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# 1. Introduction

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Robotics is a field of technical knowledge that deals with the construction of robots, their control, their programming and application in various domains of science and technology. It is highly interdisciplinary and combines knowledge from many other fields (mechanics, automation, electronics, IT etc.). Today, one can easily notice the presence of robots in industry, medicine, transport, building engineering, administration, the army, agriculture, and space. Robotics is used wherever work is particularly onerous, monotonous and dangerous for humans. The good examples are factory production lines (where, among others, the processes of packing, palletizing, painting, welding and cutting, and manipulation are carried out), work in harmful conditions (low and high temperatures, radiation, sparks and chemical contamination) or unexplored areas, such as sea depths and the outer space. Although the robotics has been developing very fast for many years, the role of humans is still superior. It is possible that in future, the tasks done currently only by humans (including constructing, programming and maintaining) will be carried out also by robots. Already today it is obvious that autonomous workstations with limited human service are the future of robotics industry. The basic branches of robotics include:

- theoretical robotics (theories of robots and manipulators),
- general robotics (the methods and the economic and social aspects),
- metrological robotics (robots for measuring and control purposes),
- robotics of locomotion machines (single- and multi-legged, wheeled, crawling, and wheeled-foot machines),
- medical and psychotherapeutic robotics (robots for surgical and prosthetic and psychotherapeutic purposes),
- industrial robotics (robots in the machine, food, paper and mining industries),
- non-industrial robotics (robots for underwater, military and rescue works, and in the space),

- service robotics (robots for office and cleaning works),
- micro-robotics (miniaturization of robots).

The concept of 'robotics' is very closely related to the concept of a 'robot'. First mechanisms came into being at the times of Plato (circa 400 BC), when, according to the historical sources, first automatic machines (toys capable of making simple movements) were created. In turn, the water clock is considered the first robotic mechanism. It was invented probably around 250 BC and was intended to turn the hourglass. It obtained the name of a robotic device thanks to the cyclically repeated action to which it was intended. Rapid development of movable mechanisms started in the Middle Ages, when constructors were building up mechanically complex clocks and movable figurines driven by either water energy, springs or gravitational forces. It is easy to notice that an attempt to recreate the movements of humans and animals was the common feature of all created mechanisms.

Where did the word 'robot' really come from, used as a term to define a certain type of machine?

'Robot' means a worker in the Czech language. In 1920, the Czech writer Karel Čapek used the word 'robot' to describe artificial, intelligent creatures deprived of human feelings. In his play titled 'R.U.R. – Rossum's Universal Robots', Čapek created a vision of the world in which the only way to survive is to strive for technical development, and anything that does not serve the progress is not important.

Čapek wrote: *'And to manufacture artificial workers is the same thing as to manufacture gasoline motors. The process must be of the simplest, and the product of the best from a practical point of view (...). And what sort of worker (...) is the best from a practical point of view? (...) The one that is the cheapest. The one whose requirements are the smallest. Young Rossum invented a worker with the minimum amount of requirements. He had to simplify him. He rejected everything that did not contribute directly to the progress of work. In fact, he rejected man and made the Robot.'*<sup>1</sup>

The term has been adopted all over the world. Today the word 'robot' refers to any technical device which is intended to replace some of human manipulative and locomotive functions and has a certain level of machine intelligence. People's aspiration has always been to create a machine mirroring their own image (a humanoid). With the development of technology, robots were equipped with increasingly better, more modern energy sources, sensors, actuators and control devices. At the beginning of the 20th century, when people began using electricity at a large scale, the robots were equipped with microphones, photocells and loudspeakers,

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<sup>1</sup> Čapek, Karel: 'Rossum's Universal Robots', translation: Paul Selver and Nigel Playfars.