UNSW@HOME

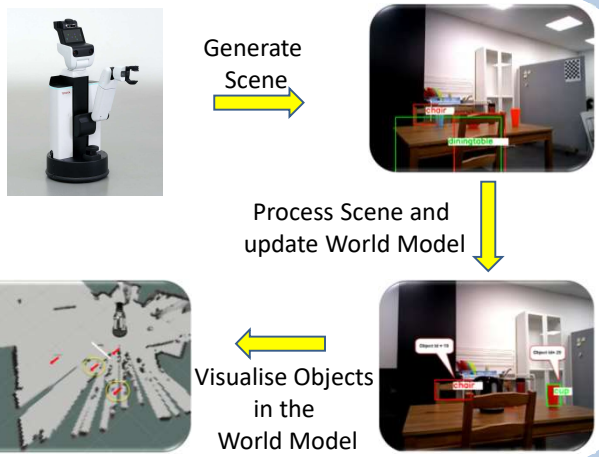
RoboCup@Home - Domestic Standard Platform League

Never Stand Still | Faculty of Engineering | School of Computer Science and Engineering

Maintaining the World Model

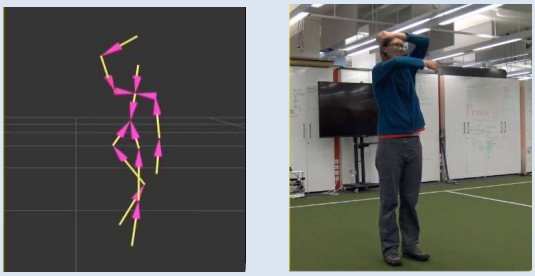
The ability of an autonomous robot to perform a task is highly dependent on how well the environment it works within can be described (modelled) and queried as well as the confidence that the various agents utilising this this data have in the of the accuracy of the model.

We developed a world model that describes unique objects with their attributes including classification, location, colour and size. The grounding of these objects in the world model is maintained by processing data (scene graphs) obtained from the spatial visual system. We also included some basic object behaviours so that the probabilities of the objects continuing to exist in the world could be updated.



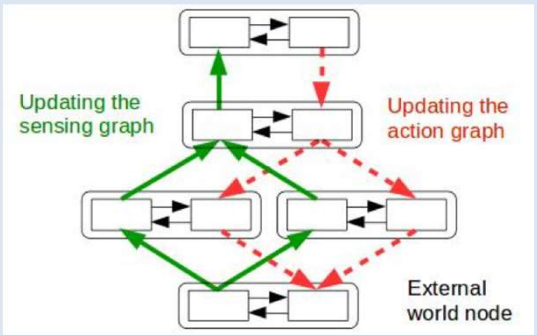
Skeleton and Person Tracking

We have previously used skeleton tracking and colour histogram-based person recognition to remotely operate humanoid robots, such as the Baxter. We are bringing this software to @Home for tracking people around the home environment.



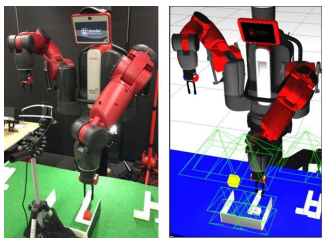
Cognitive Architecture

We wish to understand how a variety of software components should be integrated in a robot. We have developed a novel meta-model for formalising cognitive hierarchies. A cognitive hierarchy consists of a set of nodes connected in a hierarchical graph. Every node in the hierarchy has a world model and behaviour generation at a particular level of abstraction, with the lowest level node as a proxy for the external world. We use a cognitive hierarchy in the design of our software for @Home



Robot Learning

A large amount of the research conducted by the UNSW team is focused on robot learning. This is where a robot learns to perform a task, such as using different types of tools, through a combination of planning and online reinforcement learning.



ROS-Clingo

Clingo is a logic programming language developed in ASP, and is well suited for symbolic planning problems. We have helped to develop a ROS interface to Clingo, thereby using symbolic planning at the top layer of the cognitive architecture.

3D Position Tracking and SLAM

Crosbot is the name of the SLAM system that has been under development for many years at UNSW. We have previously used our mapping software in the rescue competition. These algorithms have been redeveloped to run on GPUs to speed up execution and to relieve the CPU of this work, enabling it to be used for other computations. The original 2D SLAM was extended to create 3D maps, fusing information from LIDAR and RGB-D cameras,