ARE WE READY FOR AUTONOMOUS SYSTEMS?

A report on the social, legal and ethical issues surrounding Autonomous Systems was published by The Royal Academy of Engineering in the summer of 2009. The media response worldwide was so strong that a follow-up conference was held in September 2010. Dr Natasha McCarthy and Lambert Dopping-Hepenstal FREng summarise the hopes and concerns for the technology aired by academics and industrialists at that meeting.

Predicting the impact of new technologies has become an increasingly common concern, be it in order to identify potential markets or prepare for potential negative reactions to such technologies. Autonomous systems represent an area of technology which has both the promise of benefits and returns for business; and the worry of unforeseen risks and social rejection of the technology.

Autonomous systems differ from an area like nanotechnology or GM because the issues here are not about the potential physical harm that may arise from using materials with certain properties; they relate to the place of these technologies in society, in communities and our individual personal lives.
ARE WE READY FOR AUTONOMOUS SYSTEMS?

38 INGENIA adaptation and learning.

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The essential difference between a merely significant benefits to be gained from the implementation of the technologies. There concerns of the public, and to take these and address the genuine expectations and are valuable to promote understanding and how these technologies can be and development in this area if regulation cannot exist to allow the technologies to be used. Without regulation there can be no innovation in regulation as much as in engineering – we cannot invest in research... if regulation does not exist

robots have been developed for use in Japan, which are actually intended to be companions or playmates for children, taking the place of adults or other carers.

GOVERNANCE OF AUTONOMOUS SYSTEMS

In September 2010, a group of academics and industrialists met to discuss the challenges of governing the development of autonomous systems. The meeting was organised by The Royal Academy of Engineering and University College London's Centre for Ethics and Law and featured the following academics and industrialists: Dr Chris Elliott FREng, Engineer and Barister; Lambert Dopping-Heren, Engineer, Military; Dr Veele Heysen, Department of Law, UCL; Professor Maria Lee, Centre for Ethics and Law, UCL; Professor Noel Sharkey, Professor in Robotics and Artificial Intelligence and judge of TV’s ‘Robot Wars’ and Professor Andy Stirling, SPRU, University of Sussex. A summary of the meeting can be downloaded at www.ucl.ac.uk/laws/law-ethics/files/autonote.pdf

Driverless vehicles are an example of autonomous technologies that have already been developed – although they are more likely to be introduced in the form of fleets of unmanned trucks on major highways rather than as individual cars finding their own way through busy cities. Medical robots that perform where the surgeon cannot be present are examples, be they in an ambulance on route to hospital or in confined spaces such as an MRI scanner. Military applications are also in use, unmanned air vehicles for surveillance and reconnaissance and battlefield drones are being developed by a number of countries.

Technologies where the human operator is merely absent can be contrasted with technologies designed to actually take the place of a person. In social care, autonomous systems have been designed for various purposes; from sensing the movements of a person in their home, to watch over them and look out for unusual behaviour; to robots designed to feed those unable to feed themselves. Babysitting

WHAT IS AN AUTONOMOUS SYSTEM?

The essential difference between a merely automated system (elevators and tube trains for example) and an autonomous system is that a truly autonomous system is capable of operating without human intervention, and can do so because it has a capacity for adaptation and learning.
ARE WE READY FOR AUTONOMOUS SYSTEMS?

In technological regulation, the focus is generally on weighing benefits against risks. In the area of autonomous systems the risks are difficult to quantify because they are largely unknown, they are also to a significant degree, social risks. The fear is the proliferation of soulless machines in the place of people. There are many areas of technology where apparently fundamental social norms have been challenged. Heart transplants and IVF are areas where the benefits of technology have prompted us to change our perspective and develop a conceptual framework for things we previously found repellent or amoral. Autonomous systems may well likewise change our perspective, and become an unquestioned part of our lives. The essential thing is that we need to do this mindfully and not robotically, with thought and empathy rather than sleepwalking in the direction that technology pulls us. Regulators and policy makers need to catch up with autonomous technologies, and put in place the legislation that will allow their deployment, and ensure that they are developed and used responsibly.

This will require consultation with engineers and the public to address the difficult questions that autonomous systems present.

Read Autonomous Systems at www.raeng.org.uk/autonomoussystems

**ROBOT WARS**

The ethical and ideological questions surrounding the use of autonomous systems may often seem straightforward to formulate, if difficult to answer. On the battlefield, the fundamental issue appears to boil down to saving lives. Autonomous systems are good if they mean fewer casualties on the battlefield and less collateral damage as the result of aerial bombing raids.

How can autonomous systems reduce casualties? Obviously, if you send out a robotic system to clear mines and disarm IEDs from a distance, you are removing the risk of killing the victim. You are also reducing the risk to your soldiers who might, fearing the enemy, be too quick to shoot and kill an innocent person, perhaps a young child who has strayed emotionally driven than a human soldier. The young soldier on reconnaissance might, fearing the enemy, be too quick to shoot and kill an innocent person, perhaps a young child who has strayed emotionally driven than a human soldier.

<image of TALON robots used by US forces to clear mines and disarm IEDs from a distance.>

**AUTONOMOUS SYSTEMS SPECTRUM**

There is a range of levels of control or involvement that human operators can have in a system. The following sets out the different grades of control and the spectrum from user-controlled, to automated to fully autonomous systems:

- controlled systems: where humans have full or partial control, such as an ordinary car
- supervised systems: which do what an operator has instructed, such as a programmed lathe or other industrial machinery
- automatic systems: that carry out fixed functions without the intervention of an operator, such as an elevator
- autonomous systems: that are adaptive, learn and can make decisions.

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**MAKING CHOICES**

In technological regulation, the focus is generally on weighing benefits against risks. In the area of autonomous systems the risks are difficult to quantify because they are largely unknown, they are also to a significant degree, social risks. The fear is the proliferation of soulless machines in the place of people. There is also the hope that autonomous systems might be created that are more accurate and, by their nature, less emotionally driven than a human soldier. The young soldier on reconnaissance might, fearing the enemy, be too quick to shoot and kill an innocent person, perhaps a young child who has strayed emotionally driven than a human soldier. The young soldier on reconnaissance might, fearing the enemy, be too quick to shoot and kill an innocent person, perhaps a young child who has strayed emotionally driven than a human soldier. The young soldier on reconnaissance might, fearing the enemy, be too quick to shoot and kill an innocent person, perhaps a young child who has strayed emotionally driven than a human soldier.