UNIKASSEL VERSITÄT

mrt
Mess- und Regelungstechnik
Univ.-Prof. Dr.-Ing. Andreas Kroll

Internship

Improvement of a 3D Thermal Imaging System by IMU Data Integration

Brian Avila

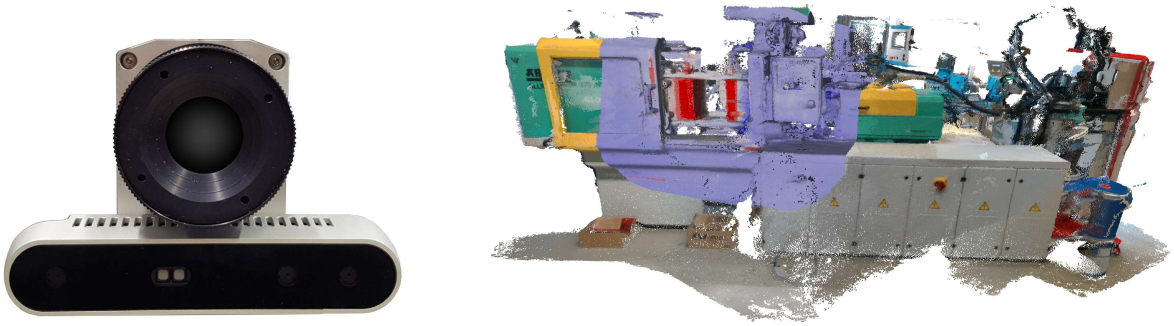

Figure 1: 3D thermal imaging system (left) and a generated model with partly overlaid thermal information of an injection molding machine (right).

Rising energy costs and increased environmental awareness are motivating industrial companies to save energy. In order to show possible potentials, sensor systems are required which allow a fast and precise inspection of the waste heat of machines. Data fusion of thermal imaging cameras and depth cameras (e.g. Intel RealSense) enables detailed and precise examination of objects in which both thermal and spatial information are important. The 3D thermal imaging system developed at the Department of Measurement and Control allows the reliable observation of large heat sources in full 3D and real-time (see Figure 1).

The used thermal camera must perform a self-calibration at regular intervals (approx. every 30 seconds) to avoid a temperature drift. During this step no new data can be integrated into the model, which is a considerable challenge for the self-localization of the system. Within the scope of this internship, the data of an IMU should be used to bypass the position estimation for short time periods and thus achieve a much more robust modelling process. Furthermore, the vertical direction of the measuring system (and thus of the measurement object) need to be determined by means of the IMU for an improved calculation of waste heat.

The following subtasks are planned during the internship:

- Familiarization with 3D thermal imaging and relative position measurement using IMU
- Selection and integration (hard- and software) of an IMU into the existing system
- Angle referencing between the vertical axis of the measurement coordinate system and the world coordinate system
- Robustification of the modeling process by integrating the IMU data into the system's self-localization
- Comparative evaluation of the implemented methods by means of experimental studies
- Documentation of the work in a report and presentation

Experience in C++ is an advantage, but familiarization can also be done during the internship.

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