

Open Master thesis

Non-destructive material detection for innovative waste management

Globally speaking, waste management is handled quite diversely. Waste management still heavily relies on individual knowledge. As part of a global duty on making our planet more sustainable it is important to sensitize our global community about waste separation.

One vision to arise waste separation awareness is using automatized small-scaled waste processing units. Such units may be placed in urban neighborhoods. However, unsupervised waste disposal may animate violating waste separation guidelines of the device.

In this project, you will be investigating the capability of sensors to detect individual waste components (such as biodegradable waste, debris, or batteries), which are not suitable for recycling or may cause damage to the automated waste processing unit. In case of detection of a non-suitable element in a bag for sorting process, this bag will be not processed and delivered in a specific bin.

This master thesis will be conducted in cooperation with K3lab (<https://www.k3lab.at/>). K3lab is a sustainable innovation company located in Graz, and its main project “re-cube” is a stand-alone machine that enables on-site recovery of packaging waste. The machine processes waste¹ bags into homogeneous material fractions, salable as recycling material; it includes mechanical pre-treatment, material identification via optical sensors, sorting and storage. re-cube is conceived for volumes between 200-500 tons input per year, which corresponds roughly to 1000 to 3000 users.

This are your tasks:

- 1) Get familiar with different suitable sensors and their physics
- 2) Literature study on current methods of material detection (and distinction)
- 3) Compare and assess methods found in 2)
- 4) Preparing & conducting structured experimental setups using (clean) waste bags with thorough documentation of the findings

Your requirements:

- Good knowledge in mathematics and physics
- Creativity and analytical reasoning, organizational talent
- Self-driven motivation to investigate new topics

Nice to have's:

- Nice to have, Knowledge in FEA applications (e.g. COMSOL)
- Strong interest and background in electromagnetic radiation

Time period and contact information:

Duration: ~ 6 months, Start: as soon as possible

Contact: AAU: Dipl.-Ing. Dr. Hubert Zangl (hubert.zangl@aau.at),
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We offer funding and publication possibilities!

¹ Municipal waste, dry (no organic waste)