

Chapter 29

Mobile Robotics

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ABSTRACT

Mobile robots are increasingly becoming the subject of research and a very important area of science, so that the 21st century will be named as the century of development of service robots. Mobile robots are an excellent “System Engineering” research example because it includes a lot of scientific research, namely in the area of mechanical engineering, electrical engineering, electronics, computer science, social science, and more. As mobile robots perform their tasks in the same environment as humans, mobile robots should have the abilities that people have. The mobile robots should be able to recognize faces, gestures, signs, objects, speech and atmosphere. Successful realization set of tasks results in bypassing obstacles without collision and destruction in the shortest possible time and distance. They should communicate with people on the basis of emotion. The range of mobile robots application is huge. Mobile robots have found application in many areas, but this chapter will cover the following distribution of mobile robots areas of application: medicine, agriculture, defense, logistics, construction, demolition, professional cleaning, space exploration, education and scientific research. The price of robots is declining steadily and they are coming into ever wider use. It is only a matter of time before robots become available to the population of today’s high school students, just as it happened with computers and cell phones.

INTRODUCTION

In the early fifties, more precisely in 1951, Raymond Goertz made the first telecom operator – the hand that “dealt” with radioactive material and was developed for the Atomic Energy Commission. The first robot that could be programmed was also made in fifties – in 1954 – and its constructor was George Dovel, who had his methods patented. Two years later, George Dovel and Joseph F. Engelberg started Unimation Inc. company, which was the first company to deal with robots. In the sixties, precisely in 1962, the first robot was installed on the production line of the General Motors Company. The first robot arm controlled by computer was made a year later in the Los Amigos Hospital in California. Also, 1964

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was a significant year when it comes to education in robotics. In fact, Artificial Intelligence (AI) research laboratories were opened at MIT, Stanford Research Institute, Stanford University, and the University of Edinburgh. Japan, which is among the leading countries engaged in robots manufacturing nowadays, imported its first robot from the United States. In 1968, Kawasaki Heavy Industries Company started production under the license of Unimation Company. At present, robots have a wide application – probably wider than it seems. They are used almost from the beginnings of space exploration (at the spacecrafts Viking 1 and 2, as we have seen) and, of course, to this day. NASA used robots to explore Mars. Similar vehicles were developed after the success of the Pathfinder mission, and those were able to travel 100 meters per day on each Martian day while carrying instruments used to explore the Red Planet. Robots are used a lot by different armies, but probably the biggest progress in this aspect was made by the United States army. Great number of robots is used in potentially dangerous situations. You can see on TV how robots manipulate with bombs or go through minefields. One of these is the Mini Andros, which has two “arms” and can climb and descend the stairs. It is equipped with three video cameras, and thus is useful in exploring new areas, such as large houses where there are dangerous people. Special versions of this robot are equipped with the radiation detector. Nowadays, robots are applied at home, for vacuuming, laundry, surveillance, etc. Lego Mindstorm robots are extremely popular. The project Lego Mindstrom itself was launched fifteen years ago by Lego and Massachusetts Institute of Technology. As the company Lego claims, a user who knows how to use a personal computer can make his first Lego robot up in an hour. Robots are also applied in sport: it is old news that some kind of RoboCup competition is organized every now and then. By 2050, RoboCup project aims to develop a complete humanoid soccer team, claiming it can certainly beat the current world champions. Nowadays, robots and artificial intelligence coexist and thus it is hard to imagine a present-day robot not being some kind of artificial intelligence. As with artificial intelligence, the question with robots, androids, as well as fusion of all three life forms is what if they get out of control? According to Hans Moravec, one of the robot/AI experts, robots will become as smart as a man by 2040, and we are sure they will be much smarter than many of the inhabitants. Despite pessimistic and paranoid predictions, Moravec is not worried. It is considered that robots and artificial intelligence will actually extend the life of man and improve the quality of life in general. As it seems, evolution has led man nearly to the degree that it can build a being as intelligent as himself! We live in a time that will in the distant future undoubtedly be remembered for many things, and it would be a shame we are not aware of it now as well. It is sufficient just to look around and realize that what we only used to read or watch is already around us. Mobile robots’ application increases daily, so they are used in medicine, defense, agriculture, civil engineering, logistics, rescue and safety, professional cleaning, inspection and maintenance, space exploration, education, household, etc. It can be claimed there is no segment of a man’s life in which mobile robots are not incorporated. With fast computerization of all forms of business and a vast expansion of the Internet, it is expected that there will be a big gap in the 21st century between those technologically advanced and those who have lost their connection with modern times. Most people are not aware of the extent to which robots are already represented within their lives. Their cars and computers are almost certainly partially assembled with the help of a robot. As it has been mentioned, the price of robots is steadily declining and mobile robots are increasingly coming into wide use (Chen, Chen, Chase, 2009; Karabegović, Doleček, 2012; Doleček, Karabegović, 2002; Angeles, 2007; Mulfer, 2010; Doleček, 2015; Teich, 2012; Steckelberg, 2007).

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