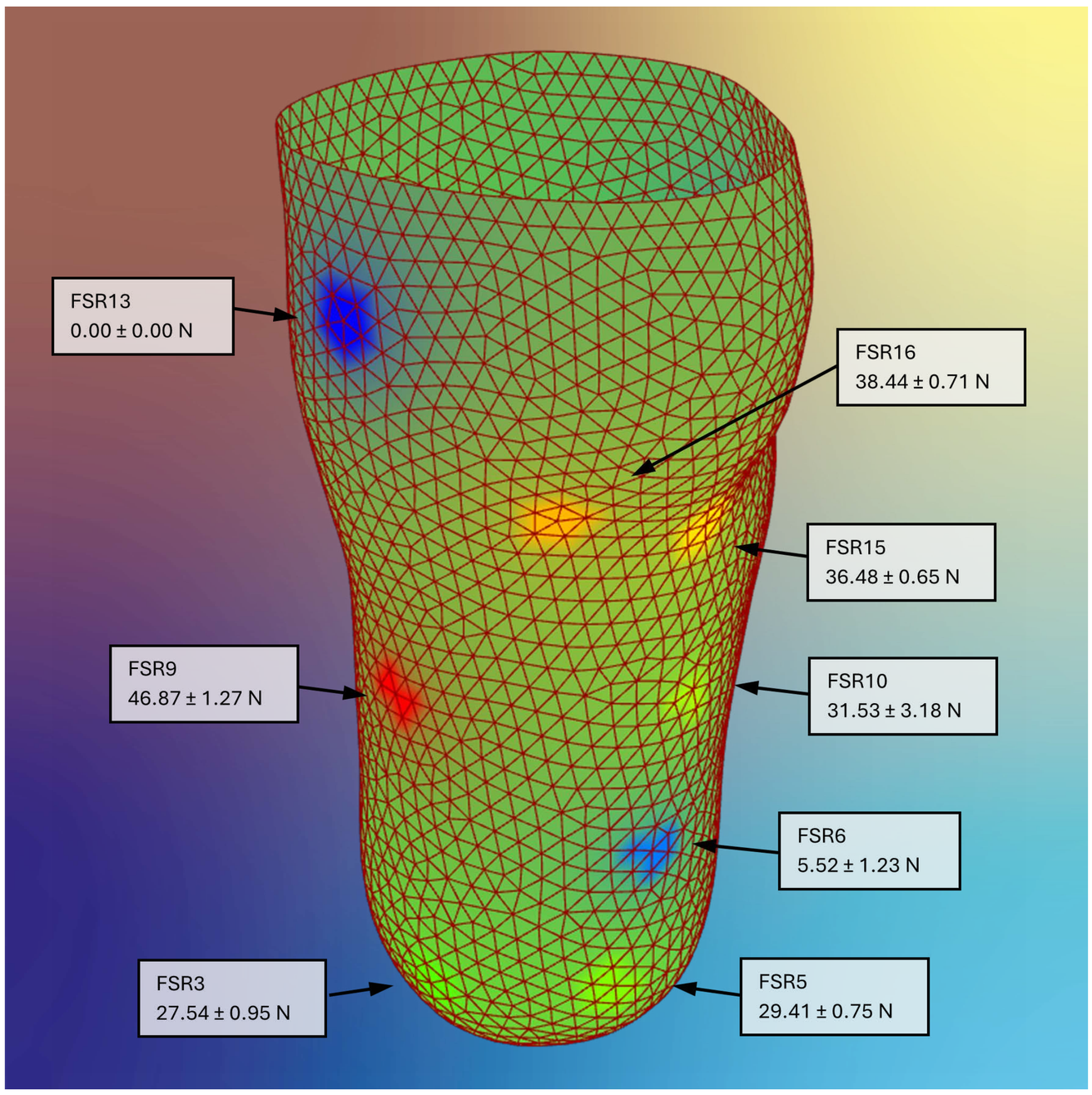
The findings indicate that the highest loads are registered by FSRs positioned at the bottom of the stump and below the knee. Some anomalies were observed, potentially due to specific geometric features of the prototype and the way the load was applied during testing.

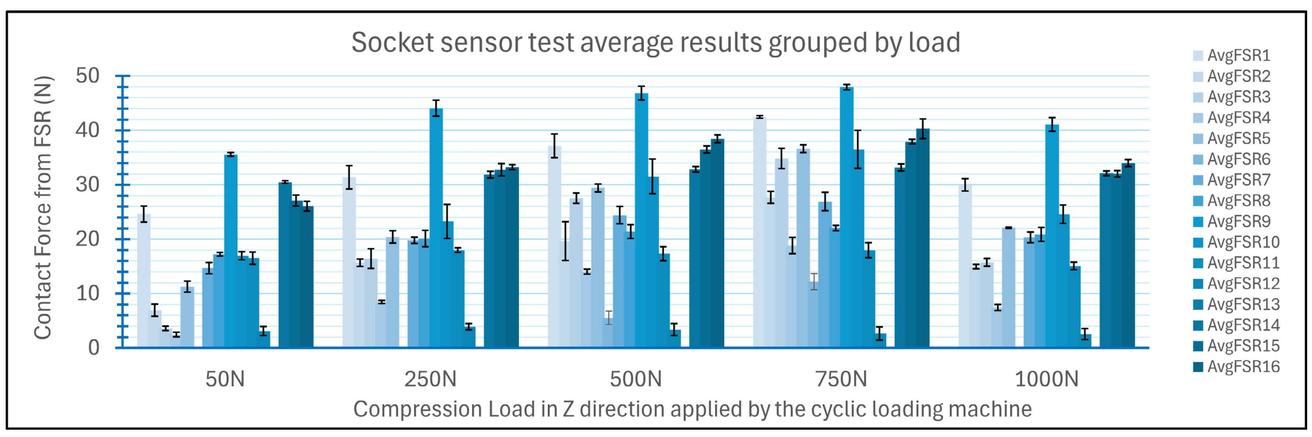
Discussion

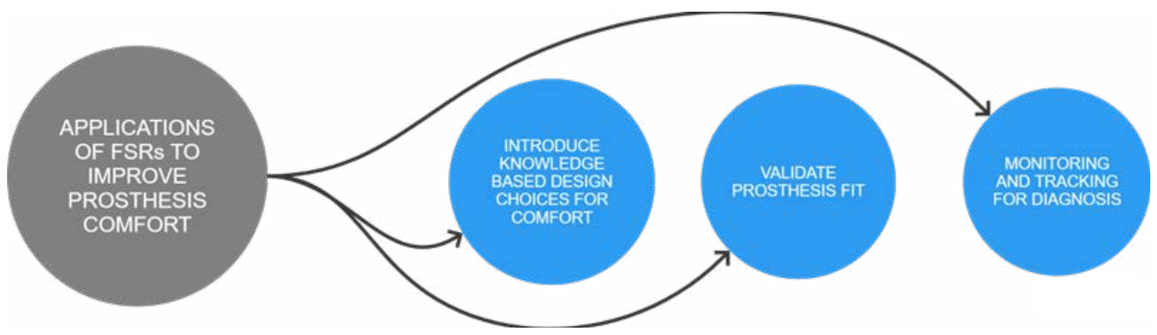
Overall, the experimental data suggests that FSRs are effective for measuring stump pressure distribution. However, further testing with increasingly complex load cases is necessary to validate the sensors' reliability holistically.

Conclusion

In conclusion, FSRs demonstrate significant potential for enabling knowledge-based designs focused on patient comfort. Through the course of this project, valuable design insights and requirements for integrating sensors into prosthetic sockets were identified. Moreover, this systematic sensor testing approach can be applied to explore and compare results between other pressure sensors.







Santiago Andújar Arias
Towards improved user comfort with knowledge based design
21st of August, 2024
MSc Integrated Product Design

Committee
Dr. Wolf Song (chair)
Ir. Vahid Moosabeiki (mentor)
Dr. Mohammad Mirzaali (mentor)

TU Delft