The new superelement formulation is validated using static and dynamic benchmark problems with beams. By comparing the simulation results to results obtained by commonly used software packages, accuracy of the new method is proven.

A body’s linear finite element model is reused to describe its flexible behaviour in a floating frame formulation, saving time when making the multibody model. Model order reduction is used to reduce the finite element model to the interface points using Craig-Bampton modes. The floating frame coordinates and local interface coordinates are expressed in terms of the absolute interface coordinates. No Lagrange multipliers are required for the constraints.

**PROSTHETIC FLEXURE-BASED FINGER JOINT**

**IMPROVEMENTS**

Flexure-based finger joints for prosthetic hands have been studied, but until now they lack stiffness and load capacity. Three design considerations which increase grasp force and limit the stress values are presented. Finally, the entire joint is rotated by 20° so the combination of actuation and contact forces leads to mainly axial forces in the curved leaf springs, avoiding excessive internal bending.

**Inverted flexure attachment**

Due to the inverted joint, the flexures are loaded in tension (right) instead of in compression (left) when actuation forces are applied.

**Triangular torsional reinforcements**

To achieve high torsional loads, one of the flexures is outfitted with triangular torsional reinforcements, while only slightly increasing actuation stiffness.

**Curved cross hinge**

Deflection in compliant direction will result in one of the leaf springs straightening out, which improves the load capacity at large deflections.

**CONCLUSION**

The presented prosthetic flexure-based finger joint is able to achieve 20N of contact force with an additional 5N out-of-plane load over the entire 80° range of motion, which is a major improvement over existing prosthetic flexure-based finger designs.

Based on contribution:
Inverted curved flexure hinge with torsional reinforcement in a printed prosthetic finger
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