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**Project Scope**

**Robotic Studio 1**

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**Project Scope**

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| --- | --- |
| Project Name: | Custom End Effector for Bottle sorting cobot system |
| Project Client: | Matthias Guertler, Joshua Schiff |
| Project Team: | Arthur Baron von Wilcke, Laurentius Setiadharma, Steven Nguyen-Pham, Andreas Obermaier |

# Problem Statement

"The current process of handling and transporting goods within the factory's storage facility is inefficient and heavily reliant on manual labor. The manual sorting, storing, and retrieval of goods are prone to errors, leading to delays and increased operational costs. Furthermore, the existing system is not optimized for scalability or robustness, making it unsuitable for large-scale industrial implementation. To overcome these limitations, an autonomous mobile robot will be introduced to streamline the process, enhance reliability, and optimize the overall efficiency of the factory's operations."

# Project Objectives:

**Main Objectives:**

* **Develop and implement an autonomous mobile robot system to streamline goods handling within the factory's storage facility.**
  + The robot must be capable of:
    - **Autonomous Navigation:** Efficiently navigating through the factory environment, avoiding obstacles and interacting with storage areas.
    - **Goods Handling:** Reliably picking up, sorting, and placing goods on designated shelves based on predefined criteria.
    - **System Integration:** Seamlessly integrating with the existing factory infrastructure, including conveyors and storage systems.
  + The robot must meet operational constraints, including:
    - **Payload Handling:** Accommodating various sizes and weights of goods, ensuring compatibility with the factory's product range.
    - **Safety Compliance:** Incorporating safety features such as emergency stops and human awareness to ensure safe operation around human workers.
* **Enhance the operational efficiency of the storage facility.**
  + **Increase Processing Speed:** Reduce the time required to sort and store goods by optimizing the robot's handling and navigation processes.
  + **Accuracy Improvement:** Enhance the accuracy of goods placement and retrieval, minimizing errors and reducing the need for human intervention.

**Stretch Objectives:**

* **Optimize the overall storage facility layout to maximize the efficiency of the robotic system.**
  + **Facility Re-engineering:** Propose modifications to the layout or storage system to better suit autonomous operations and improve overall throughput.
  + **Scalability:** Ensure that the robotic system can be easily scaled or adapted to different factory sizes and configurations.
* **Advanced Functionality:**
  + **Multi-object Handling:** Develop the capability for the robot to handle multiple goods simultaneously, further increasing processing speed.
  + **Real-time Data Integration:** Implement a real-time data tracking system to monitor inventory levels, processing times, and system performance, allowing for continuous optimization and decision-making.

# Deliverables:

* Project Report
* CAD file of the end effector and cobot
* Fully functional and integrated end effector addressable by the TM flow software for functionality (open/close)
* Documentation Video

Stretch:

* Automation changes
* Process modification, including mounting positions and standard workflow.

# Timeline Overview:

* Research and Ideation: 2 weeks (Sprint 1&2)
* Designing and modelling: 2 weeks (Sprint 2)
* Prototyping: 3 weeks (Sprint 3)
* Testing and validation: 2 weeks (Sprint 3)
* Hand over: (Sprint 4)

# Timeline Detailed:

* Sprint 1 (Week 2 -3):
* Meeting Client
* Develop project scope
* Identify stakeholder
* Sprint 2 (Week 4 -6):
* Ideation
* Designing the solution
* Sprint 3 (Week 7 – End of Stuvac)
* Start Prototyping
* Test the solution.
* Sprint 4 (Week N – Exam Period)
* Final Prototyping
* Final Solution
* Reporting and Handover to the client

# Milestones:

* Finished Ideation
* Prototype CAD file finished.
* Initial prototype
* Fully functional prototype
* Finished Product + associated CAD
* Completed Documentation

# Design Objectives and Evaluation Criteria

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# Budget

* Prototyping: TBA
* Manufacturing: TBA

# Constraints

* The project must be finished in week 12 or 13 (Sprint 4)
* The project must stay within the given budget
* The use of the robot must follow the safety protocol
* The project must prioritise developing the end effector
* The project must optimise the effectiveness of the system