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Designing Planar, Shape-Changing Rigid Body Mechanisms for Profiles with Significant Differences in Arc Length

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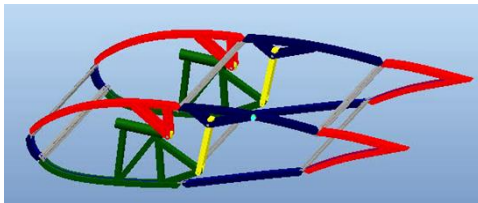
SHAMSUL ANUAR SHAMSUDIN

ADVISOR: DREW MURRAY, Ph.D.

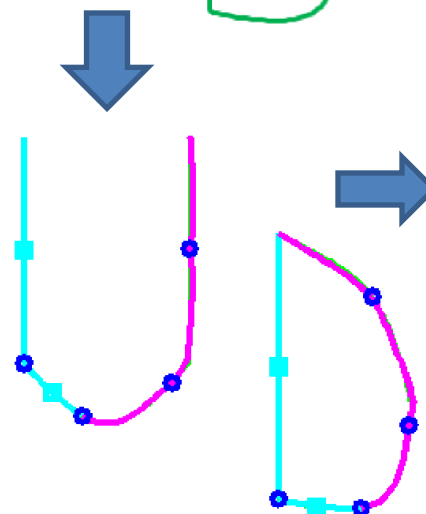
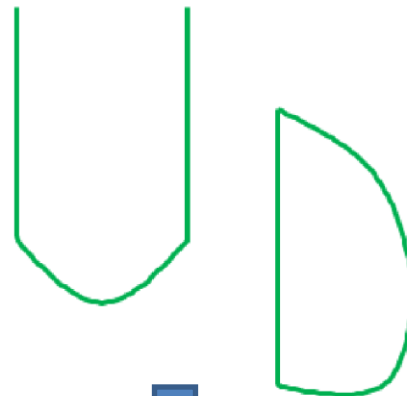
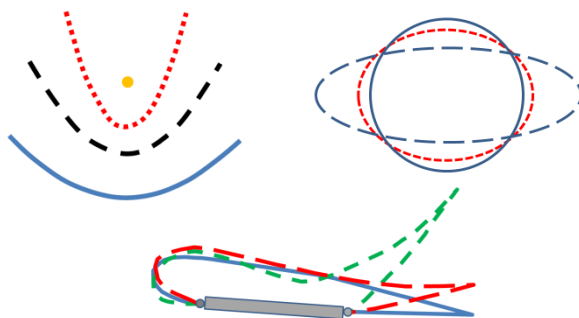
Research Objective: To modify the synthesis theory to address shape-change where significant differences in arc length motivate the problem.

Applications

- Automotive spoilers
- Morphing airfoils
- Active aperture antennas
- Active solar trough
- Deformable mirrors
- Dynamic artwork
- Compliant robotic gripper
- Extrusion dies.

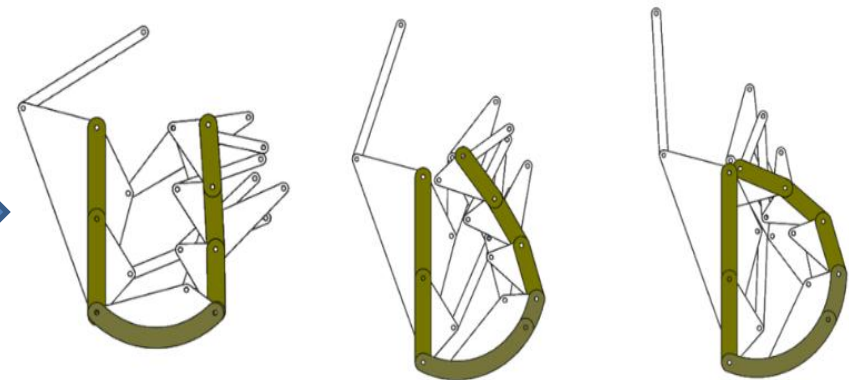


Types of Profiles



Methodology

1. Target Profiles: Create edge-geometry profile curves that have uniform piece length. They are shapes that a machine 's edge or surface will approximate.
2. Segmentation: Divide the profiles into sections and create rigid-body segments. Then form a chain of these segments connected by revolute (R) and prismatic (P) joints.
3. Mechanization: Synthesize the means for moving the chain of rigid-bodies.



Conclusions

A serial chain of rigid bodies connected by R and P joints is able to approximate design profiles of different lengths. This work redefines segmentation process.