

Human-Guided Robot Teams for Manipulating Large Flexible Sheets in Manufacturing Applications

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Motivation

- Advanced composites are critical to many industries
- Layup of prepreg sheets is one of the main processes for realizing composite parts with complex geometries
- Sheet layup process requires significant manual labor
- Sheet layup automation can reduce ergonomic challenges and increase process throughput

Goals

- Develop deliberative planning algorithms for collaborative manipulation by proactively accounting for interventions by controllers and humans during execution to handle contingencies
- Develop algorithms for monitoring of the task progress during the execution and initiating interventions to ensure that part is manufactured in a safe and efficient manner
- Integrate research results with manufacturing and robotics courses

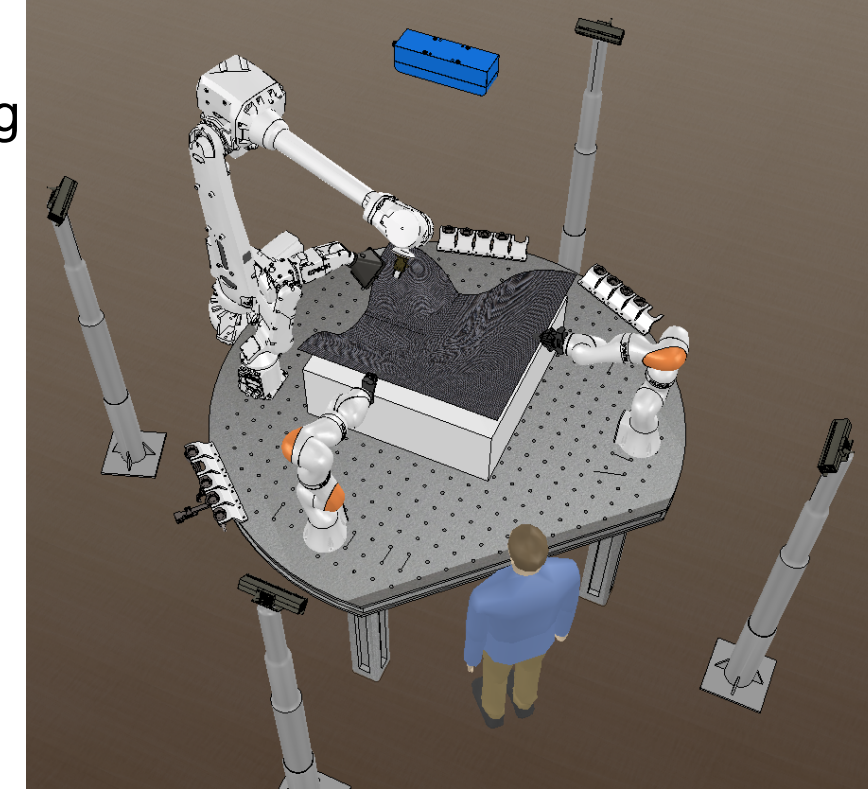


Illustration of a hybrid cell that can be used for composite sheet layup

Approach



Deliberative Planning for Collaborative Manipulation

- Coordinated State Space Search
- Human Guidance During Search
- Efficiently Solving Grasping Sequence Search
- Efficiently Determining Feasible Robot Placements

Execution Monitoring and Intervention Planning

- Fast and Accurate Automated Cell Calibration
- Preventing Defect Formation through Contingency Maneuvers
- Planning for Rework and Recovery from Errors
- Safe and Efficient Human Intervention during Execution

