

Data Collection with Mobile Manipulators for Learning from Demonstration

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Introduction:

Manipulation and Navigation capabilities of mobile robots with objects have been proven from a hardware standpoint.



[1]

Collecting large scale data for **robot learning** to build intelligent systems is **challenging**.

Using **Spot's** existing hardware capabilities and primitive behaviors, we develop a method to perform **robust data collection** to facilitate robot learning from task demonstrations - such as "putting chair next to a table".

Model Information:

Collected demos fed into a variation of a Vision-Language Model, Per-Act [2] – creates 3D, colored blocks called **voxels** to train. Weights produced for the task "move to right of chair" are then evaluated with **evaluation script**.

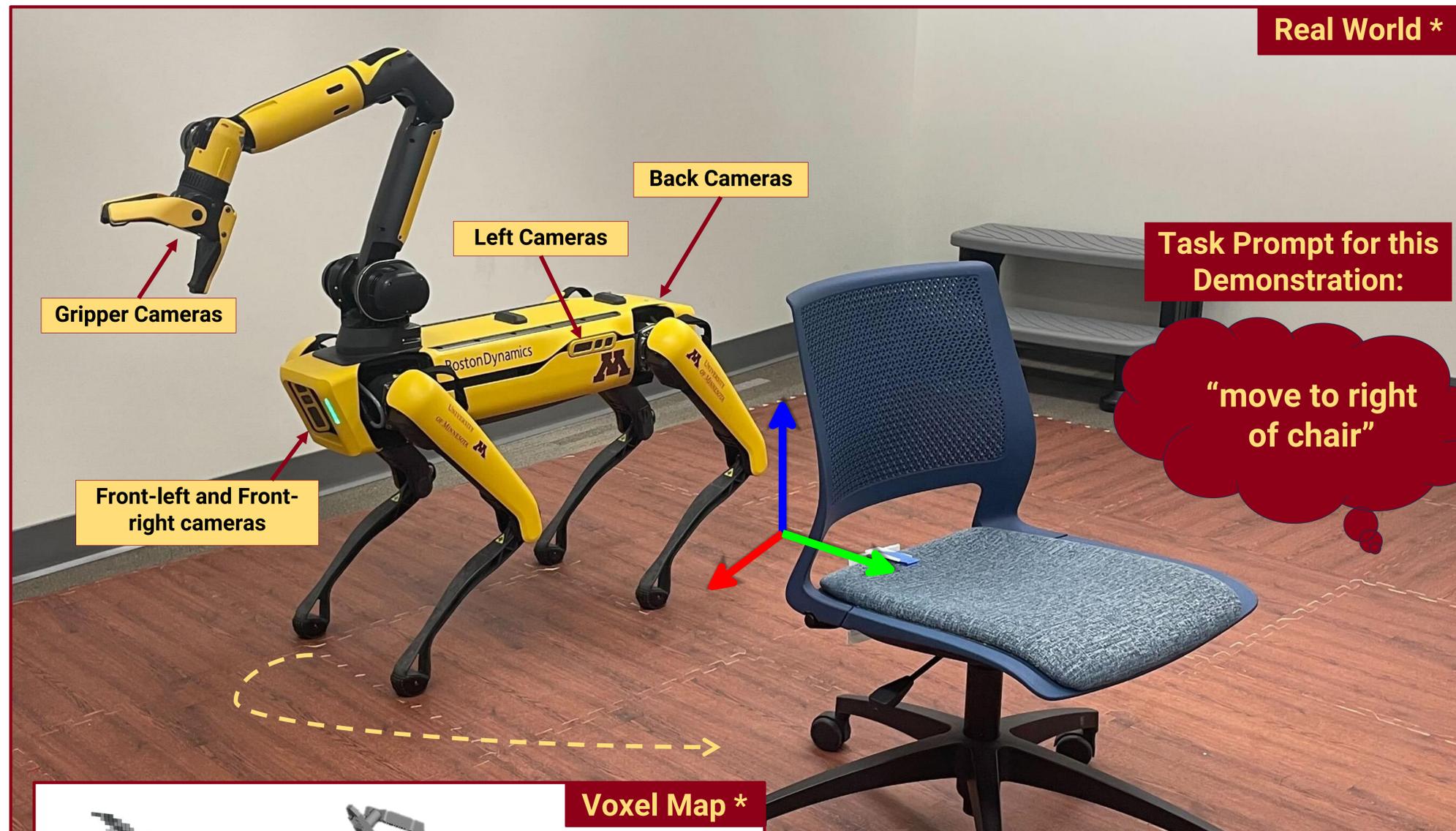
Dataset Information:

≈25 demos currently used to train model, all randomly placed chair positions. Data recordings (ROSBags) include **color and depth image data**, **task state info**, **transforms** relating different components of Spot.

References:

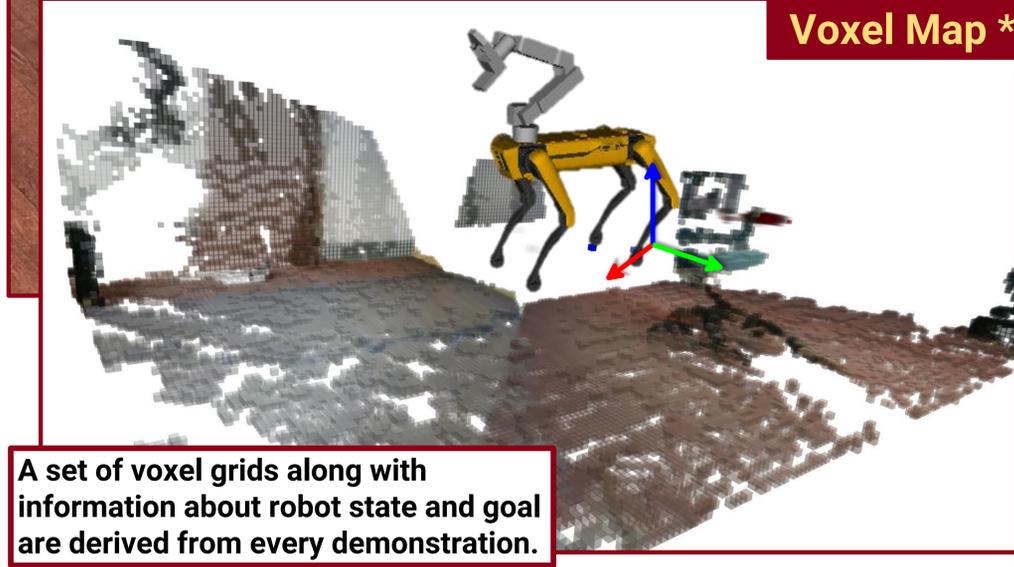
- [1] Boston Dynamics, <https://bostondynamics.com/>
[2] Shridhar, Mohit, Lucas Manuelli, and Dieter Fox. "Perceiver-actor: A multi-task transformer for robotic manipulation." In Conference on Robot Learning, pp. 785-799. PMLR, 2023

Real World *



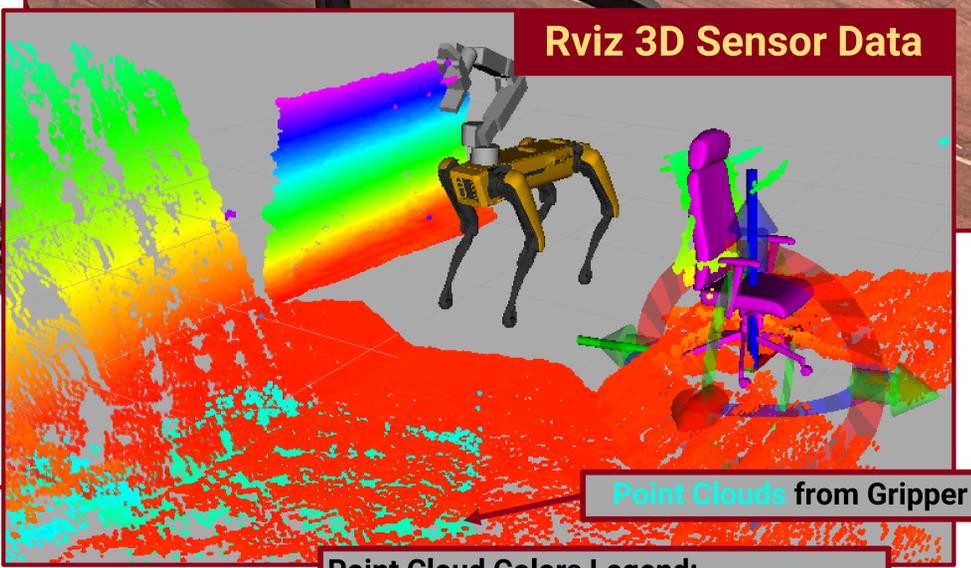
Task Prompt for this Demonstration:

"move to right of chair"



Voxel Map *

A set of voxel grids along with information about robot state and goal are derived from every demonstration.

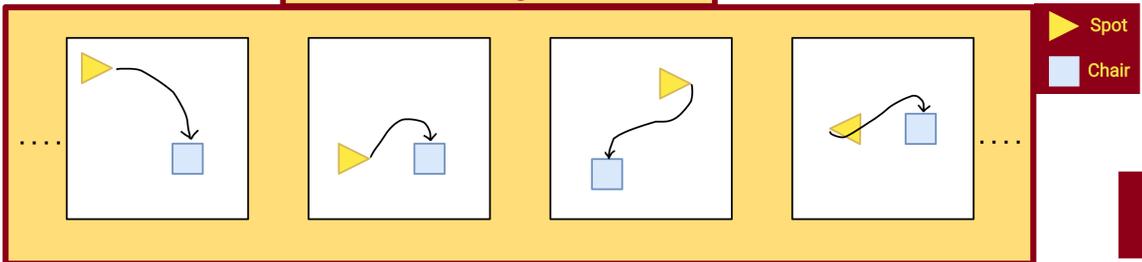


Rviz 3D Sensor Data

Point Clouds from Gripper

Point Cloud Colors Legend:
Red: on level ground
Violet: highest elevation from ground
Elevation decreases along VIBGYOR spectrum from Violet to Red

Examples of demonstrations for "move to right of chair"



Spot
Chair

* goal position and orientation for robot represented with: 

