ROBO.666

Group 2: Industrial Robot in Harsh Conditions

Requirements Specification

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Contents

1. Environmental Conditions

1.1 Operating Environment

Indoor and outdoor.

1.2 Temperature Range

–40 to +40 °C.

1.3 Lighting Conditions

All lighting conditions, including direct sunlight and complete darkness.

1.4 Environmental factors

Dust, mud, moisture, snow and rain.

2. Physical Requirements

2.1 Maximum Dimension

2.1.1 The width and height of the entire machine, including the robot, shall be smaller than 5m x 5m.

2.1.2 No limit on the length of the machine/robot.

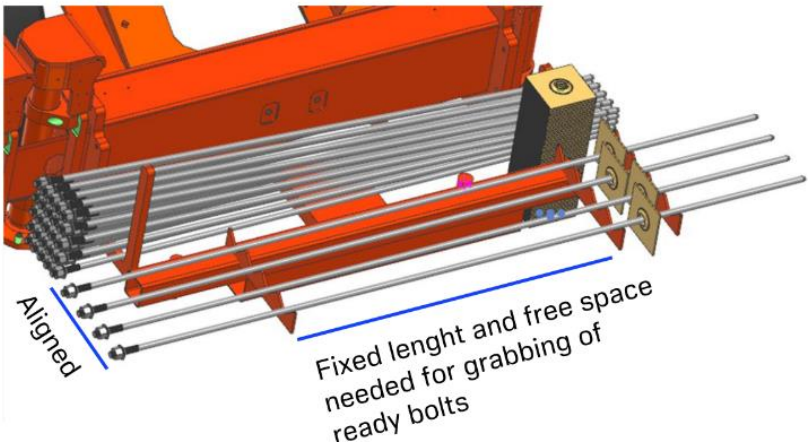
2.2 Manipulator Location

The manipulator shall be located behind the rebar pile, or between it and the tray.

2.3 Rebar and Plate Location

2.3.1 The rebar pile has a variable amount of rebars arranged as in below image.

2.3.2 The plates are stacked vertically.



2.4 Robot Workspace

The workspace shall be smaller than 5m x 5m.

2.5 Assembly Materials

Both rebar and plate shall be made of magnetic material.

2.5.1 Dimension of Rebar

Length: 3 m

2.5.2 Dimension of Plate

Dimension: 200 x 200 x 8 mm

3. Hardware Requirements

3.1 Bolt Tray

3.1.1 The bolt tray shall have space for 4 rock bolts.

3.1.2 The center of the bolt tray must be free for another mechanism to pick up the assembled rock bolts.

3.1.3 The rebars on the bolt tray shall align horizontally.

3.1.4 The plates on the bolt tray shall be evenly spaced to minimise tray size.

3.2 Actuation Constraints

3.2.1 The energy source of actuators can be hydraulic, pneumatic and electric.

3.2.2 Robot tool change is not allowed.

3.3 Robot Manipulator

3.3.1 Only 1 manipulator is allowed.

4. Functional requirements

4.1 Assemble rock bolts

4.1.1 The robot shall

4.1.1.1 Pick rebars and plates from their respective piles

4.1.1.2 Attach a plate to each rebar

4.1.1.3 Place the assembled rock bolts on the bolt tray for collection.

4.1.1.4 The robot shall fill all positions on the tray and stop until the tray is empty and ordered to start again.

4.1.2 Initial State

The tray starts empty.

5. Non-functional requirements

5.1 Demonstration with prototype

- The demonstration should be conducted using a downscale prototype (i.e. 1:5).
- Scale and materials for prototype shall be reviewed during the prototyping phase.

5.2 Robot Cover Design for harsh conditions

- The necessary equipment to work in harsh conditions does not need to be in the simulation nor demo. It is only required in the final documentation.