**THE CHANGING FACE OF ROBOTICS**

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The science fiction robot or android is still a way off in science fact, but many of the key elements of are being realized in current research into robots, cybernetics, embodied conversational agents and autonomous vehicles.

What do Astroboy and HAL have in common? They both are autonomous robotic systems that learned like a child rather than being just programmed. They answer one of the conundrums about intelligence – how can we get an intelligent agent that knows about and understands and can talk about the world, how can we get it to deal with people and the emotional states and drives that motivate them. The answer is we don’t build it or program it, we train it or teach it.

This talk will cover a wide ranging longterm program of research into building intelligent machines that can interact with and talk about the world they are immersed in. They don’t necessarily look human like, but they all have human-like attributes in some aspects.

Our earliest intelligent agents were just programs on computers, that learned to pick up patterns. We immersed them in a simulated 3D world to allow them to make the semantic and ontological connections that allow language to mean, but after a certain point simulations are no longer convincing, and the work to make them realistically complex outweights the work in dealing with complex robotic systems. Our current embodied conversational agents are based around a 2D simulation of a talking head with a Loebner prize winning question answering system, our Thinking Head. One version of this has been mounted on a robot arm to make it mobile. We’ve also had it mounted on a moving robot or ground vehicle. However, our main application for the head has turned out to be teaching. The Thinking Head is used to help children with disabilities learn social skills, to help older people live in their home longer, to teach foreign languages. The 2D simulated worlds are now being turned around with the computer as teacher rather than learner.

This year I have been privileged to lead the MAGICian team, the only Australian finalist in the MAGIC Grand Challenge (Multiple Autonomous Ground-Robotic International Challenge). The Thinking Head makes an appearance here too, providing a “driver” identity for messages from the different vehicles in the fleet. The focus of the competition is to have autonomous vehicles explore and map a town, deal with a first response (terrorist) situation, and make sure the human operators know where they are, what’s happening, what they are doing and why. The rules specified two roles (Sensor and Disruptor – the latter laser designating bombs for neutralization) but we have specified additional roles and worked on coordination between Scouts, Protectors and Disruptors, and Rangers/Rearguards. In separate experiments, we have also explored how to enable operators to control a fleet of vehicles without getting overloaded with information. We are looking at the question of trust, and how best to manage interventions when autonomy goes wrong.