Automation Joining Station

INSPIRED FROM FESTO'S INDUSTRIAL AUTOMATION SOLUTIONS

Authors:

65011619 Varis Saligupta ,65110131 Akesit Akkharasaksiri, 65110141 Kunlanith Busabong, 65110149 Rattapol Kitirak, 65110150 Saranya Vichakyotin

Affiliations:

International Program
B.Eng. Robotics and AI Engineering (International Program),
King Mongkut's Institute of Technology Ladkrabang

INTRODUCTION

This project aims to design an automated joining station inspired by Festo's systems, highlighting automation's benefits in industrial assembly. By enabling precise part movement, it boosts productivity and minimizes human intervention, essential in automotive and electronics sectors. Through sensor integration, process management, and actuation, it demonstrates how automation enhances quality, reduces costs, and increases speed, all while ensuring safety.

OBJECTIVE

- Design and development of an automated joining station inspired by existing industrial models.
- Incorporates precise positioning, control mechanisms, and in-process corrections.
- Aims to optimize the speed and quality of assembly tasks.
- Demonstrates a self-sufficient system that reduces manual labor and minimizes errors.
- Highlights the role of automation in managing high-demand production processes effectively.

EXPECTED OUTCOMES

The automated joining station is expected to speed up assembly, reduce manpower, and minimize part misalignments, thereby increasing output. By limiting human input to only high-risk steps, it promotes both versatility and safety. Overall, the system demonstrates the potential for automating production processes, efficient resource use, and improved quality in manufacturing.

APPLICATIONS

Automated joining station has numerous applications across various precision-reliant industries:

- **Automotive Industry:** Used to assemble engine parts and interior components with high accuracy.
- **Electronics:** Facilitates rapid joining of circuit boards and small parts, enhancing production speed and quality.
- **General Manufacturing:** Mechanizes repetitive joining processes, reducing labor costs and improving uniformity.
- **Versatility:** The mobility and precision of this solution make it adaptable for any high-demand production system.

MACHINE

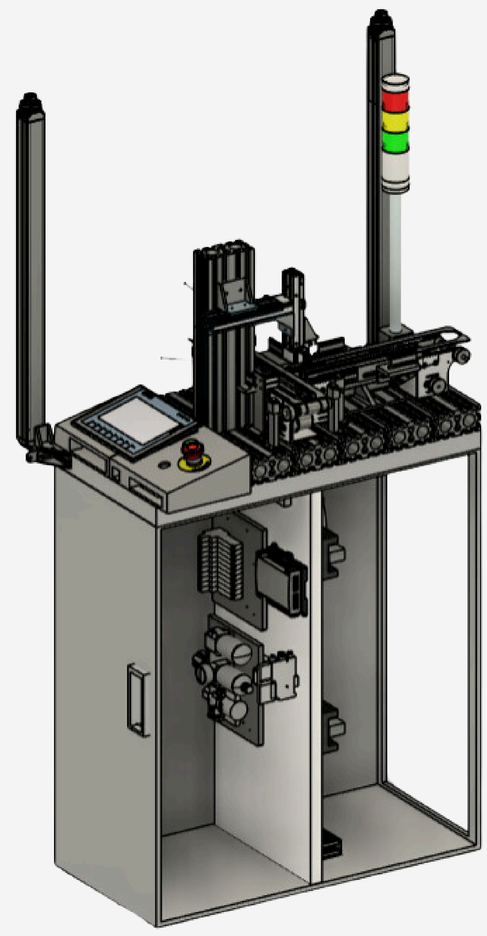
MAIN COMPONENTS

- **Actuators:** Provide controlled movement and force to ensure component alignment during joining.
- **Sensors:** Detect component position, orientation, and process completion, including proximity sensors for positioning and load sensors for monitoring applied force.
- **Control System:** Manages automation, coordinating actuators and sensors with real-time error correction.
- **Frame and Fixtures:** Provide a stable base and custom fixtures to secure parts and prevent misalignment.
- **Safety Features:** Include emergency stops and fail-safe mechanisms to protect operators and machinery.

METHODOLOGY

1. Design Layout : Model the station after Festo's design.
2. Select Components : Choose actuators, sensors, and controllers.
3. Integrate System : Assemble and integrate components.
4. Write Ladder Code : Create control code for safe, timely operation.
5. Test and Calibrate : Enhance accuracy and responsiveness.
6. Assess Performance : Compare cycle time and precision with manual processes.

CAD DESIGN



CHALLENGES

Designing the automated joining station required addressing several critical issues. Achieving precise calibration was essential, as even minor misalignments could impact assembly quality. Selecting cost-effective sensors and actuators to ensure performance, integrating real-time monitoring, and developing robust, efficient control systems posed additional challenges. Safety considerations were paramount, especially in a design allowing rapid transitions. Successfully balancing these aspects enabled a reliable, variance-free solution.