Definition

Machines have been around for millennia as tools to expand human capabilities. The advent of powered machines in the XVIII century has ignited the industrial revolution. The embedding of processing power in the last century has progressively created more flexible machines and eventually robots that can be programmed to serve a variety of purposes and now can start to take decisions on their own.

We are on the edge of a new revolution where machines are no longer “extensions” of human capabilities but are becoming companions working and acting in symbioses with people and with the environment.

This results from increasing understanding of goals, resources and ambient by a machine, by the leveraging on cooperation principles, applying both to other machines as well as humans, and it brings to the fore new issues, including ethical ones.

Description

Robots are a reality in manufacturing, making production chains ever more flexible. The drive towards autonomous vehicles is basically a transformation of vehicles into robots. More and more complex issues arise by this increase flexibility of machines and their need to take advantage, or at least take notice of their environment to adapt their behavior. Artificial Intelligence is de facto permeating the control of machine actions and a collective intelligence is born out of an ambient where several machines are active, even though they may not interact directly.

Increased pressure to ensure safety and security in a world that gets more and more vulnerable is pushing researchers to increase awareness in machine and this in turns increases their capability to act as autonomous systems, raising the stakes of security to protect from hacking in a never ending story.

We are going to see a symbioses among machines and between machines and people. This symbioses will occur at micro and macro level.

At micro level we are seeing micro bots being developed to detect and fix health issues, by circulating in our blood stream. Researchers are even working on nano-bots that can act at cellular and intra-cellular level. However, in these cases there is very little intelligence involved, everything is programmed at physical and chemical level (as in DNA). Still it is an interesting area of symbiotic relation that scale up at the macro level.
At human dimension we are seeing smart prosthetics that interact more and more with the person “thoughts” and “intentions”, like an artificial arm that can be used to pick up a glass of water and drink it.

These prosthetics will go beyond restoring a human functionality, they will start augmenting it raising ethical issues and potentially creating a new form of “symbiotic divide” beyond the “digital divide”. This is sometime addressed as “transhumanism” that is partly a philosophical debate and partly rooted in evolution of generics, cyber-implants, nanotech and guided natural selection (with heavy ethical issues).

At ambient level we are going to see a seamless evolution of our human interaction with machines (Baxter is a first example of a robot designed to work with humans as a member of a team). It will happen in elderly care, in every day transportation, at the work level (with machines taking over “intellectual” jobs including writing newspaper articles – according to Gartner by 2018 20% of all biz content will be authored by machines, by 2020 autonomous software agents outside the human control will participate in 5% of all economic transactions, by 2018 more than 3 million workers will be supervised by roboboss, by 2018 50% of the fastest growing companies will have fewer employees than instances of smart machines…).

A challenging “near” future, indeed!

In this complex scenario IEEE is not just ideally positioned with its strong multidisciplinary competence that keeps evolving at the leading edge. It also has a moral obligation as a strong enabler of this evolution to look into its implication.

An initiative within FDC led by our Society of Social Implication of Technology should be able to create synergies among various Societies and attract new constituencies to IEEE positioning IEEE as a tough leader in a changing world.