![frontiers logo]

Supplementary Material

1 SUPPLEMENTARY TABLES AND FIGURES

Figure S1. Locomotion Modes. **(A)** Pure translation mode. **(B)** Pure rotation mode. **C** Double Ackermann steering.
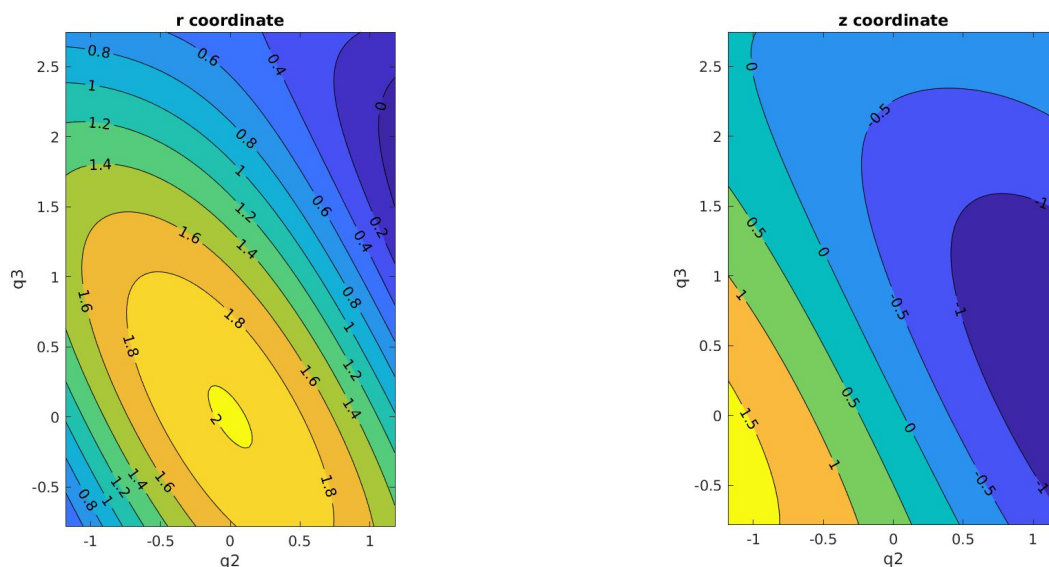

Figure S2. Workspace of the Excavator's arm was parameterized by the shoulder (q_2) and elbow pitch (q_3) joints. This allowed for quick checking if a desired goal for the arm is reachable and if the Hauler needs to park again. **(A)** Radial range map (r coordinate). **(B)** Height map (z coordinate).
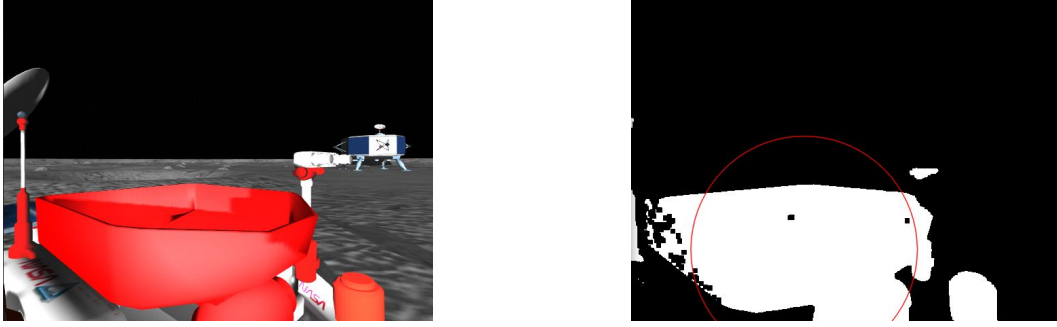
Figure S3. Detection of the Hauler's bin. The Excavator finds the Hauler bin by processing the original RGB image using color segmentation. **(A)** RGB Image captured by the Excavator. **(B)** Detector mask.
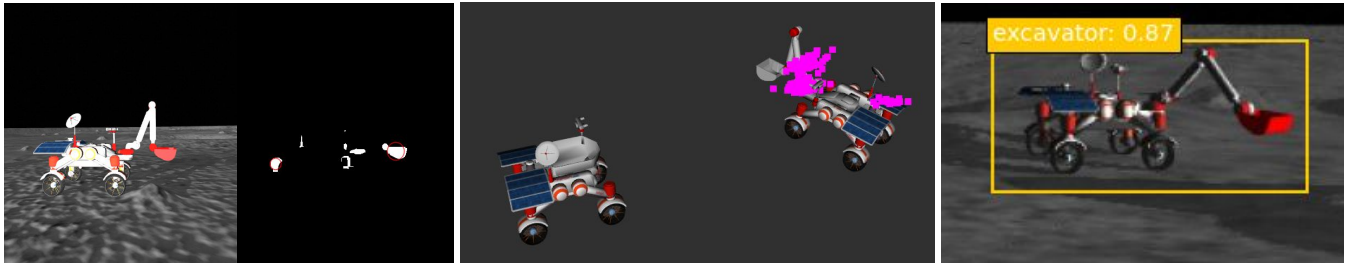

Figure S4. Methods for estimation of the relative 3D position between Hauler and Excavator. **(A)** Using blob detection and depth image segmentation. **(B)** Using an assemble of filtered laser scans. **(C)** Using a real-time object detection system and depth image segmentation.
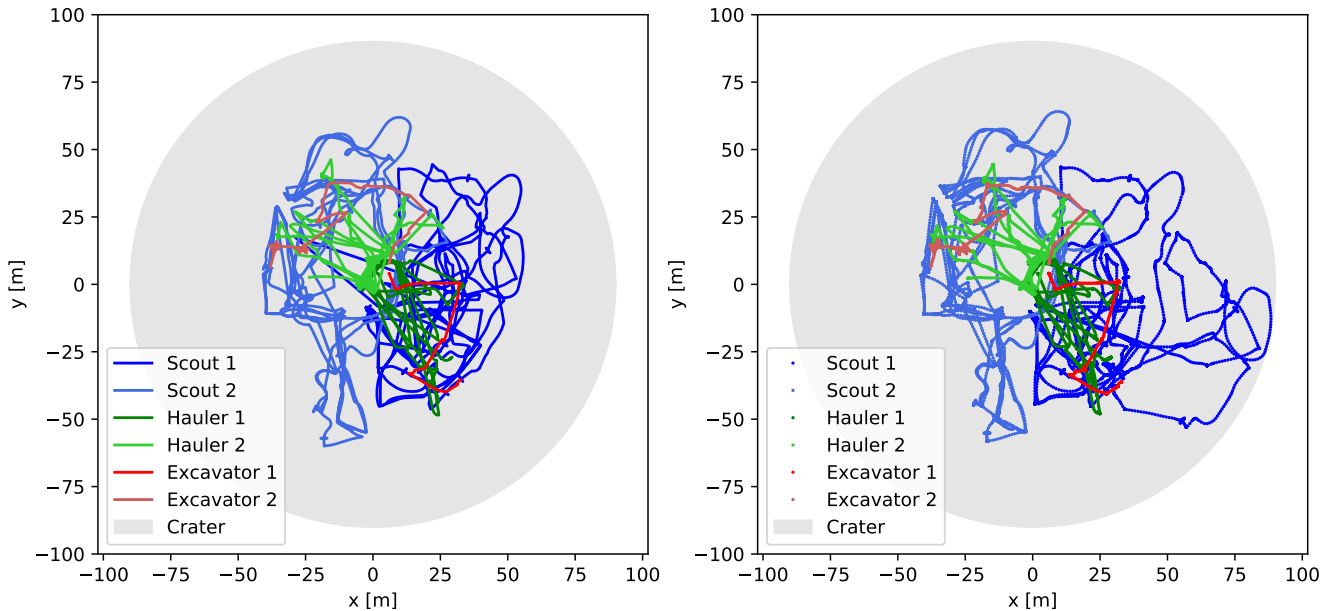

Figure S5. Comparison between **(A)** our localization estimate and **(B)** the localization truth for a two-hours mission for multiple robots.