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Role of Robots in Collaborative Work of Employees and Machines Inside Warehouses

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Abstract

Introduction

Collaboration means the action of working with someone to produce or create something. Working with others to do a task and to achieve shared goals. Flexibility is an essential element of collaboration. Collaborative robot specifically designed for direct interaction within a defined collaborative workspace.(Beaupre)

Collaborative robots or cobots which are meant to work alongside humans to help them complete various tasks. cobots can also lower operating costs and expenses for many other organizations. Amazon, has outfitted their warehouses and fulfilment centres with smart robots and components to help personnel do their work faster and better.

Literature Review

Case studies presenting real-world collaborative applications of different collaboration intensity can be found on the IFR's website (https://ifr.org/casestudies/collaborative-robots).

Applications in which the robot responds in real-time to the motion of a worker (altering the angle of the gripper to match the angle at which a worker presents a part, for example) are the most technically challenging. Since the robot needs to adjust to the motion of the worker, its movements are not completely predictable and therefore the end-user must be sure that the full parameters of its potential scope of motion meet safety requirements. Examples of responsive collaboration in industrial settings are unlikely to appear soon in most manufacturing sectors, which rely on precision and repeatability to achieve productivity gains.

Role of Robotic technology inside warehouses

The businesses have been integrating Robots into their operations.

The International Federation of Robotics (IFR),[4] a global industry association of robot manufacturers and national robot associations, recognizes two main groups of robots –

1) industrial robots used in automation (in an industrial environment) and 2) service robots for domestic and professional use. Service robots could be considered to be cobots as they are intended to work alongside humans. Industrial robots have traditionally worked separately from humans behind fences or other protective barriers, but cobots remove that separation.

Cobots can have many uses, from information robots in public spaces (an example of service robots),[5] logistics robots that transport materials within a building,[6] to industrial robots that help automate unergonomic tasks such as helping people moving heavy parts, or machine feeding or assembly operations.

The IFR defines four levels of collaboration between industrial robots and human workers:[7]

Coexistence: Human and robot work alongside each other without a fence, but with no shared workspace.
Sequential Collaboration: Human and robot are active in shared workspace but their motions are sequential; they do not work on a part at the same time.
Cooperation: Robot and human work on the same part at the same time, with both in motion.
Responsive Collaboration: The robot responds in real-time to movement of the human worker.
In most industrial applications of cobots today, the cobot and human worker share the same space but complete tasks independently or sequentially (Co-existence or Sequential Collaboration.) Co-operation or Responsive Collaboration are presently less common.

IFR ACTIVITIES

Predictions of growth in the collaborative robot market vary widely and some do not distinguish between the manufacturing and professional service sectors. The IFR therefore aims to produce reliable statistics and forecasts on the market for collaborative industrial robots, based on sales figures of robot suppliers. The IFR is preparing a survey for comprehensive reporting in 2019, based on the two types of collaborative robot detailed above. Preliminary results show that, despite all the hype, less than 4% of the 381,000 industrial robots globally installed in 2017 were cobots.

[DemystifyingCollaborativeIndustrial Robots,published byInternationalFederation of RoboticsFrankfurt, GermanyDecember 2018]

TYPES OF HUMAN-INDUSTRIAL ROBOT COLLABORATION

Human-industrial robot collaboration can range from a shared workspace with no direct human-robot contact or task synchronisation, to a robot that adjusts its motion in real-time to the motion of an individual human worker (cf. Figure 1).

Currently, IFR members find the most common collaborative robot applications are shared workspace applications where robot and employee work alongside each other, completing tasks sequentially.

Often, the robot performs tasks that are either tedious or unergonomic – from lifting heavy parts to performing repetitive tasks such as tightening screws.

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Robots can efficiently handle repetitive tasks unlike a human worker.Humans on the other hand, have unique skill of flexibility.This combination of both Human worker and Robots can greatly improve performance.Installation of Robots have improved the quality which in turn has increased the productivity.Apart from working side by side with human employees Robots can handle larger volumes of goods per day.It helps in picking items, particularly ones whose bins are on shelves too high for workers to reach by themselves.

Robots reduce physical strain on human staff by assuming more dangerous and stressful tasks.

Autonomous Mobile Robots(AMR) deliver inventory throughout vast warehouses by using sensor technologies.These robots reduces repetetive tasks that lead to human errors.cobots acts as mobile storages and help speed order fulfillment by delivering picked orders to other stations throughout the warehouse.

Goods to person technology(GtoP) delivers items to stationary pick stations where human employees fulfill orders.Robotic arms can lift,move and turn items like humans which is helpful in palletizing,picking/packing and recieving/storage operations in distribution centres and warehouses.

Challenges in implementing Drones and Robotics

Robots will not encourage the warehouse employment rates.when it comes to labour intensive works robots could replace human workers which can lead to unemployment in the near future.

Cobots are also trained differently than traditional industrial robots. Rather than programmed to a specific set of steps using programming tools, many cobots are trained by humans manipulating the arms and

training by example. This video from Rethink Robotics does a great job showing this. Humans control the bot by physically moving it around, with the cobot remembering the steps and perhaps even the end goal of what is being accomplished, and then repeats those steps, optimizing them to achieve increasingly better outcomes.

Conclusion

In many ways, cobots are the hardware version of augmented intelligence that we talk about in the software world. Instead of replacing humans with autonomous counterparts, cobots augment and enhance human capabilities with super strength, precision, and data capabilities so that they can do more and provide more value to the organization. Pioneered by robotics company KUKA and further developed by Universal Robots and then Rethink Robotics (now defunct), cobots have increased their footprint in industrial settings both large and small.

Future research

FUTURE TRENDS IN COLLABORATIVE ROBOTICS[DemystifyingCollaborativeIndustrial Robots,published byInternationalFederation of RoboticsFrankfurt, GermanyDecember 2018]
The market for collaborative robots is still in its infancy. End-users and systems integrators are still gaining experience on what works and doesn't in the design and implementation of collaborative applications. Technology developments in sensors and grippers hold promise for expanding the range of actions that the robot end-effector can perform. Programming interfaces will continue to become more intuitive, not just for cobots, but also for traditional industrial robots.

Industries are continually looking for new technologies to lower production costs while improving the quality of their products and increasing productivity. The adoption of collaborative robots, or cobots, is one of the ways to achieve these goals. Driven by the trend of industrial automation, cobots are a fast-growing segment within the broader robotics market. Between 2017 and 2020, cobot installations worldwide doubled, from around 11,000 in 2017 to 22,000 in 2020.

The Robotics Market was valued at USD 27.73 billion in 2020 and is expected to reach a value of USD 74.1 billion by 2026, registering a CAGR of 17.45% over the forecast period primarily owing to the onset of industry 4.0, digitization, and other advances in the field of robotics that are making flexible production

concepts as well as easy domestic and personal use The global Robotics market (henceforth referred to as the market studied) was valued at USD 27.73 billion in 2020 and is expected to reach USD 74.1 billion by 2026, registering a CAGR of 17.45%, during the period of 2021-2026 (henceforth referred to as the forecast period).

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