**IT Technologies - Robots**

**What does it do?**

The field of robotics has come a long way since its humble beginnings. The earliest creation of modern robots has been attributed to George Devol. He invented a programmable calculator called “Unimate” in the early 1950s; the name is derived from the phrase “Universal Automation” (cs.stanford.edu, n.d.). The actual word “robot” was originally derived from the Czech noun “robota” which means “labour”, and is the invention of cubist painter and writer Josef Capek (Adelaide Robotics Academy, 2016).

Before robotics is discussed it would be wise to have an understanding of the definition of the word. Robotics is a “branch of mechanical engineering, electrical engineering and computer science that deals with the design, construction, operation, and application of robots, as well as computer systems for their control, sensory feedback, and information processing” (Wikipedia, 2022). Why is this important? Essentially, the field of robotics is attempting to develop machines that are capable of replacing humans and their actions. As to the various contexts within which this might be important, we need to consider where development is already taking place.

Health care, agriculture, food preparation, manufacturing and unfortunately the military sector are the top five applications (Ohio University, 2018). Some others that make the list appear to be e-commerce, including warehousing and shipping, the hotel industry, fashion, and retail (Martina Große Bley, 2018). Robots are also being developed to be companions, in various contexts, from being able to provide friendship for seniors (the Guardian, 2021) to the provision of relationships of a more intimate, even sexual nature (TFlex Tech, 2020).

To elaborate, robots are being utilized in work practices that are dangerous and/or repetitive. Industries in which speed and accuracy in completing work processes are an important consideration have also seen a wide adoption of robots. Humans being primarily social creatures crave companionship, and robots have started to fill a remarkably large niche here as well. It is important to remember that the umbrella term “robots” includes machines that are heterogenous in nature, and the form and function of which will heavily depend on their particular application.

In the realm of retail Amazon currently leads the pack. Amazon warehouses and distribution centers use 200,000 autonomous robots. Amazon scout delivery bots are also currently being rolled out, replacing the need for delivery drivers (Digital Engine, 2021). The state of the art in warehousing bots however, is “Handle”, by Boston Dynamics (Boston Dynamics, 2019). Handle is a manipulation robot designed for logistics. Handle autonomously performs pallet building and depalletizing. The on-board vision system on Handle tracks the marked pallets for navigation and can find and place individual boxes.

The best example in manufacturing by far is that of Elon Musk’s vehicle production lines. Musk created 10 of the world’s largest manufacturing robots for his Tesla facilities. Being a completely automated process, it takes just three days to build an entire Tesla vehicle from scratch (Digital Engine, 2021).

In health care, AI and robotics are being used in early detection, diagnosis, decision making and treatment of illnesses, including the use of the “Internet of Medical Things” (IoMT) (PricewaterhouseCoopers, 2017). As an example of early detection, the use of AI is enabling the review of mammograms at a thirty times quicker rate, with 99% accuracy. Google’s “Deep Mind Health” technology combines machine learning and systems neuroscience to construct learning algorithms which can be used in diagnosis. Robots have been used for a long time in the realm of medical science; surgical robots now exist which can complete medical procedures without human input. The Hinotori Medicaroid is a good example. It does not have a narrow specialization and can perform a wide range of operations (Pro Robots 2022).

Cooking and catering/service bots have been proliferating within the food industry. The “Moley Robotic Kitchen” has robotic arms attached to the ceiling, and can cook more than 5000 recipes. The arms are capable of turning on appliances, picking up and putting down saucepans and spatulas, and can also stir, whisk, and flip. Robotic waiters such as those sold by Robowaiter (n.d.) are autonomous service bots that have “Intelligent obstacle avoidance”, including LIDAR, depth vision, stereo vision (RGBD), collision sensor, and infrared ranging depth vision.

Examples of agricultural applications include drones that use AI to pick only fruit which is ripe and avoid collision with each other, while other drones are being used for seeding, spraying and frost control. Large autonomous harvesters can also pick ripe produce but on a large scale. Seeding and weeding robots use GPS technology to navigate their environment. Another type of bot can analyze the growth of crops and detect diseases due to the application of machine learning (Interesting Engineering, 2021).

Companion robots come in a wide variety of shapes, sizes and purposes. At one end of the spectrum there are bots such as “Buddy the Emotional Robot” (BUDDY The Emotional Robot, n.d.). He is presented in a cute package with “gentle curves, big sparkling eyes and a smile radiating the atmosphere, thus creating empathy and the desire to interact”. This bot is a personal assistant, is interactive and can provide entertainment, and has the capacity to connect to your smart home devices.

Solidly at the other end of our imagined spectrum lie the bots designed for intimacy and the provision of sexual services. Male and female bots are available – and depending on how much a potential customer is willing to spend, they come prepackaged with different functions. They usually come with some AI on board, and the customer can pick from a range of personalities. Some are also apparently able to learn from conversations with their user and memorize information, for example their name and interests. Face recognition and automatic tracking are in the works for the future (Future of Sex, 2022).

The field of robotics is multidisciplinary, and therefore the overall pace of development will depend on related disciplines such as software engineering, Artificial intelligence, motor control, kinematics and machine vision. The application of these developments will then widen the overall vision of what is possible in robotics.

**What is the likely impact?**

Throughout history, advancements in technology have always had an effect on the way jobs were executed, and even whether jobs would continue to be performed by humans at all. We can consider, as examples, jobs such as bowling pin setter, human alarm clock, or pre-radar listener (Ethical Jobs, n.d.). The development of machines to replace humans often resulted in those jobs being performed more quickly and with increased accuracy, and probably at a lower cost – a win-win situation for the former employees of the now unemployed humans. Modern developments in robotics are no exception.

In the case of Amazon, their 200,000 bots work with 300,000 humans. The bots have cut the rate of mistakes in half, and have increased the productivity of workers by 400%. It is entirely possible that Amazon will phase out more of its human workers in the very near future. The introduction of delivery drones and automated regional distribution centers in the future might also spell disaster for Amazon employees (Digital Engine, 2021).

Elon Musk’s automated Tesla production lines have meant that a smaller human workforce is being retained. Human workers cannot compete with the speed of the automated process, which sees a new part being made every six seconds. These production lines are making Musk the richest man in the world (Digital Engine, 2021).

Despite the above examples, the research shows that the adoption of robots and automation in the workforce is not all doom and gloom (The Century Foundation, 2019). Apparently, there is insufficient evidence to suggest that the use of robots is leading to widespread job displacement. The seemingly obvious effect that industries with larger adoption of robots see increased loss of human employment is negated by the displaced human employees being able to find work elsewhere; the net losses are balanced by employment opportunities. The key takeaway however (one that is not being mentioned) is that these people might have to retrain for a different industry and will suffer from the loss of income for some time.

As technology and economic considerations drive the adoption of robots the way some jobs are executed will change drastically, and some may even disappear altogether (at least as far as humans are concerned). Currently, this is happening the most in the industries most affected by the adoption – particularly e-commerce, manufacturing and agriculture. To put it differently, the industries with most change will see the biggest worker displacements.

We should also look at the impact of developments with the various companion bots. Besides the obvious potential profits that may be accrued for this industry, there are ethical and psychological considerations.

In a study of an elderly group of residents of an aged care facility, residents that interacted with a companion robot had significant decreases in loneliness over the length of the study (Robinson et al., 2013). A meta-analysis also found benefits in randomized controlled trials performed with dementia patients. Agitation and depression levels decreased significantly (Lu et al., 2021). Robots are also able to assist with emotional, physical and social rehabilitation (Chaffee, I. 2017).

Humans have been described as ultrasocial animals (Prescott and Robillard, 2021), and companion bots have been filling a need for the more neuro-typical among us as well. Apparently, people “can spontaneously form socio-emotional bonds with robots, even ones not designed to elicit social behavior”. Because robots can act as companions, they are able to decrease the loneliness and social isolation a person might feel, and some suggest that they may be able to catalyze interaction with other humans. Critics argue that robot relationships could decrease humans’ ability to socialize with other humans, as well as the desire to do so, because robot relationships are artificial and non-challenging.

What will the future bring? Can we imagine the continual “live” presence of a robot? Will everyone have a robot companion? "Imagine a companion also knowing what news events you would be interested in, how to update you on your sports team, tell you when you have a message from your husband or wife, or even diagnosing medical problems so both yourself and doctors save time” (London, L., n.d.). With the potential of having the perfect companion manufactured to our specifications, will humans want to spend time with other humans?

**How will this affect you?**

With regard to job displacement on a personal level, I don’t think these changes will have an effect – I (as many of us are) am retraining in software development, and so hopefully I am able to stay ahead of the bow wave of the change as I maintain employment in the future. This will not affect my family a great deal, as my parents are too old, and my children are too young; they are still at school, and will adapt to future technological revolutions.

In terms of the social impacts of the adoption of companion robots to the fullest extent of what is expected, that change has not quite arrived yet. The technology, AI, and other required developments are not substantial enough for these bots to make a substantial mark on society. I do believe, however, that in the future robots will have a great impact on how we live our lives and how we relate to each other.

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