

# Self-Reconfiguring Robotics

## An Ultra Versatile Robotics Application Platform

<http://www.spectral-robotics.com>



### Problem

The robotics industry is highly fragmented. Specialist robot builders with specialized knowledge sell to small numbers of customers at high cost. This would be a good way of conducting business except that the robots being sold are similar. These specialist robots differ mainly in sensory or manipulation capabilities e.g. a sewer inspection robot is very similar to a bomb disposal robot except in the pay load it carries.

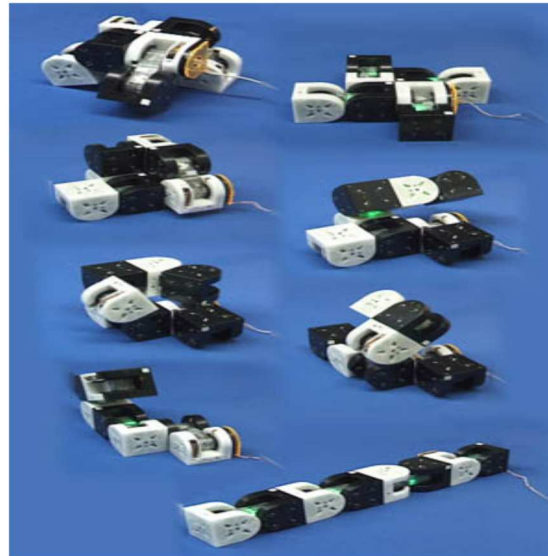
*"Many have linked the current state of the Advanced Robotics industry to that of the computer industry in the early 1980s, i.e. relatively few, high priced systems largely in the hands of professionals but on the verge of spreading into mass market applications. Several however, including the CEO of Evolution Robotics, Paolo Pijanani, point out that unlike the PC, which was essentially a single product, robotics is essentially multi-product and a better analogy is consumer electronics, at least with regard to robotics for the home environment. With this analogy the promise of massive growth is still retained but the question of which area will be the primary growth area is much more difficult to define."*

ITI TECHMEDIA MARKET INTELLIGENCE REPORT, 2008

Paolo Pijanani and others believe that robotics will remain a fragmented industry. They lack the imagination that it is possible that one robotic system can serve a broad range of capabilities. While it is true that a general system is likely to be over capable in many contexts, **an over specified mass producible system is cheaper to produce than many custom tailored solutions.**

The ideal situation would be a general purpose robot company supplying general purpose components to specialist robot builders, who are able to annex the system with additional bespoke specialist sensors and manipulators.

### Solution



We propose that self-reconfiguring robotic systems (SRS) are to robotics as PCs were to calculators. An SRS is a robot built from a number of simple, cooperating robotic sub-units. The sub-units can autonomously attach and detach from one another. Thus, the robot can shape shift on the fly. The design accommodates specialized sub-units that carry tools, and mechanical interfacing to other modular robot kits. The platform will offer an unparalleled versatility compared to fixed-shape robots like mobile platforms, robot arms and humanoids.

- One SRS deployment can replace a number of expensive single-purpose robots.
- Parallel manipulation gives scalable strength and accuracy
- Identical sub-units are mass producible
- Self-repair, maintenance free operation through reconfiguring off broken components
- The capabilities can be upgraded gradually by purchasing more modules.
- Novel applications directions are possible through autonomous shape shifting.
- Modularized system, including control software

### Team



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### Status

A first generation prototype has been constructed, including electronics, control software and mechanics. The prototype is capable of self-reconfiguring in controlled experiments. IDEALab money is being used to construct an example application, and optical scanner robot.

- An application has been made to Scottish Enterprise/RSE Enterprise Fellowships Funds to develop the business plan further.
- An application has been made to the Initiating Knowledge Transfer Fund to fund market research
- Business advisors are being sought
- Potential customers in specific market segments are being contacted

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