

Actual problems of robotics



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Introduction

There's no precise definition, but by general agreement a robot is a programmable machine that imitates the actions or appearance of an intelligent creature—usually a human. To qualify as a robot, a machine has to be able to do two things: 1) get information from its surroundings, and 2) do something physical—such as move or manipulate objects.

The word robot comes from the Czech word *robota*, meaning drudgery or slave-like labor. It was first used to describe fabricated workers in a fictional 1920s play by Czech author Karel Capek called "*Rossum's Universal Robots*". In the story, a scientist invents robots to help people by performing simple, repetitive tasks. However, once the robots are used to fight wars, they turn on their human owners and take over the world.

In last 50 years the robotics made a great leap forward. If in 1950's robots could only perform a fixed sequence of actions like assembling car engines or weight lifting, today we have robots driving cars, extinguishing fires, doing the house work and even travel to Mars.

However, there is a huge set of unsolved problems till now. This article is a review of current front line in this area.

We will see next branches of robotics:

- Industrial
- Military
- Medical
- Entertainment

Industrial robots

The first industrial robot in Europe, a Unimate, was installed at Metallverken, Uppsland Väsby, Sweden. It weighed two tons and was controlled by a program on a magnetic drum. They used hydraulic actuators and were programmed in joint coordinates, i.e. the angles of the various joints were stored during a teaching phase and replayed in operation. The rate of accuracy was within 1/10,000 of an inch.

The first National Symposium on Industrial Robots was held in 1970 in Chicago, USA. A year later it was upgraded to an international conference and was called the International Symposium on Industrial Robots (ISIR). The purpose of this symposium was to provide researchers and engineers worldwide an opportunity to present their work and to share their ideas in the fields of robotics. In 1997 the



symposium changed its name to International Symposium on Robotics (ISR) and included the technology of service robots. Today the ISR still represents a meeting point for all scientific, technical and industrial topics related to robotics. One main goal is to bring academia and industry together. The symposium is organized annually by a national robot association either in America, Europe or Asia in conjunction with an international robot exhibition.

Takeo Kanade, Carnegie Mellon University, USA designed the world's first Direct Drive Arm. He also founded the world's first doctoral program in Robotics, which he chaired from 1989-1993 at Carnegie Mellon. Direct Drive Robotic Arms are currently the best method of design for mechanical arms, due to the removal of transmission mechanisms between the motors and loads, rather than using reducers and chain belts which produce uneven movements. The result is an arm that can move freely and smoothly, allowing for high speed precision robots. Design of the arm was completed in 1981, and successful patent was obtained a few years later.

In 2005 the IEEE Robotics and Automation Society (IEEE/RAS) and the International Federation of Robotics (IFR) agreed to jointly sponsor the Invention and Entrepreneurship in Robotics and Automation (IERA) Award. The purpose of this award is to highlight and honor the achievements of the inventors with value creating ideas and entrepreneurs who propel those ideas into world-class products. At the same time the joint disposition of the award underlines the determination of both organizations to promote stronger collaboration between robotics science and robotics industry.

Now, the development on industrial robots is rather stable and aimed only on improvement of precision.

Military robots

Broadly defined, military robots date back to World War II and the Cold War in the form of the German Goliath tracked mines and the Soviet teletanks. The MQ-1 Predator drone was when "CIA officers began to see the first practical returns on their decade-old fantasy of using aerial robots to collect intelligence".



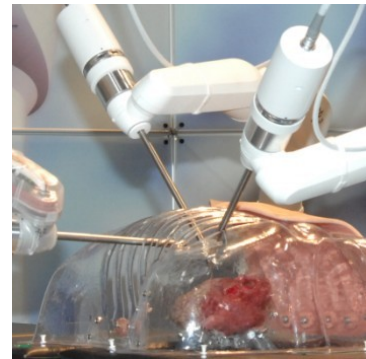
The use of robots in warfare, although traditionally a topic for science fiction, is being researched as a possible future means of fighting wars. Already several military robots have been developed by various armies.

After the World War the implementation of robots into forces had been progressing rapidly. Now the armies of many countries have their own automatic helicopters, cargo transporters and soldiers, which can be manipulated from the control room or act by itself.

The feature of the main part of military robots – is their price. In a difference from industrial robots a metal troop can be explored in first 15 minutes after launch, so engineers try to construct them as cheap as it possible, to make the mass manufacture available. For example, in 2011 the government of US decided to send more than two thousand robots in Afghanistan as an reinforcement.

Medical robots

Medical robots are robots that allow surgeons greater access to areas under operation using more precise and less invasive methods. They are in most telemanipulators, which use the surgeon's actions on one side to control the "effector" on the other side.

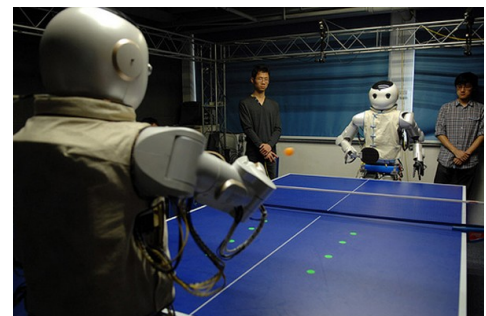


In 1985 a robot, the PUMA 560, was used to place a needle for a brain biopsy using CT guidance. In May, 2006 Robot carries out operation by itself. The 50-minute surgery, which took place in a Milan hospital, was carried out on a 34-year-old patient suffering from atrial fibrillation. Now we have robots, which can perform a any kind of operations, but there is a big disadvantage of medical robots. As the biggest part of them is still needed in remote control, surgeons shell to learn how to manipulate it, and as it takes from 8 to 12 times to adopt the system completely, this learning can get fatal for a someone.

However, surgery is not the only way of using robots in medicine. They can be used for nursing care or rehabilitation.

Entertainment robots

Of course such interesting theme like robotics could not be stayed far from community for a long time. In 1990 the first electronic dog Teksta was invented. After that a wave of robots surged to market. Every new model had some improvements in goings-on simulation, commands detection and design.



An entertainment robot is, as the name indicates, a robot that is not made for utilitarian use, as in production or domestic services, but for the sole subjective pleasure of the human it serves, usually the owner or his housemates, guests or clients.

Another interesting robot line is ASIMO (Advanced Step in Innovative Mobility). The modern model of this robot can walk on 2 legs with speed up to 9 km/h, pour water from bottle to glass and recognize it's owner by camera.

After the first entertainment robots appeared, they got a role of effective element for advertisement. Many corporations started to use robots to attract more people in stores or exhibitions.

Conclusion

As we see, robotics had filled all spheres of our lives and in all this spheres are needed in improvement. The common trends are developments in artificial intelligence and decreasing of the dependence from human. The enhancement of precision is actual too. But the intensity of today research give us some reasons to suppose, that robotics will change our world completely soon.



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