**The Execution Cycle**

- Robot perceives scene with initial cup setup and generates local model for motion planning
- User announces color of cup to place at a position and indicates the desired positions with pointing
- Robot starts planning to compute a program that re-orders the cups with a minimum #moves
- Robot plans trajectories using OpenRAVE [11] and moves cups with 5 DOF arm (Katana6M)

**Extended Scenario**

- Robot drives around looking for tables
- Moves cups from one table to another
- Uses localization & path planning
- Shown at RoboCup German Open & int'l conf.

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**ROBOCD: ROBOTIC ORDER CUPS DEMO**

**AN INTERACTIVE DOMESTIC SERVICE ROBOTICS DEMO**

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**The Perception**

- Data from RGB-D camera (Kinect)
- Fit model for tables and cups

**The Interaction Modules**

- Robust speech recognition [4]
- 3D (pointing) gesture recognition [5]
- Post output to central blackboard

**The Higher Level Program**

**READYLOG** [1] program for roboCD:

```plaintext
1 proc order_cups demo,
2   get_initial_order(i1, i2, i3), % perceive initial order
3   get_goal_order(p1, p2, p3), % inquire about goal order
4   sort_cups(p1, p2, p3, p4), % start planner
5 endproc
6 proc sort_cups(p1, p2, p3, p4),
7   solve(H, reward_cup(p1, p2, p3),
8   while(!p1 = pos(p1) & p2 = pos(p2) & p3 = pos(p3)) do
9   pickBest_cup(cup = red, green, blue),
10  pickBest(to = p1, p2, p3, p4, move_cup(cup, pos(cup), to))
11 endwhile
12 endsolve
13 endproc
```

**The Planning Result**

Simplified READYLOG policy for example run:

- Initial order was "green, blue, red"
- Desired order is "red, blue, green"

```plaintext
1 exof Update if done then
2 move_cup blue, cup_position = blue, p4,
3 exof Update if done then
4 move_cup red, cup_position = red, p1,
5 exof Update if done then
6 move_cup green, cup_position = green, p2,
7 exof Update if done then
8 move_cup blue, cup_position = blue, p4
9 done
```

**References**


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Knowledge-Based Systems Group
RWTH Aachen University
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http://kbsg.rwth-aachen.de/