

Simon Fraser University, School of Mechatronic Systems Engineering
MSE 980, Industry 4.0
Fall 2023, Course Project-1

Project Title:

Application of Collaborative Robots (Cobots) in Electronic Manufacturing

Introduction

- In this fast-moving industry, agility is the key to competitiveness. Whether you're building sub-assemblies, loading and unloading test fixtures, or kitting and packaging products, flexible collaborative robots can improve productivity, quality, and consistency.
- Safe alongside workers (after a risk assessment), Cobots can handle precise tasks such as insertion, dispensing, screwdriver, or labeling with high repeatability. As you automate these repetitive processes, you can redeploy skilled workers to more valuable tasks. Collaborative robots are also an ideal way to distance workers on production lines, by filling in upstream or downstream processes.
- Cobot arms are lightweight and easy to program, so they can be easily moved from one production line to another—or moved from production to packaging or palletizing—as needed. Even in competitive electronics manufacturing, Cobots can pay for themselves in under a year.

https://www.youtube.com/watch?v=UyI9gHz_l8U



<https://www.youtube.com/watch?v=UEq4uqh-ljQ>



Commercially available Cobots in the market that can be used in electronic manufacturing

- List of commercially available cobots in the market that can be used in electronic manufacturing
- Tabular comparison of the available cobots used in electronic manufacturing in terms of the number of DoFs., workspace, payload, speed, and types of IOs available for peripheral devices, programming, precision, repeatability, price, popularity in the North American/European/ Asian markets
- Which Cobot vendor do we recommend for electronic manufacturing
- What features of the Cobots do we need to consider when purchasing and deploying them for electronic manufacturing applications?

Applications of Cobots + peripheral equipment in electronic manufacturing

(Each application should be accompanied by a video/picture, and students need to explain and review the task/case study in detail, each group should review at least 5 applications/case studies including the end-effector tooling)

- Loading/unloading of printed circuit boards (PCBs) into and from machines
- PCB and PCBA stacking on pallets and trays
- Mechanical assembly of electrical enclosures, and screw driving
- Quality control and testing of final electronic boards
- Cobots in the final packaging (boxing) of electronic boards
- Mechanical assembly of through-hole electronic components
- Soldering of through-hole components
- Cobots used in visual chip/PBC/PCBA testing
- Cobots in PCB, PCBA testing
- Glue dispensing applications

Benefits of Cobots in Smart Manufacturing of PCB/PCBA

- How Cobots increases the efficiency, throughput, and productivity, and safety of the above procedures in electronic manufacturing
- What is the driving force behind using Cobots in electronic manufacturing with mixed and low-volume production?
- How we can calculate the return on investment (ROI) when deploying Cobots in such manufacturing lines

Students should prepare a PowerPoint presentation using the following resources

- Websites of vendors (Cobots, grippers, end-effector tools, vision sensors, etc.)
- Website of vendors (partner section), partners provide complementary technologies to Cobots such as vision systems, special grippers, etc.
- White papers from vendor websites (Cobots, grippers, end-effector tools, vision sensors, etc.)
- Datasheets, catalogs, and brochures of the above elements
- YouTube channels and videos
- Webinars
- Scientific papers (Journal/conference papers) from 2017 to present

Project presentation

- 1- Projects can be done in a group of two or a maximum of three students.
- 2- The project and presentation due date is Nov. 29, and Dec. 04.
- 3- Each group should submit a PowerPoint presentation.
- 4- Each presentation should be done in 15 min.
- 5- Each group should study and review 5 applications listed above.
- 6- Each group should study at least two scientific papers to show the state-of-the-art Cobots in electronic manufacturing
- 7- Each presentation should cover 20 slides.