Magnetic Sensing for Pose Detection
Optimization and Evaluation of a Flexible Magnetic Sensor-Array for Real Time Pose Detection of Medical Instruments — 10th October 2021 —

Context

Medical instruments in minimally invasive surgery bring great benefits in terms of patients' medical outcome while monitoring the instrument's exact pose (position + orientation) within the human body remains challenging. As an alternative to limited optical tracking, magnetic tracking might be promising for medical applications of different kind. Simplified prototypes with rigid planar arrays of Hall sensors already provide pose information permanent magnets. When applied in a medical-robotic context, such sensor array shall be rather flexible and compliant to be used directly on a patients body surface. Thus, facile handling and better sensing performance can be achieved. However, further optimization on the provided flexible sensor array is needed such as enhanced solvers, filters and deformation models. Desired hardware improvements include a reduction of the array thickness and robust embedded wiring.

Task Summary

- Study the provided documentation and relevant literature about intracorporeal (magnetic) tracking and pose estimation strategies.
- Optimize the design and evaluation setup based on provided findings and your own ideas.
- Fabricate the new design and setup.
- Evaluate and discuss the new design.
- Optional: Contribute your findings to the scientific community in the form of a conference paper.

Requirements

Qualified candidates (computer science, engineering, physics) shall be interested in:

- Magnetism
- Microcontroller
- Sensing
- Experimentation
- Robotics

Contact

Nikola Fischer, M.Sc.
Building 40.28, Room 102
nikola.fischer@kit.edu
+49 721 608 - 44263