**Robots**

**What does it do?**

There is currently a vast array of new developments going on in the world of robotics, but the underlying goals are very similar. It’s all about a applying mechanical problem solving to real world working environments. Given the broad nature of the topic, I’ve chosen to talk about two significant developments; Soft robotics and Collaborative robots.

Soft robotics take advantage of the mechanism of organisms and aim to emulate them in a non-rigid way by using materials with the properties of living tissue (e.g.; stretches and squashes rather than pivots). Currently soft robots use fluids such as air pumped into small pockets which expand under pressure similar to balloon inflating and deflating. Via stiffening part of the material, the machine can be made to move in a particular direction, similar to the motion of an actuator or piston. (François Schmitt, 2018)

Soft robots are typically created via an additive process (e.g.; adding material to a mould, rather than cutting it down). Soft robots can distribute force evenly across the surface. This enables ‘off the shelf’ solutions such an FDM 3D printing to be used in the manufacturing process reducing costs. (Dylan Drotman, 2019)Advances are being made in the design of the robots so that one single tube of compressed air can be used to power multiple motions.

The applications for Soft Robots are vast, ranging from climbing robots to wearable robots but the most significant developments will be in the biomedical field. Soft robots enable a surgeon to operate in a manner that reduces trauma and pain due to their non rigid nature. Soft robots can pickup more fragile objects without the use of sensors and complex mechanical parts. (Team, Robotics Online Marketing, 2018) (Runciman, Mark; Darzi, Ara; Mylonas, P., 2019)

Collaborative robots known as Cobots, are robots that can work in conjunction with human workers. Robots in the workplace, do their work fenced away from human workers due to safety issues such as collisions/impacts (robots hitting people), but Cobots have an array of sensors which enable them to work alongside human workers. This allows for the human workers to guide the robots through a particular task rather than go through the rigours of complex robotic programming which means that lower skilled human workers can setup the Cobots to perform a new task quickly. (Zimmermann, 2019)

Robots today, are more suited to doing monotonous repetitive tasks that a person would do less precisely or which could injure or endanger humans if they were to perform that particular task. The advent of Artificial Intelligence (AI) in collaboration with sensors means that the robots are able to develop datasets from sensor data, that will enable robots to learn and improve on a task. An example could be an object which isn’t precisely where the robot expects it to be, the AI and data will assist the robot in working out where the object will be and the robots will learn to expect it to be in that location. (Vargas, 2018)

The development of each of these systems are not mutually exclusive. They are both aiming to improve safety and assist workers in a similar capacity to a tool, rather than replace them. They both aim to use sensors to give the robot feedback on its environment.

Advancements in computing hardware such as Nanomagnetic Logic (Crawford, 2012), memory and sensors enable more complex tasks to be performed by machines at less cost and advancements in the engineering of materials enable robots to be built and constructed at lower cost. Due to these factors, robots are likely to become faster and more accurate.

Soft Robots and Cobots are ultimately advanced tools. Just as a spanner tightens a nut, these robots enable precise and repetitive tasks to be performed with ease. Soft Robots and Cobots will one day come together to provide a safer and more efficient working environment.

**What is the likely impact?**

The proprietary nature of the current systems could mean that the robotics companies could hold their client’s small business to ransom. This is very much a danger associated with outsourcing outlined in Volodymyr Ostapchuk’s article; ‘Outsourcing Benefits and Ways to Mitigate Possible Risks’, Volodymyr *Ostapchuk* (2020) states that companies could potentially increase costs of their services, and this is no different with Robotics companies. Andra Picincu also mentions that should the company (in our case the robotics company) stop support of that product (robot) the company using the robot could experience a significant loss of productivity. (Picincu, 2019)

If a business were to become reliant on a particular Cobot and Soft Robot company who own the patent the demands of that company would affect the business.

When the benefits of Cobots become obvious to businesses, they will begin to appear in work warehouses and factories and Soft robots will begin to appear in many applications such as surgeries, espionage, food processing, search and rescue and manufacturing. According to Carlos Gonzalez, 34% of all Industrial robots sold will be Cobots by 2025 (Gonzalez, 2017)

Soft Robots will be used in places where a traditional robot can’t, such as the human body. Soft Robots will enable surgeries to be done more much quickly and accurately via soft robotic endoscopy (a surgical camera which can traverse the human body without doing damage), reducing the time required (Mark Runciman, Ara Darzi, and George P. Mylonas - 2019).

Soft Robot Search and rescue could be used in areas where the rigid robot equivalent would be more expensive. We could potentially dispose of the Soft robot if required as it would not be as expensive. (Brown, 2018)

Another application for Cobots and Soft Robots could be in the task of repairs. A robot could be designed to repair machines. The nature of the soft robots could allow for a robot to squeeze through and manoeuvre through the gears of a larger machine and reach areas difficult for human workers to access.

**How will this affect you?**

3D printable designs in soft Robotics mean designs can be downloaded and created. A variant of Soft robots will become more available to hobbyists and enable people such as myself to create simple robots for performing tasks. It would be possible for a relatively cheap DIY robot kit to be created at home. (Holland, Dónal; Walsh, Conor J.; Herman, Max ; Berndt, Sara, 2018)

Due to the ability of Soft Robots to grip more fragile objects and significant application for them is food. Fewer humans in the processing chain mean that things like disease are no longer a problem. (Owen-Hill, 2017) This would mean that it’s harder to spread something such coronavirus, which would allow employees to continue work during a quarantine.

These robots could affect me in mostly in an economic way. Soft Robots Cobots could become a standard in most work places which require manual labour. The deployment of Cobots can increase productivity due to their ability to free human workers from repetitive tasks, meaning they can perform more human specifics tasks. (Hern, 2019) Less expensive manufacturing costs may result in Cobots result in cheaper products.

Cobots will start to appear in hospitals performing tasks such as Neurosurgery (manoeuvring a microscope to give surgeon a better view) and Bone Surgery (able to cut bone with a cold laser with no contact) (Owen-Hill, 2019). Another example of this is the da Vinci system. It allows are surgeon to perform more precise actions by capturing the hand movements of the surgeon and mimicking them with smaller robotic mechanisms. (Roberge, 2019)

Thanks to developments in 2D and 3D camera technology and AI, we may start to see robots in the home become a reality. A robot called Aeolus is designed to do all the things most people envision a household robot doing, such as house hold tasks like mopping up, sweeping vacuuming and fetching beverages (Vyas, 2018). While household robots like Aeolus don’t fit the traditional definition of a Cobot I would argue that they’re similar to a Cobot in that they free people up to do more human skill intensive tasks in that same way that Cobots do in the workplace.

In conclusion these technology aid peoples in the real world by assisting people and we can expect a more optimistic future.

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