RoSE: Software Architecture for DLO Manipulation: A Shape Manipulation Case Study

Manuel Zürn
Motivation
• Why focusing on research concerning deformable objects?
• Why presenting a software architecture?

Approach
• Problem formulation of shape manipulation
• Components and design of the software architecture

Evaluation
• Videos
• Conclusion
Potential for automation

Examples of intended use for DLOs

Electrical Sector

[1] [2] [3] [4]

[1] [2] [3] [4]

[5] [6] [7] [8]

[5] [6] [7] [8]

Automotive  Aviation  Switch Cabinet

Catheter insertion  Stitching  Surgery

Medical Sector

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Reason to present a software architecture

Paper evaluation by search term

306 papers related to deformable object manipulation

Research mostly focuses on components → **software architecture** can help in **modularization** and **comparison**
Shape manipulation
From problem formulation to a program flow chart
Software Architecture used for DLO manipulation

Three layer approach

**Decision Layer**
- Used for skill planning

**Skill Layer**
- Modularizing different skills

**Functional Layer**
- Hardware/Library abstraction

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Three layer software architecture
Evaluation
Skill verification and validation

Video
Evaluation
User defined shape validation
Conclusion and outlook

• Conclusion
  • Modularized layered approach allows for
    • Switching decision layers for different application scenarios
    • Switching specific algorithms for comparison
  • Interchangeable components, e.g. different simulation software

• Outlook
  • Comparison of different non-rigid-registration algorithms
  • Implement further skills, e.g. advanced task planning using predicted states of the deformable objects
Sources

Thank you!

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