

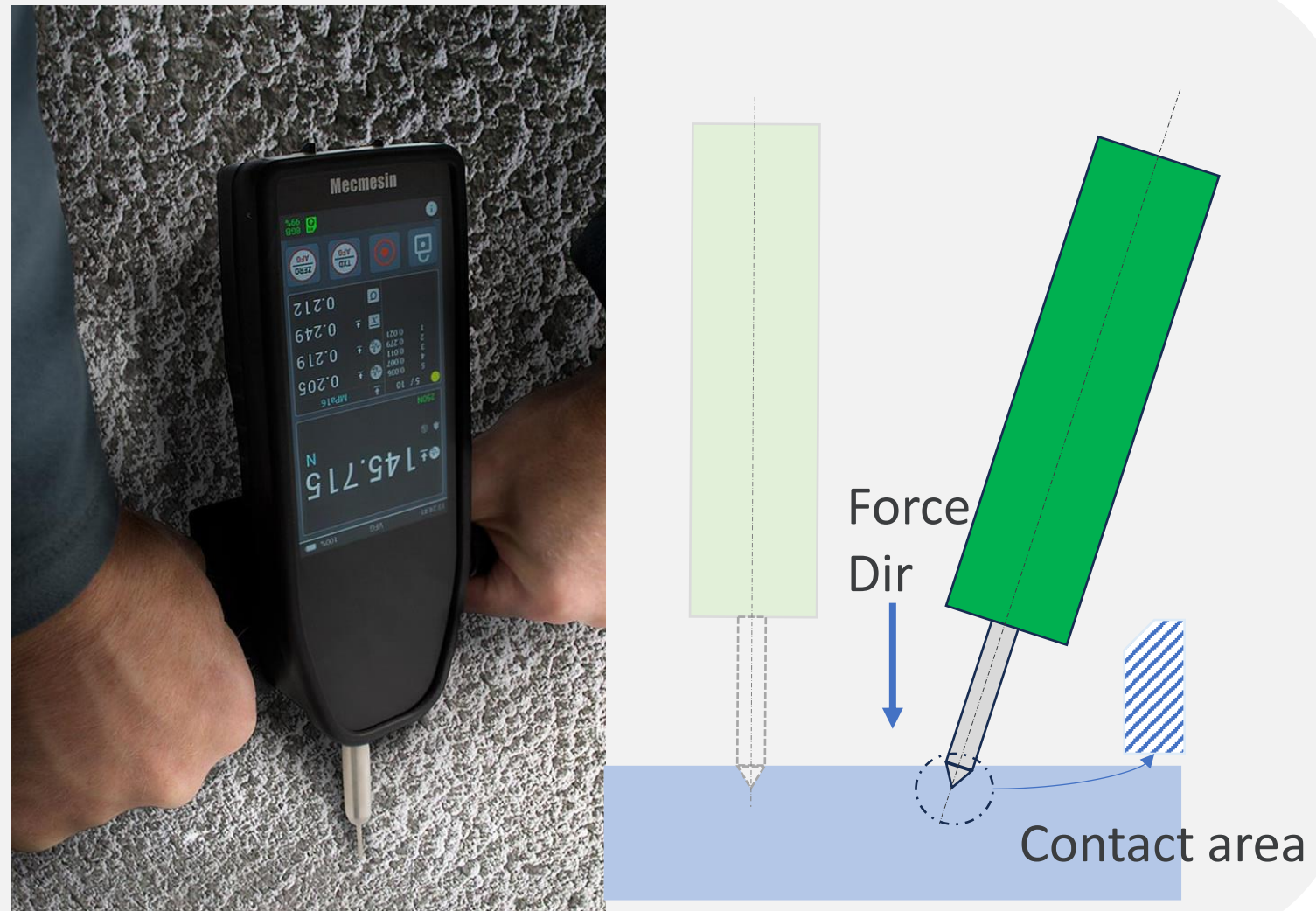


Brief Overview: Extrusion-based 3D concrete printing (3DCP) has emerged as a leading method in digital concrete fabrication. Given the time-dependent variability of concrete properties, a critical challenge is determining the optimal timing for milling after print. Traditionally, rheological measurements using a penetrometer are performed manually, which is time-consuming and susceptible to operator errors. This research aims to automate the inspection with a collaborative robots and vision-based slugs-test.

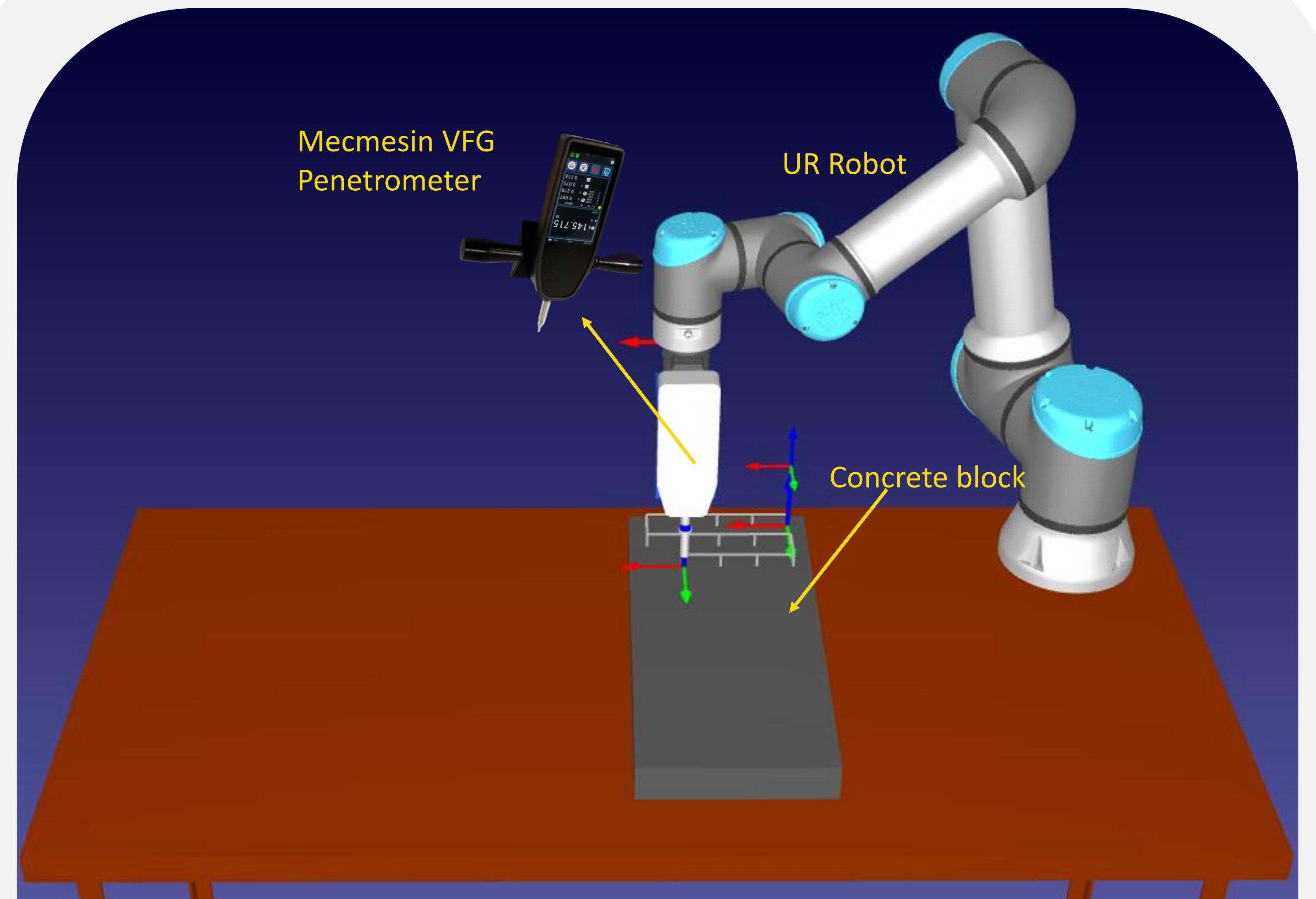
Human Factors Effecting Inspection:

- ✗ Misalignment Errors
- ✗ Uneven speed
- ✗ Inspection Time

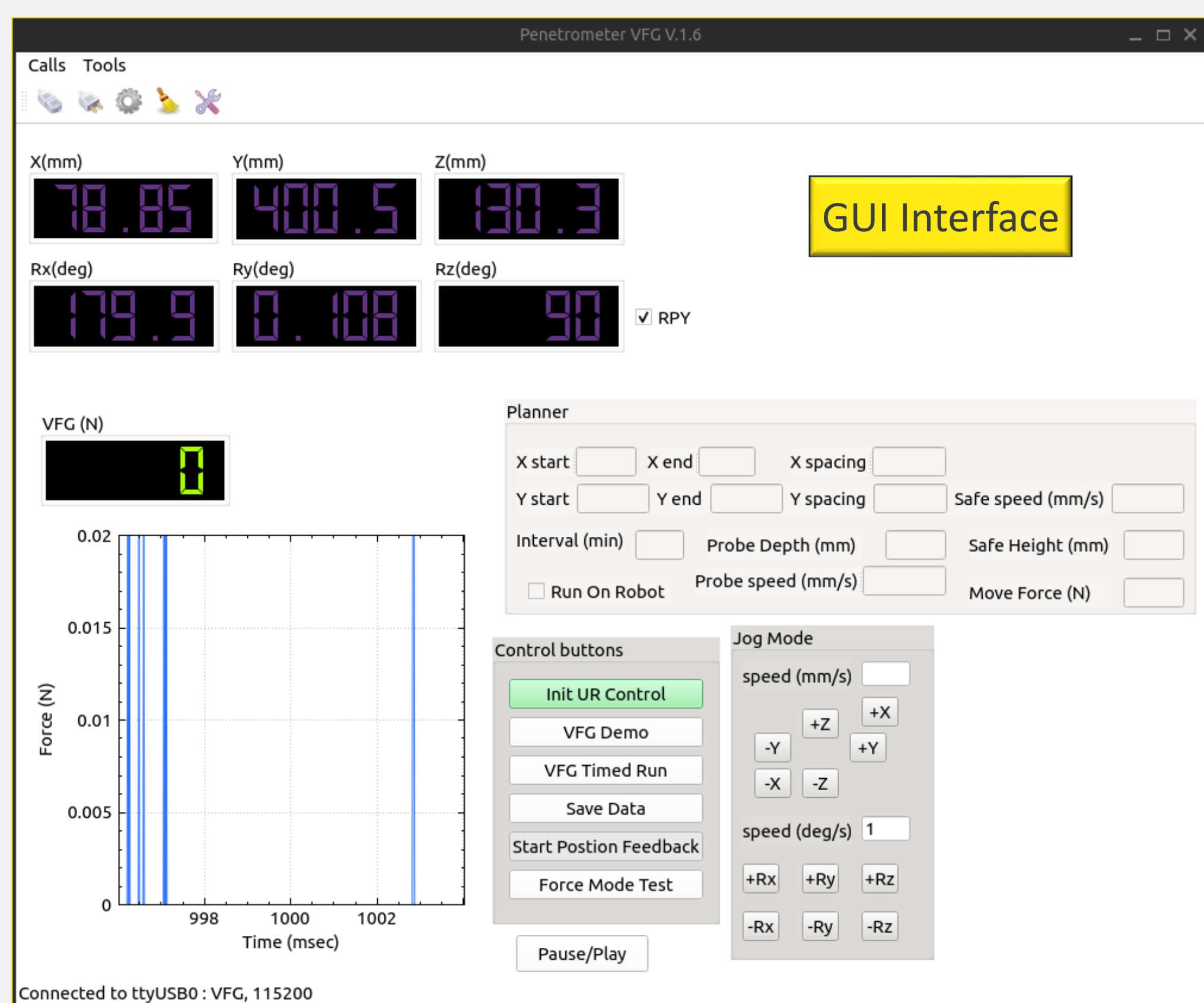
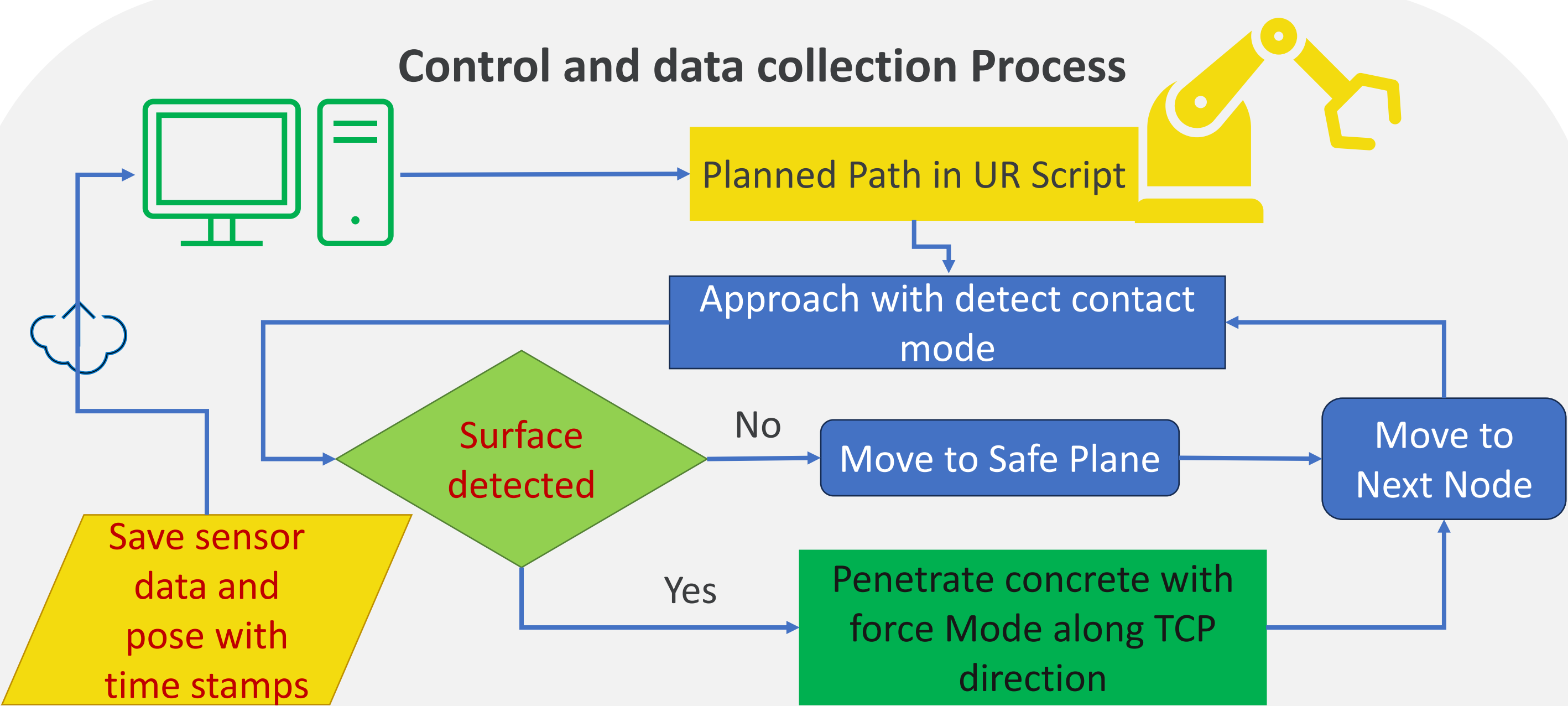
repeatability and reproducibility ?!



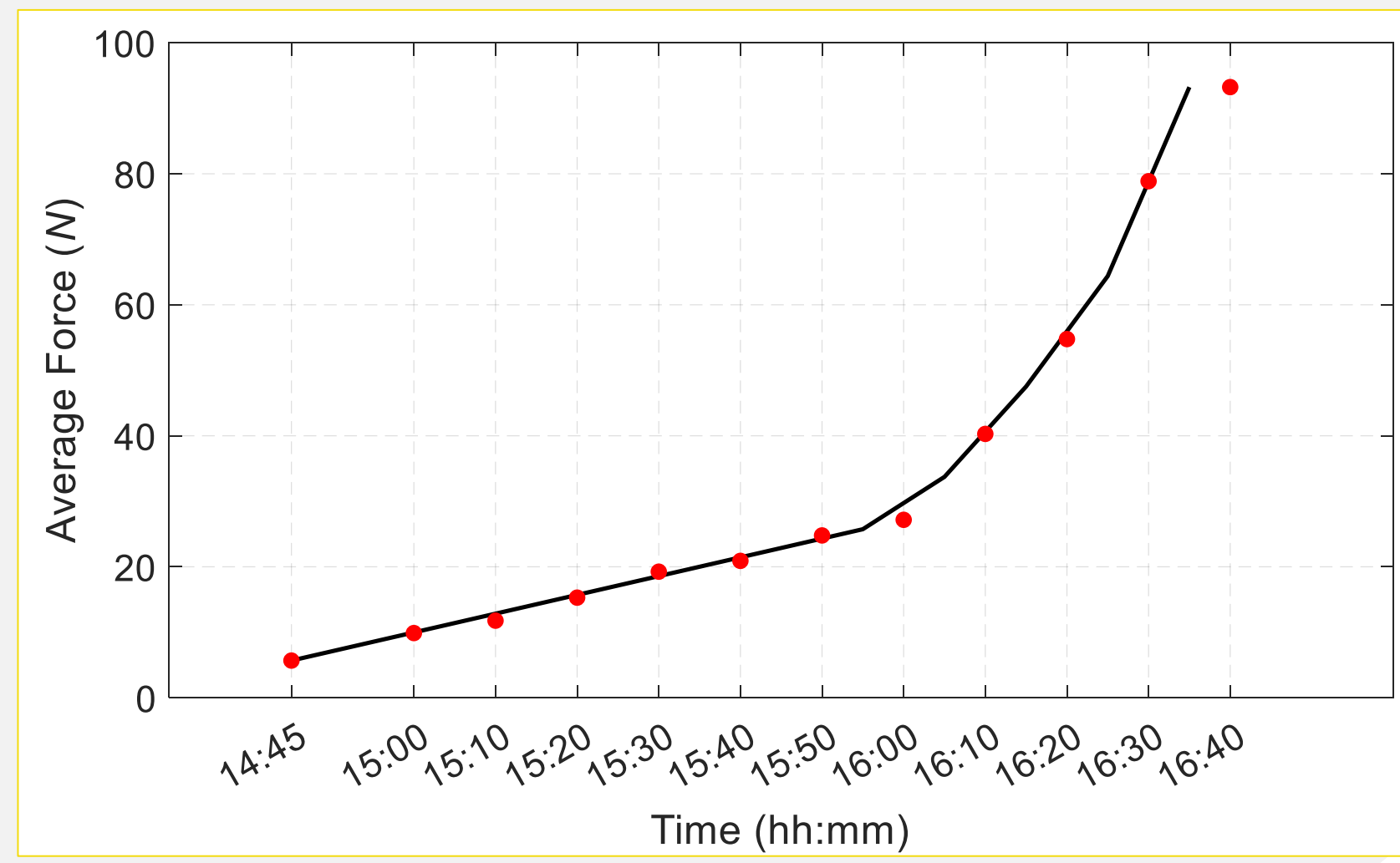
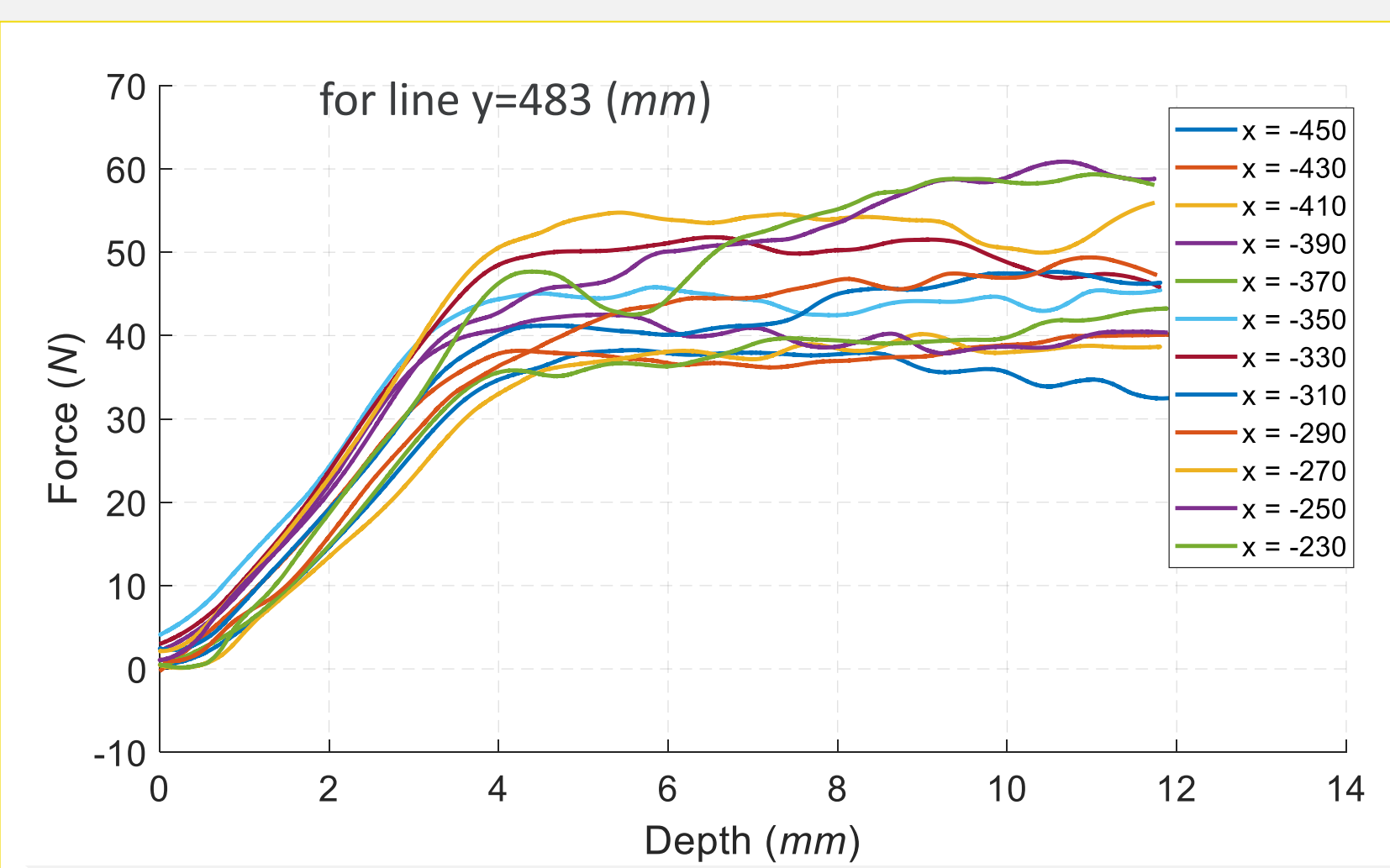
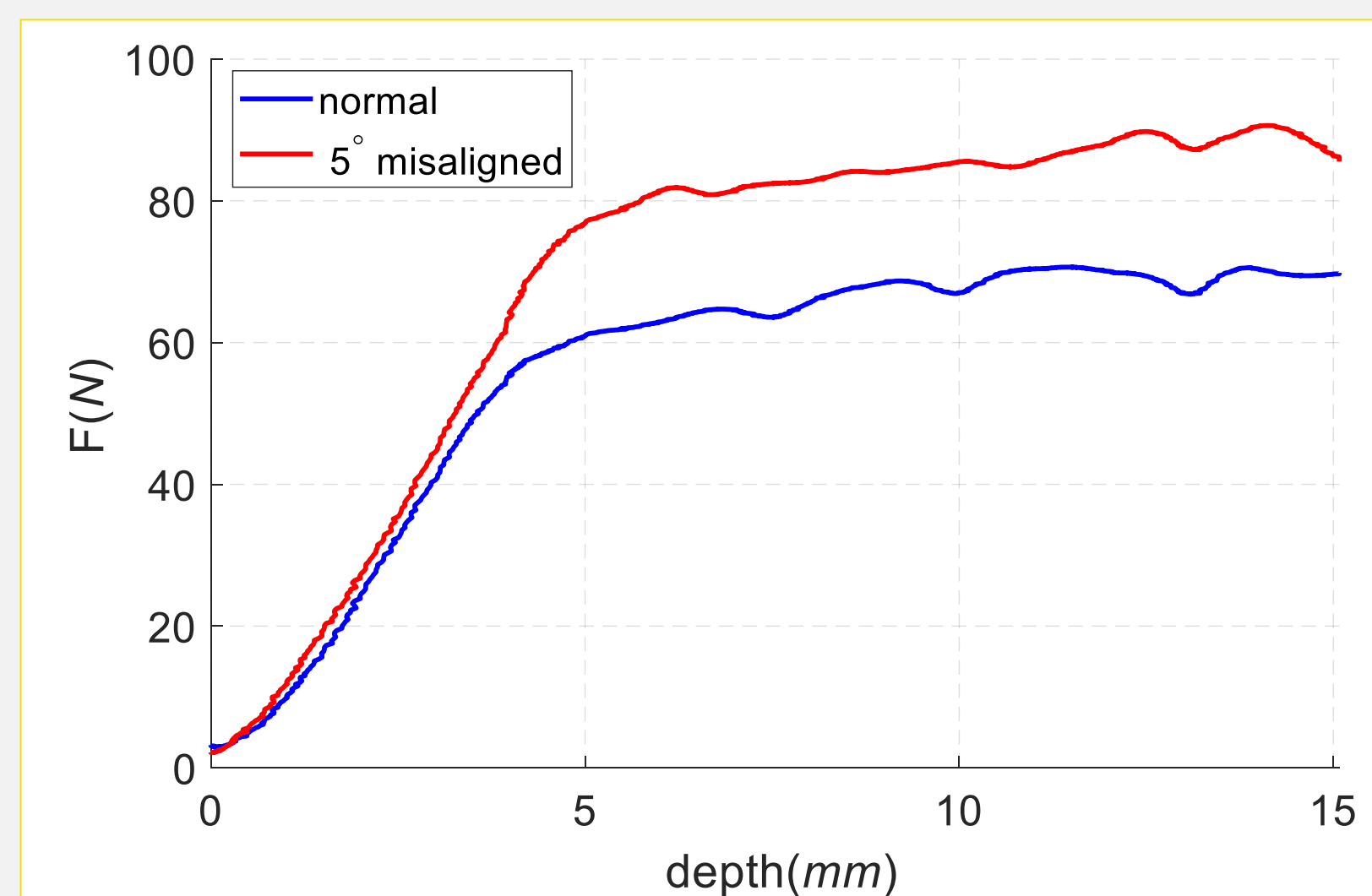
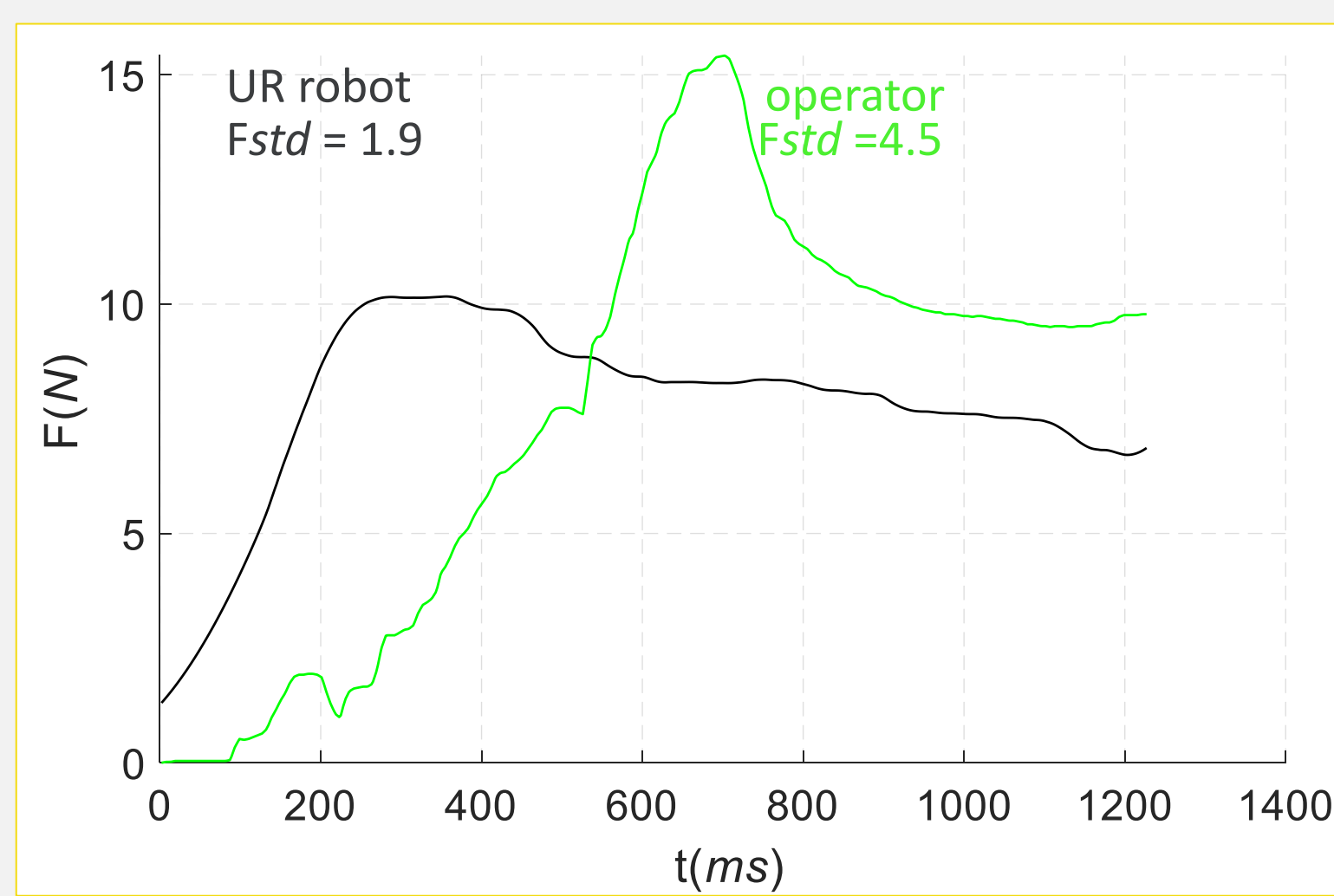
Process Simulation and Experimental Setup



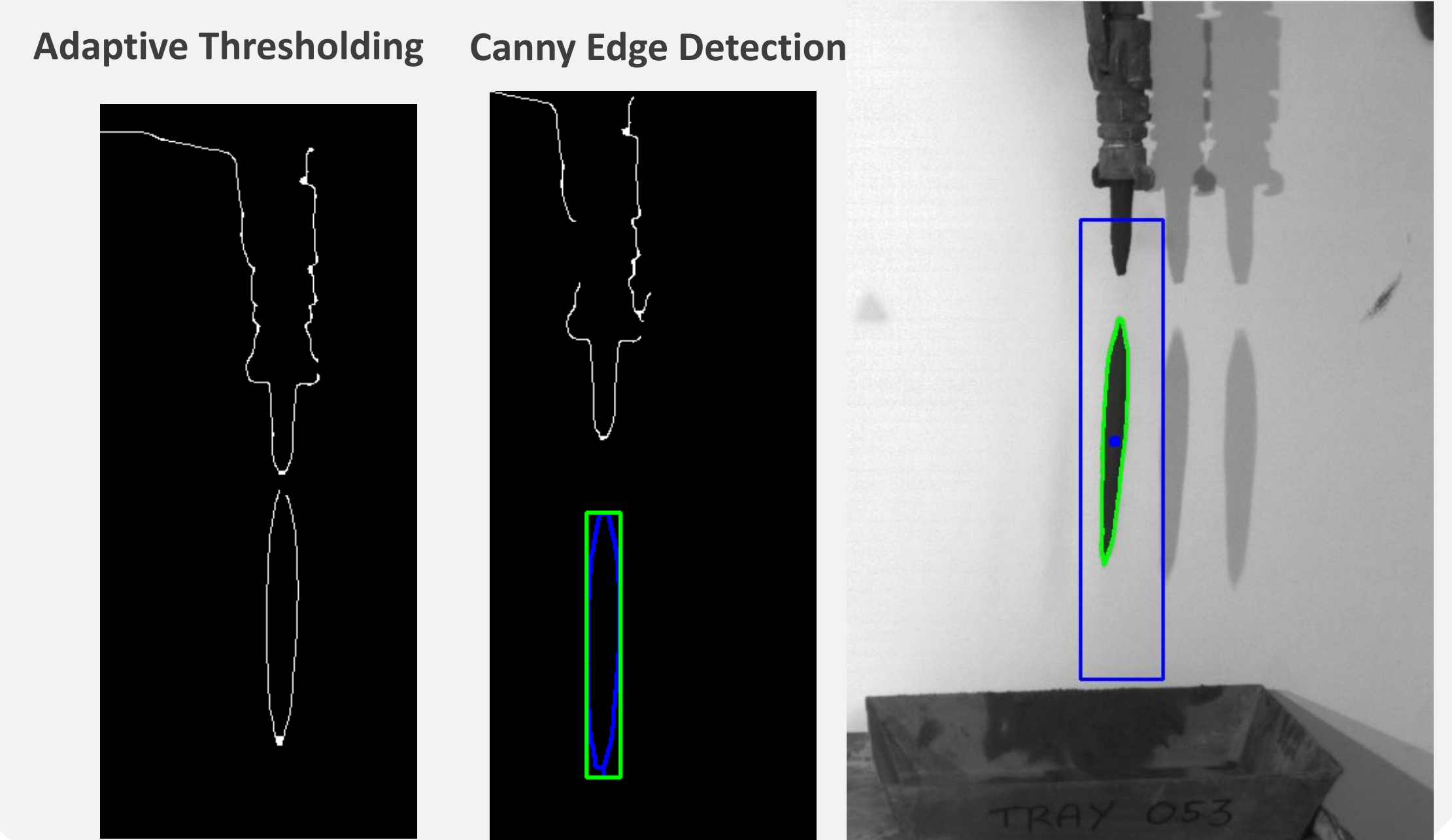
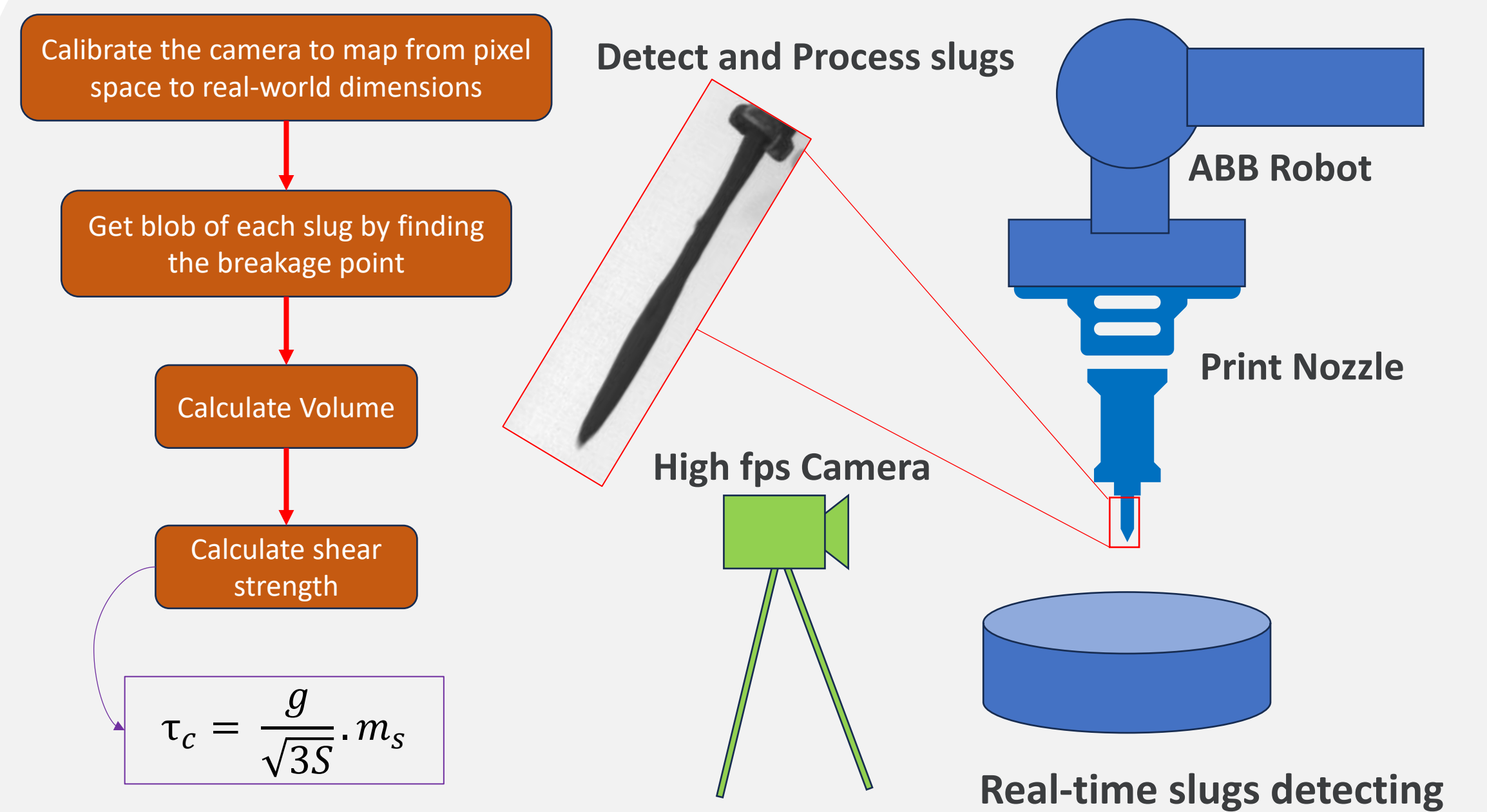
Control and data collection Process



Preliminary Results



Right time to 3D Print: Vision Based Slugs-test



Future Directions

- Measurement system analysis of human-driven tests.
- Sensitivity analysis of automated penetrometer test.
- Fully automated of process control for 3D concrete robotic hybrid manufacturing.

