A Brief Introduction about Service Robots

Definition and Purpose

According to Wikipedia, service robots basically assist human beings, especially by performing a job that is dirty, dull, distant or repetitive. In a word, performing a job that we dislike. And based on ISO standard, a robot requires a degree of autonomy, which means it has the ability to perform intended tasks based on present state independently. When it comes to service robots, it range from partial autonomy to fully autonomy which involves no human robot intervention.

At present, service robots are divided into several categories according to their personal or professional use.

Introduction for Existing Service Robots

The possible applications have been widely spread nowadays, and as the definition of Service robot is ambiguous there are a lot of categories. This introduction will cover areas include domestic ones and scientific ones.

Domestic Robot

Domestic robots perform tasks that human regularly performed in daily life, such as cleaning. This kind of robots will work in many situations as if the owner has disabilities or too busy to do these works. And these robots have urgent market demand as there are more and more aged people who can't perform daily tasks. The big category is divided into several small ones, include indoors, outdoors etc.. And even social robots are also considered domestic robots sometimes.

For this kind of robots, there are several examples.

The earliest kind of domestic robots is called "HERO", which first sold in 1980s. This is the most popular kind of robot at that time. HERO1 is controlled by onboard computer, and because the limit of hardware, the robot had got a RAM of only 4KB. When the robot first came out, the price is $2,500, and that's about $6,300 now. So it's quite obvious that the robot is not very affordable for most family at that time. As a result, only about 14,000 units had been sold in 8 years. And even though this robot is considered domestic robots, it's actually used for educational purpose.

Roomba is a series of robots focusing on vacuum cleaners, and it started quite a long ago in 2002. This series of robots are mostly in disc-shape. So that means the bulk of the robot is not that big and the mass is lighter. To fulfill the responsibility of been a vacuum cleaners, it had sensors which can detect obstacles and dirty spots on the floor. And these robots have a pair of brushes, rotating in opposite directions, to pick up debris from the floor [1]. In most models, the brushes are followed by a squeegee vacuum, which directs the airflow through a narrow slit to increase its speed in order to collect fine dust. For the earlier series, they can only perform simple cleaning tasks. Nowadays, as embedded computer in conjunction of Roomba Open Interface, some can perform tasks that are more creative.

Scientific Robot

Quite similar to the domestic ones, Some scientific robots are used to so simple but repetitive jobs, such as works performed by gene samplers, while some perform job that cannot be accomplish by human under present situation of technology which is named fully autonomous scientific robots.

Some people consider scientific robots as labor of science. The name basically shows why these robots are needed. Apart from the limitation of human body. The process of many scientific research is bland. The most typical one is the invention of light bulb. It's almost known to everyone that Edison experimented with more than 2000 kind of materials which can be perfectly performed by robots. Even almost 200 years has past, the secret of experiment has never changed. So if replaced by robots, it will save so many time, that scientists can actually devote into other territory.

For complicated jobs, the example comes to AUV sentry. *Sentry* is a fully autonomous underwater vehicle capable of exploring the ocean down to 6,000 meters (19,685 feet) depth. *Sentry* builds on ABE's success with improved speed, range, and maneuverability. Sentry's hydrodynamic shape also allows faster ascents and descents [2].

There is one example of this kind which I find quite interesting. According to a report in 2009, a robot named Adam made a novel scientific discovery all by itself including the process of formulating hypotheses, designing and running experiments, analyzing data, and deciding which experiments to run next. To me, the process of decision making is the most impressing thing in this case.

Ideal Service Robots

As is mentioned before, all kinds of service robots performed works to assist human beings. But nowadays, most service robots are limited to a specific area, which means you can't expect a cleaning robot to do laundry for you. So if you want to have considerate service, you will have to apply many different types of robots in your home. While the spaces may not stands for so many of them, dealing with lots of different robots can be really annoying. So the first requirement I considered important is the performance of generalization. Even to scientific areas, things are the same. If one single robots can perform different tasks, a lot more people will consider using it.

Secondly, I would say the mass and dimensions. A more acceptable volume will make robots been applied to more circumstances. The development process of computer is a good example. When the first computer came out, it was as big as two teaching buildings. So as a result, very few people are using it at that time. And as time went by, computers became personal computers, the volume become smaller and smaller. As a result, more people came to use it. Finally, when the smart phones came out, almost every got a entrance to computer (Here we consider smart phones as micro-computer). Standing at my side, the process of robots should be the same. As the size goes smaller, user group goes larger.

Finally, there is still one point I considered important, which is the efficiency. It shouldn't take too long for a robot to perform tasks. Most people now are working in a fast mode, which requires the robots to have the same efficiency. I think this requirement is especially important in daily tasks. If the aim is to assist people with disability, or even further, to serve patients, their requirement need to be satisfied in a short period of time. And this also means, these service robots are not allowed to have frequent breakdown. In circumstances mentioned, a breakdown of these robots could be deadly.

In general, ideal service robots need to have small mass and volume and the ability to perform different needed tasks with great efficiency. Of course, prices are also important, or to be precisely, the cost performance. One reason why smart phones are widely used is people can afford it. And thing works in the same way when it comes to robots.

Based on demand, service robots are needed as the price of human resource are getting higher, so I think the future of service robots is bright.

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1. Roomba https://en.wikipedia.org/wiki/Roomba#cite_note-1↩

2. AUV sentry https://www.whoi.edu/what-we-do/explore/underwater-vehicles/sentry/?pid=38095↩