

# Chapter 6

## Professional and Personal Service Robots

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### ABSTRACT

*The short history of service robots with its precursors is presented. The definitions of service robot are discussed with some statistical data. The history of service robots summarizes the ancient period with robot precursors, the middle ages and the period of industrial revolution. The representative examples of different kinds of service robots built in the XX c. and XXI c. are given. The article is concluded focusing on the future trends.*

### BACKGROUND: WHAT IS A SERVICE ROBOT

Till year 2012 the term service robots had no strict officially accepted definition, they represented very different structures, abilities and considered many different application.

By the end of 90s the International Service Robot Association (ISRA) issued following working definition of service robots: “Machines that sense, think, and act to benefit or extend human capabilities and to increase human productivity” (Pransky, 1996).

International Federation of Robotics (IFR) gave following provisional definition: “A service robot is a robot which operates semi- or fully autonomously to perform services useful to the well-being of humans and equipment, excluding manufacturing operations”.

And it continued with explanation:

*With this definition, manipulating industrial robots could also be regarded as service robots, provided they are installed in non-manufacturing operations. Service robots may or may not be equipped with an arm structure as is the industrial robot. Often, but not always, the service robots are mobile. In some cases, service robots consist of a mobile platform on which one or several arms are attached and controlled in the same mode as the arms of the industrial robot.*

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In 1999 International Federation of Robotics (IFR) and the United Nations Economic Commission for Europe for the first time included service robots in statistical reports. The fast development of this class of robots caused, that in 2008 IFR decided to split their World Robotics Yearbook containing robot statistics into two volumes, with one dedicated only to the service robots.

Effort on terminology unification was started in 1995 by the United Nations Economic Commission for Europe (UNECE) and IFR, it resulted in novel ISO-Standard 8373 definition which had become effective in year 2012, it states:

*A robot is an actuated mechanism programmable in two or more axes with a degree of autonomy, moving within its environment, to perform intended tasks. Autonomy in this context means the ability to perform intended tasks based on current state and sensing, without human intervention.*

A *service robot* is a robot that performs useful tasks for humans or equipment excluding industrial automation application. Note: The classification of a robot into industrial robot or service robot is done according to its intended application.

A *personal service robot or a service robot for personal use* is a service robot used for a non-commercial task, usually by lay persons. Examples are domestic servant robot, automated wheelchair, personal mobility assist robot, and pet exercising robot.

A *professional service robot or a service robot for professional use* is a service robot used for a commercial task, usually operated by a properly trained operator. Examples are cleaning robot for public places, delivery robot in offices or hospitals, fire-fighting robot, rehabilitation robot and surgery robot in hospitals. In this context an operator is a person designated to start, monitor and stop the intended operation of a robot or a robot system.”

The above classification considers the user type (professional versus personal) as classification criterion, another possible robots categorisation takes into account the type of acting environment (Zielinski, 2010):

- **Industrial Robots:** These robots are operating in a fully structured environment. For example, in the work cell all devices are strictly cooperating, so it is sufficient that the robot control is position based, and therefore not many external sensors are needed;
- **Personal Service Robots:** These robots are operating in a quasi-structural environment, created by man for its own purposes. It means that the surrounding is not exactly adjusted to the needs of the performed job (e.g., regular home, waiting hall, office, restaurant);
- **Field Robots:** These robots work for the group of anonymous recipients in the natural environment which is fully unstructured - for example: the forest, sky space, sea bottom, ruins, mountains. Field robots represent the category of *professional service robots*.

In general, the actions of service robots are determined by the information gathered by external sensors.

With the fast development of various robots and widening its application areas still it is valid the observation stated by Joseph Engelberger - the “father” of robotics: “I can’t define a robot, but I know one when I see one.”

Joseph Engelberger predicted that the service robots one day become the largest class of robot applications, outnumbering the industrial uses by several times, this is becoming the fact.

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