

Perception and Perspective in Robotics

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Overview

Goal

To build robots that can interact with novel objects and participate in novel activities

Challenge

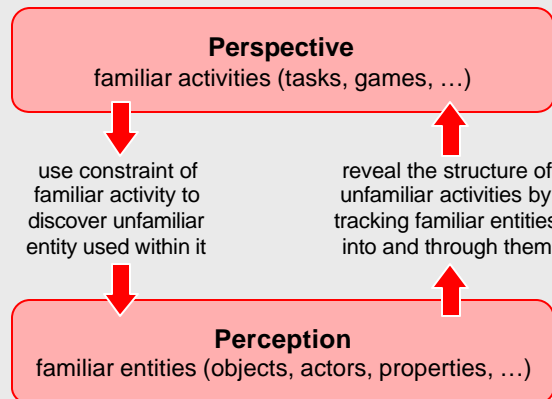
Machine perception can be robust for a specific domain such as face detection, but unlike human perception it is not currently adaptable in the face of change (new objects, changed circumstances)

Approach

Integrate conventional machine perception and machine learning with strategies for opportunistic development –

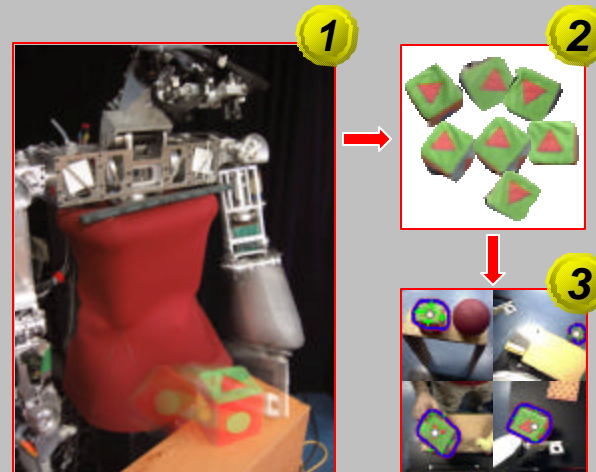
- ❑ Active perception (sensorimotor 'toil')
- ❑ Interpersonal influences ('theft')

This work is implemented on a humanoid robot (*Cog*, see right). The robot uses the structure of familiar activities to learn about novel elements within those activities, and tracks known elements to learn about the unfamiliar activities in which they are used.

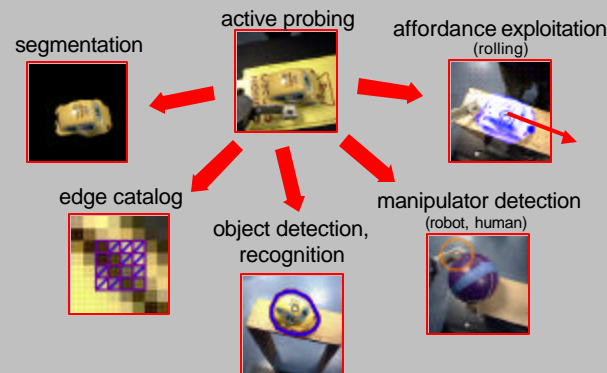


'Toil' Example – Active Segmentation

- 1 Object boundaries are not always easy to detect visually, so robot *Cog* sweeps its arm through ambiguous areas
- 2 This can cause object motion, which makes boundaries much easier to find
- 3 Then robot can learn to recognize and segment object without further contact



This is a good basis for adaptable object perception:



'Theft' Example – Search Activity

Robot observes a human searching for objects, and learns to make a connection between the named target of the search and the object successfully found. The robot has no predefined vocabulary or object set.

Human	Robot	
says "Find"	says "Find"	
"Toma"	"Toma"	
(shows cube)	(sees cube)	
"No"	"No"	
(shows car)	(sees car)	
"No"	"No"	
(shows bottle)	(sees bottle)	
"Yes!"	"Yes"	
(shows cube)	(sees cube)	
"Say"	"Say" "Cube"	
(shows bottle)	(sees bottle)	
"Say"	"Say" "Toma"	