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Optimal robot operation for wire harness production

Masterarbeit

During this thesis, the optimal on demand planing of robot action during batch size one wire harness production is examined

Motivation

Wire harness production is predominantly a manual process, where each wire is meticulously prepared by hand on assembly boards (Figure 1). Workers are well-versed in every step of the process and can adapt flexibly to various situations. Their ability to perform highly dexterous movements, such as pushing occluding wires aside while pinning another wire, is crucial.
However, when automating this process with robots, the inherent human expertise is absent. Robotic movements are governed by predetermined algorithms, making it challenging to handle unforeseen situations effectively. Additionally, robots lack the dexterity of human operators, leading to additional constraints during production, such as the order of pinning wires.
This underscores the need for developing a comprehensive wiring strategy to bridge the gap between manual dexterity and robotic automation.

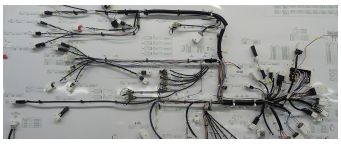

Figure 1: Wire harness

Cooperation partner

Kromberg & Schubert is a globally leading specialist with 120 years company history in wiring systems for the automotive industry. The company offers significant prospects in a forward-looking industry. Kromberg & Schubert is experienced and popular among working students and interns. They support practical thesis projects with substantial input and commitment. The company is open to subsequent employment if it suits both parties.

Figure 2: In cooperation with Kromberg & Schubert

Aim

The aim of this thesis is to develop a rule-based method for structuring the wire harness manufacturing process to optimize robot operation (Figure 3).
To achieve this, the manufacturing process will first be analyzed. Based on discussions with members of Kromberg & Schubert, the necessary rules will be established. Subsequently, the method will be tested through simulation. To further the understanding of the current manufacturing processes, a visit of a European production plant is possible.

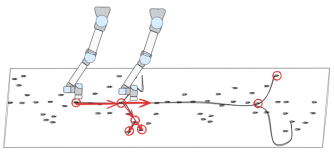

Figure 3: Robotic manufacturung process

Helpful prior knowledge

- Robotics
- Optimization theory
- Interest in robotic manufacturing processes

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