

Waiter Robot in Restaurant

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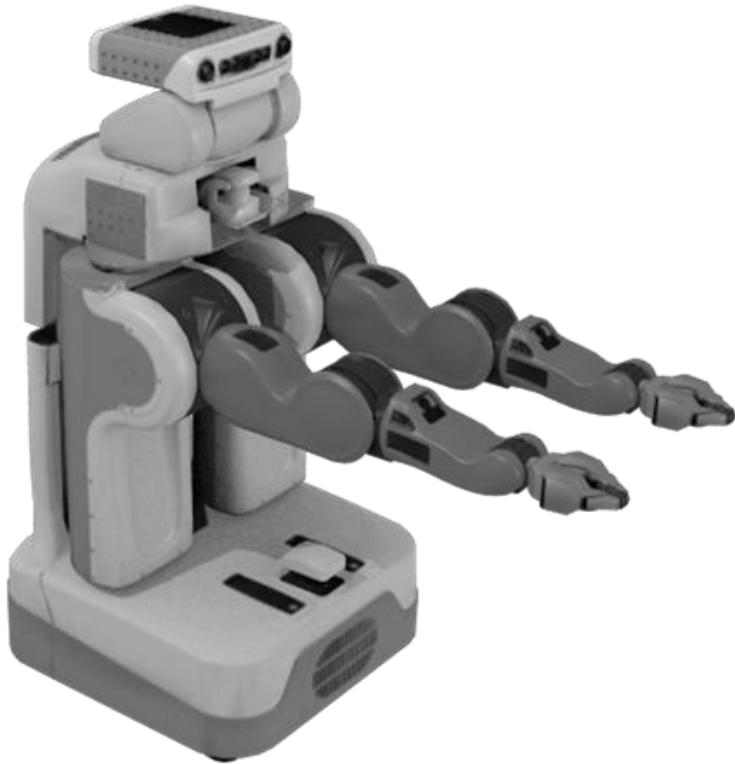
Practical Course Robotics

Project Demonstration

16-07-2020

<https://github.com/Gokulk1994/Waiter-Robot-Project>

<https://github.com/vijaykumarprabhu/robotics-course>



Objective

- Usage of robots as waiters and helpers in restaurants
- Control different robots like multiple panda arms and a Pr2 robot to perform tasks

Key Tasks

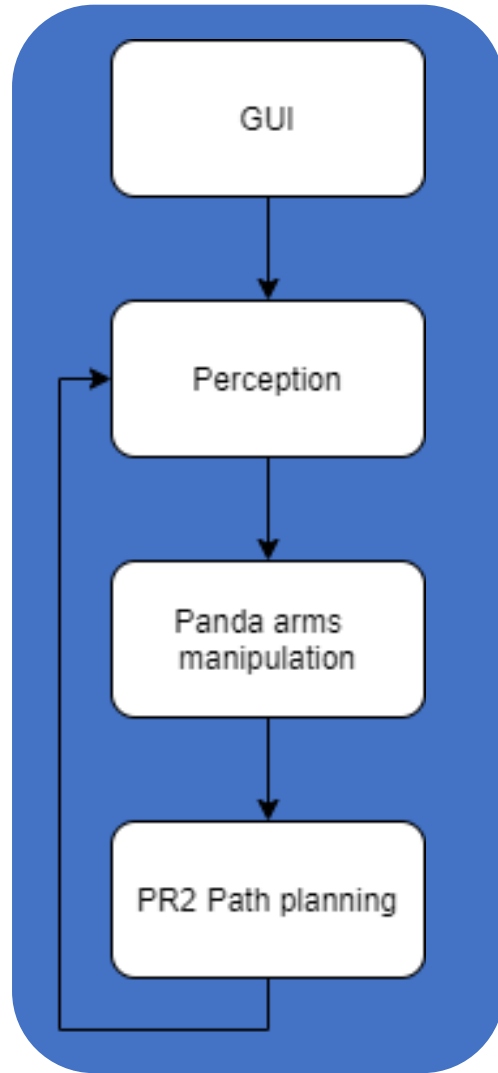
- Get order from customer (**GUI**)
- Picking food or drinks from kitchen and placing it on mobile robot (**Panda** arm)
- Moving mobile waiter robot to the dining table (**PR2**)
- Placing the orders of customer on the dining table in desired location (**Panda** arm)

Features

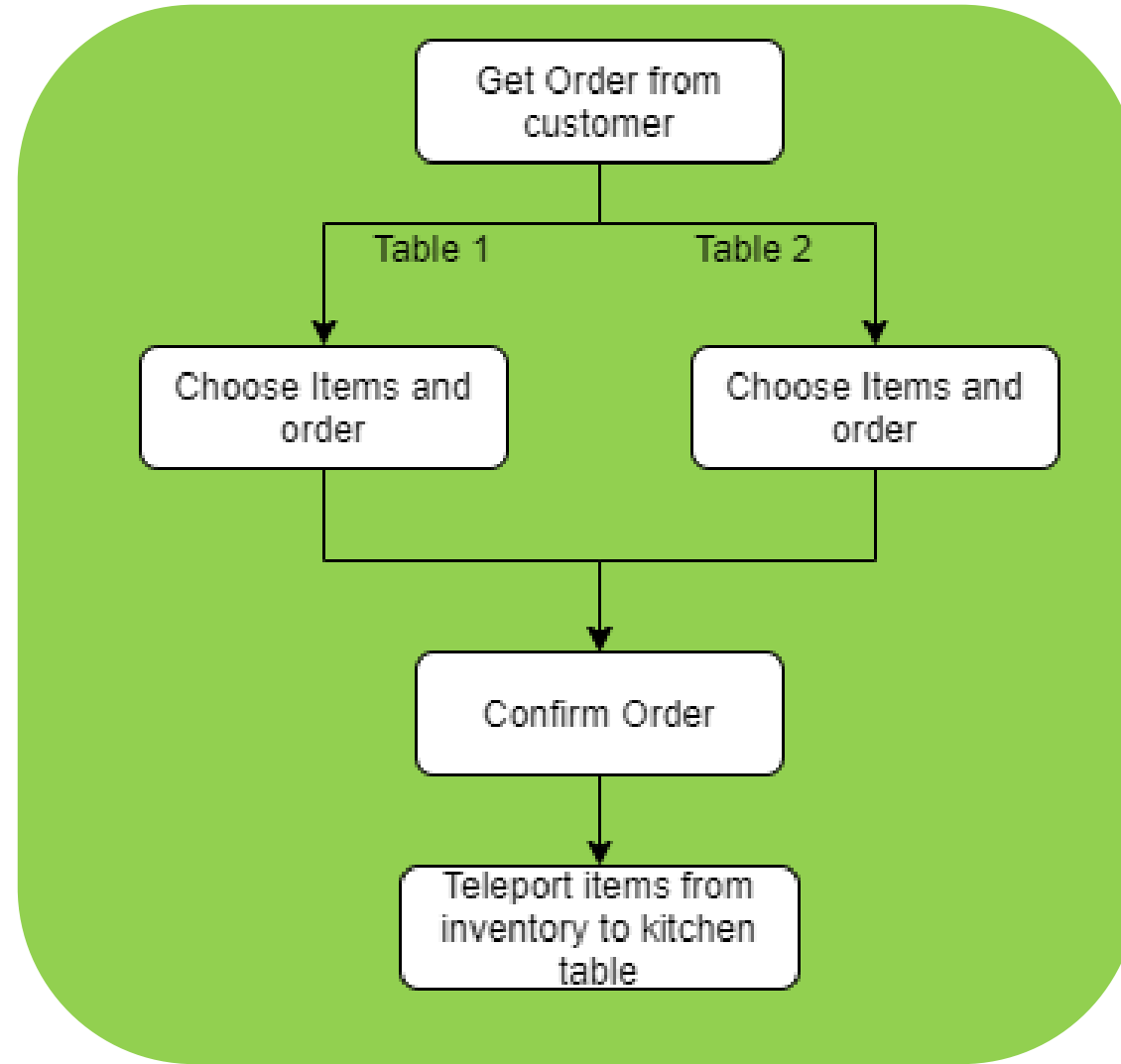
- Localizing the food items using **color** and **depth** map based **perception** algorithm
- Panda arm can able to grasp and place the following kind of object shapes
 - **Custom meshes**
 - **Cylinder**
 - **Curved box (ssbox)**
- **Marker** based food item position estimation using perception in Dining table
- PR2 can deliver 2 items in a single round trip
 - One food items to each table
 - Two food items to one table



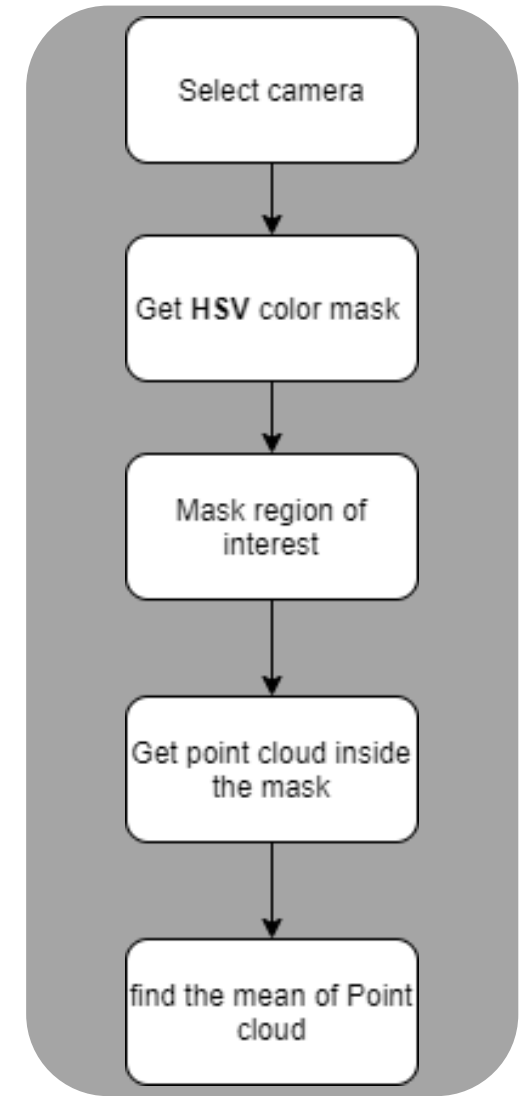
High Level Architecture



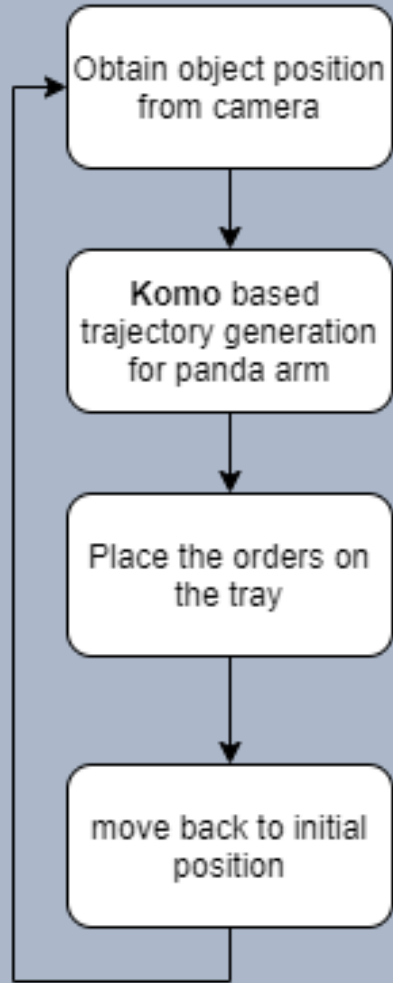
GUI Flow Chart



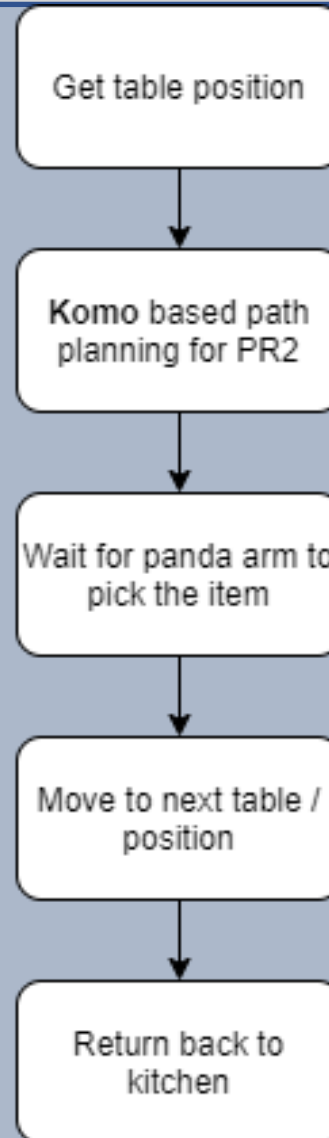
Perception Flowchart



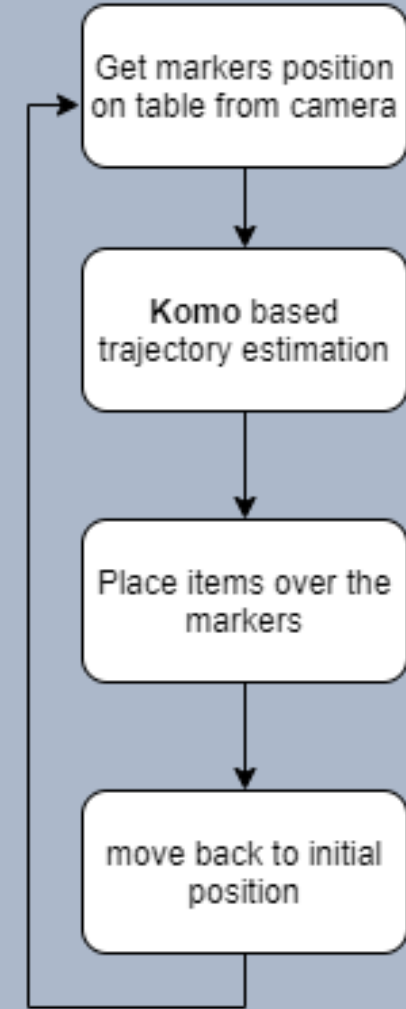
Kitchen Panda arm arm



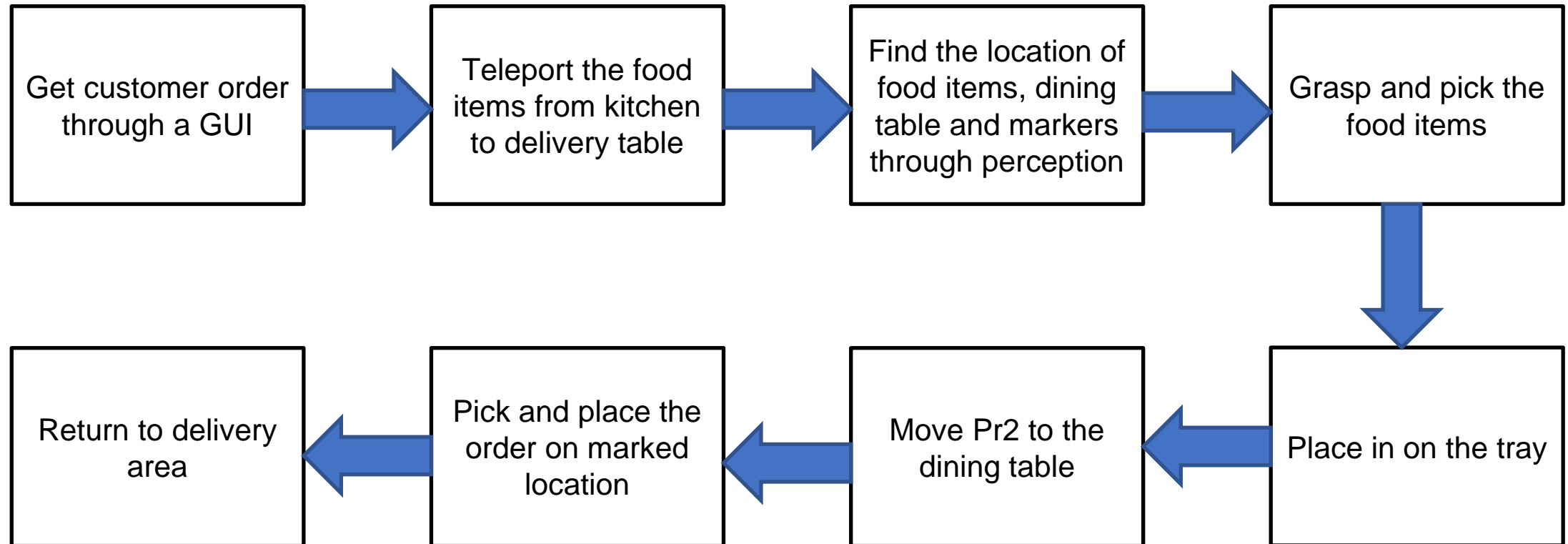
PR2



Dining table Panda



Task Overview



Challenges and Solutions

Problems	Root cause	Solution
Unable to lift custom mesh objects	Custom meshes are added as static objects in environment	Change object type to dynamic in Rai module for custom meshes (identified with prefix “dyna_”)
Objects on tray flying/ falling down when PR2 moves	Sudden movement of PR2 causes moment of inertia	Gradual increase in time per phase value of the KOMO path configuration
Difficult to handle control of multiple functionalities	Multiple KOMO constraints, panda arm control, camera based position estimation	Modularized all the components, so that a common function is sufficient
Unwanted motions in PR2 joints	Single joint state for all the joints in the environment	Immobilize PR2 function prevents optimizing PR2 related joints



Video Demo

