NRI:FND: Collaborative Mobile Manufacturing in Uncertain Scenarios

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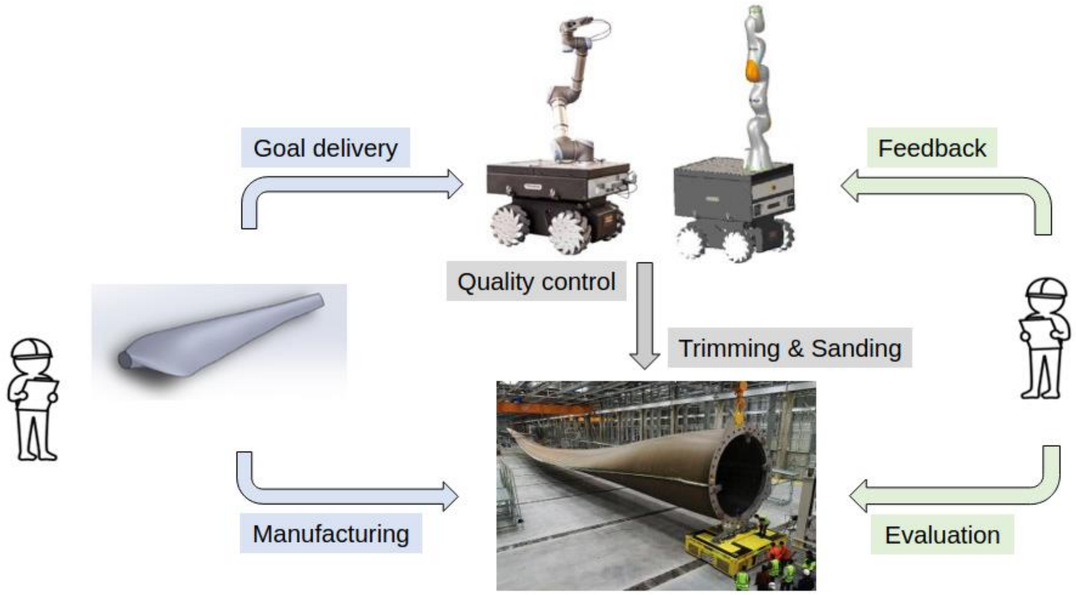
https://nri-cmmus-lsu.github.io/dist/index.html

NRI-CmmUS-LSU

Overview: This project develops a scalable, mobile, co-robotic system that leverages robot-robot collaboration with trained human supervisors for large-scale manufacturing applications, focusing on finishing operations for composite wind turbine blades.

Key challenges: Specific barriers hinder the automation of finishing processes: **(1)** final part shapes may vary from the planned geometry, **(2)** the nature and duration of the task vary from one part to the next, and **(3)** task completion is based on human judgment and experience.

Intellectual merit: The project is innovative in the areas of motion and interaction planning and control, perception for environment understanding, and cognition for task completion.

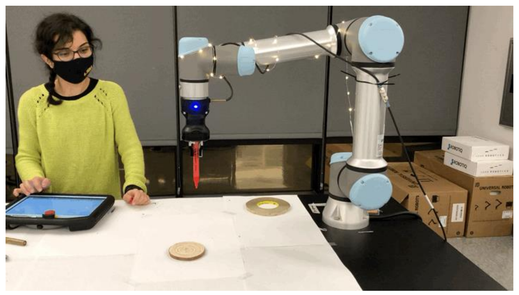


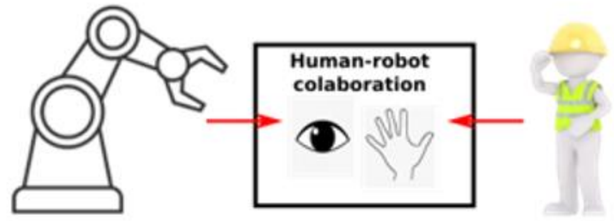
Research plan:

- An integrated control-planning strategy for multi-agent systems for motion and interaction tasks:
  - Leverages the control information into the planning strategy to produce situation-aware planning characteristics
  - Ensures safe behaviors in robotic-human environments.
- A local-based evaluation methodology for task completion using information gathered from robot understanding and human experience:
  - Combination of DNN algorithms and fiducial markers detection.
- A framework to harvest the aggregated perception capabilities of several mobile robots:
  - Enables efficient, dynamic, and real-time identification of critical surface features.
  - Uses RGBD and polarized imaging systems.

Broader Impacts:

- Proposed architecture applicable to large-scale manufacturing in other industries: transportation, aerospace, maritime, construction.
- Student training and development for job opportunities in robotics and next-generation composites manufacturing.
- **Outreach**: robotics summer camps, LSU STEM Pathway program, video demonstrations and wind turbine blades recycled into works of art





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