Collaborative Robotics

Overview

A flexible form of human-machine interaction where the user is in direct contact with the robot while he is guiding and training it. A collaborative robot, or "cobot," is a robot that can safely and effectively interact with human workers while performing simple industrial tasks. However, end-effectors and other environmental conditions may create hazards, and as such risk assessments should be done before using any industrial motion-control application.

Applicable Industries

- Aerospace
- Automotive
- Electronics & Embedded Devices

Applicable Functions

- Information Technology
- Production - Manufacturing
- Quality Assurance

Case Studies

Remote operation of deployed teleoperated robots - Sarcos

Remote operation of deployed teleoperated robots (Guardian™ S) to perform complex tasks and video mapping and monitoring
in areas where human safety is at risk.

Market Size

Estimate A

$100 million (2015, Global, Collaborative Robots), $1.0 billion (2020)

Source: Allied Business Intelligence

Estimate B

Collaborative robots market worth $4.28 billion (2023)

Source: Markets and Markets Research

Estimate C

Collaborative robots market expected to reach $6.77 billion in 2025

Source: Grand View Research

User Viewpoint

Business Value

How does this use case impact an organization's performance?

Advancements in robotic and control technology are enabling the development of collaborative robots, systems designed to work safely in close proximity and cooperatively with human coworkers, especially in manufacturing environments. The collaborative robotics segment is growing rapidly as new suppliers, technologies, and investment enter the market. Growth is fueled by three key markets: electronics manufacturers and electronics manufacturing services companies, small-to-medium manufacturers, and manufacturers seeking robotic solutions optimized to support agile production methodologies. Expected benefits

include enhanced productivity by improving the throughput, quality, and safety of employees.

The expected benefits of cobots include: enhanced productivity by improving the throughput, quality, and safety of employees, OPEX reduction, improved health & safety situation, litigation safeguard.

Key Performance Indicators

How is the success of the system measured for users and for the business?

Productivity, overall equipment effectiveness, efficiency.

System Capabilities & Requirements

What are the typical capabilities in this use case?

Collaborative interaction between human and robotics, enhanced manufacturing capabilities and ease of use. Robots can be deployed and redeployed very quickly without having to endure major changes to an operation.

Performance Requirements: Depending on the type of the robot used. For manufacturing for example, there are safety requirements in order to ensure certain standards are adhered to and the human workers safety is ensured.

Deployment Environment

Where is the 'edge' of the solution deployed?

Currently, the robots are mostly deployed in factory environments to aid in manufacturing. In the future they may be deployed and used in other industries as well.

Technology Viewpoint

Sensors

What sensors are typically used to provide data into the IoT system, and which factors define their deployment?

Various sensors can be added to different robots to increase their adaptability. These sensors are:

1) 2D vision: 2D vision is a video camera that can perform a lot of different things such as detecting movement to localization of a part on a conveyor.

2) 3D vision: A tri-dimensional vision system that has 2 cameras at different angles. This way the dimension of the object around the robot can be detected.

3) Force torque sensor: These sensors give touch to the robot's wrist. Applications such as assembly, hand-guiding, teaching and force limitation can be done with this

device.

4) Collision detection and safety sensors: These sensors are to ensure a safe working environment for human workers.

Analytics

What types of analysis are typically used to transform data into actionable information?

Big data analytics can be used to analyze the gathered data from the robots in order to improve their functionality.

Cloud & Edge Platforms

What factors define the cloud and edge platforms used to integrate the solution?

- Cloud and edge platforms can be used to connect and gather more data from the robots. Collaborative robots are equipped with far more sensors than their assembly line counterparts, thus producing much more data that needs to be processed and analyzed in the cloud very quickly. But right now, cellular connections like 4G LTE often can't transmit that data to and from the cloud very quickly, which creates a lag and drags down the production process. But edge computing — where data is processed and analyzed locally rather than in the cloud — removes the need to transmit this wealth of data to the cloud, and will grow to be connected to?5.6 billion IoT devices in 2020. That'll allow companies to deploy more collaborative robots to their IoT deployments, fueling long-term shipment growth.

Connectivity

What factors define the connectivity solutions used to provide both device-to-device and device-to-cloud communication?

Connectivity comes in the form of the Internet-of-Things where in a connected enterprise, robots and machines communicate with each other free of cables, sharing data with humans.

User Interface

What factors define the interfaces available to the system users?

Friendly user interface in order to ensure easy collaboration with humans. Graphical interfaces are also being developed.

Data Viewpoint

Data Sources

How is data obtained by the system?

Data can be extracted from the various sensors on the robots. Data is also relayed in real time to the cloud, gathered and analyzed.

Data Types

What data points are typically collected by the system?

Cycle time, part count, speed, force on a customizable dashboard are the types of data that can be analyzed.

Implementation Viewpoint

Business & Organizational Challenges

What business challenges could impact deployment?

There are various challenges the manufacturers face when producing collaborative robotics. These are namely:

1) Skillset and experience challenges: It is reported that over 75% of manufacturing companies reported a skills shortage which hampers robotics production.

2) Cost of technology: Purchasing robotics is a costly ordeal, thus most companies are not willing to invest in this industry.

3) Safety concerns: The safety of human workers around the robots is a major issue as companies fear regulatory and legal issues from human workers should an incident happen.

Source: Blog.robotiq.com

Integration Challenges

What integration challenges could impact deployment?

When integrating the robots into the workforce, it might be difficult to make the change without proper planning. Workers also need to be trained in order to ensure seamless integration and to ensure their own safety.

Regulatory Challenges

What regulatory challenges could impact deployment?

Regulatory challenges might arise from safety issues. If a worker gets harmed by a robot, he/she can sue the company for not ensuring safety standards. Furthermore, organizations might face scrutiny by the government by replacing human workers

with robots therefore driving up unemployment figures.

IoT ONE Use Case

Accelerating the Industrial Internet of Things

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