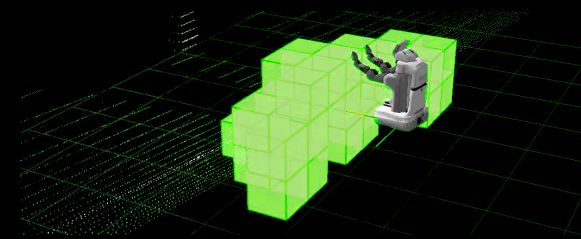


# Head Monitoring Persistent Collision Map Multi Table App

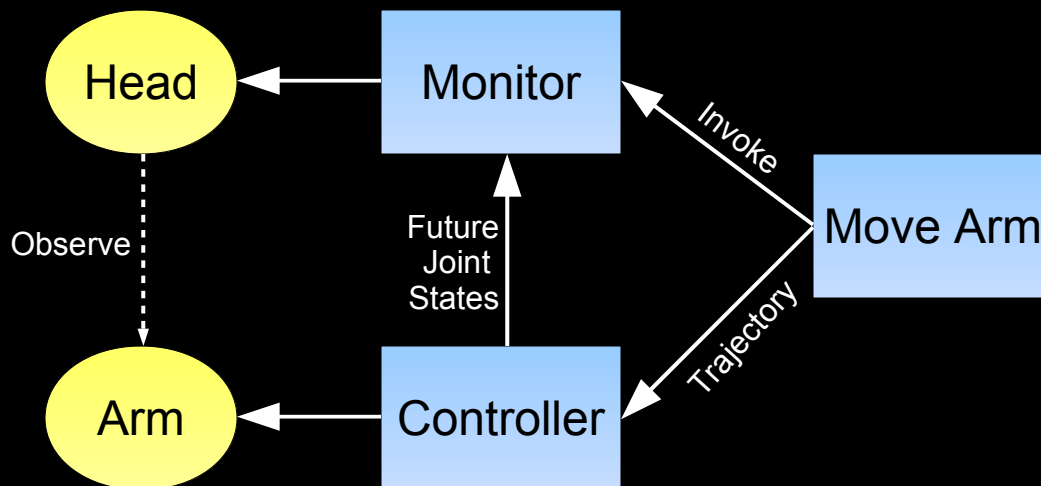
Summer 2010 Projects

Adam Harmat, Gil Jones



# Head Monitoring

- Laser limited, use stereo vision
- Integrated into move\_arm





# Head Monitoring

- Location: `move_arm_head_monitor`
- Usage:
  - `pr2_arm_navigation_actions`
  - `head_monitor_x_arm.launch`
  - `move_x_arm_active.launch`

# Persistent Collision Map

- Currently amnesic
- Want to remember
- Other desired features

# Persistent Collision Map

- OcTree structure
- Hierarchical, 8 children
- Octomap package
  - (Uni. Freiburg)



# Persistent Collision Map

- Advantages:
  - More compact
  - Probabilistic update
  - Query resolution
  - Free & unknown space
  - Can degrade
  - Templated

# Persistent Collision Map

- Implementation:
  - Replacement for collision\_map
  - Volume difference per insertion
  - Increased query speed
- Location:
  - octomap2
  - collision\_octomap





# Multi Table App

- Mobile manipulation
- Build world with Octomap
- Identify tables, objects
- Get manipulation points
- Navigation & grasping
- Head monitoring

# Multi Table App

- Multi table detector service
- Table detection:
  - Point clouds from collision\_octomap
  - Filter z direction
  - Cluster points
  - Fit plane
  - Project inliers

# Multi Table App

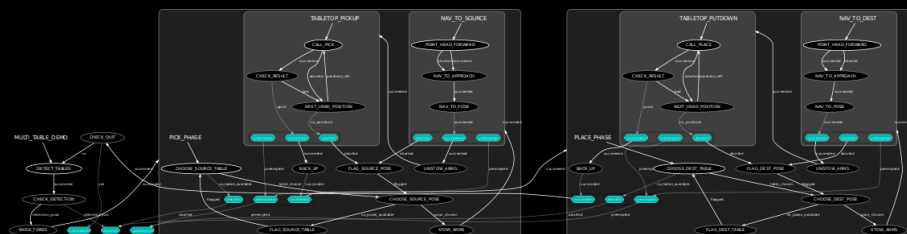
- Manipulation pose generation:
  - Expand table perimeter
  - Check for reachability
- Object detection:
  - Cluster volume over table
  - Find distance to perimeter poses
- Pose ranking

# Multi Table App



# Multi Table App

- Implemented in SMACH
  - Table and pose selection
  - Navigation
  - Grasping via wrapping PickAndPlaceManager



# Multi Table App



# Future Work

- Octomap:
  - Make it faster
  - Operations directly on octree?
  - Solve clearing problem
- App:
  - Improve table/object detector
  - Use both arms
  - Make it faster

# Package Locations

- `move_arm_head_monitor` in *arm\_navigation*
- `collision_octomap` in *collision\_environment* (soon)
- `multi_table_detector` and `multi_table_app` location (and name) t.b.d.



# Thanks

- Gil & Radu
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