Research Project

PiVision

Integrating Image Processing and Machine Learning for Material Recognition on Conveyor

M.Sc. Shohreh Kia
TU Clausthal
Center for Digital Technologies
Institute for Software and System Engineering
Shohreh.kia@tu-clausthal.de

MOTIVATION

Recycling industries need help accurately sorting metals from mixed waste due to the limitations of conventional methods. These methods often suffer from low precision, high operational costs, and inefficiencies, especially in dusty and noisy environments. Advanced technologies, while promising, are frequently too expensive and complex for practical, widespread adoption.

This research presents PiVision, a cost-effective solution that leverages advanced image processing techniques and lightweight machine learning models to improve detection accuracy significantly. Designed for adaptability in industrial settings, PiVision offers a streamlined, efficient, and affordable approach to addressing the pressing needs of the recycling industry.

SOLUTION APPROACH

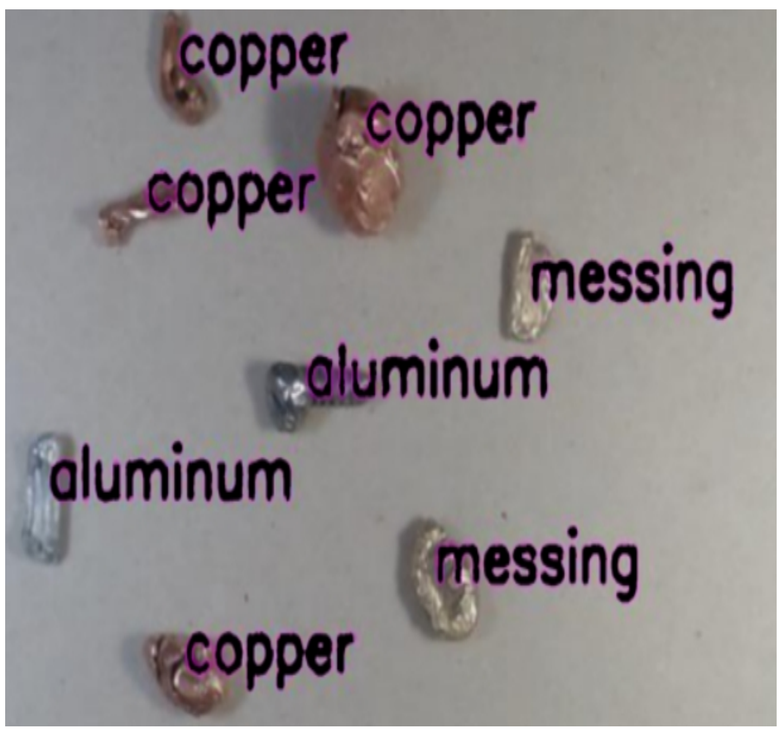
The PiVision system seamlessly integrates advanced image processing and lightweight machine learning to optimize material detection on conveyor belts. The system uses a Raspberry Pi and an industrial-grade camera to capture and process images through grayscale conversion, K-means clustering, and decision tree algorithms. These methods enable the precise classification of aluminium, copper, and brass materials. Engineered to be cost-effective and energy-efficient, PiVision is built to perform reliably in demanding industrial environments, overcoming challenges such as dust, noise, and variability in material composition.

Monitoring the Conveyor

[1]

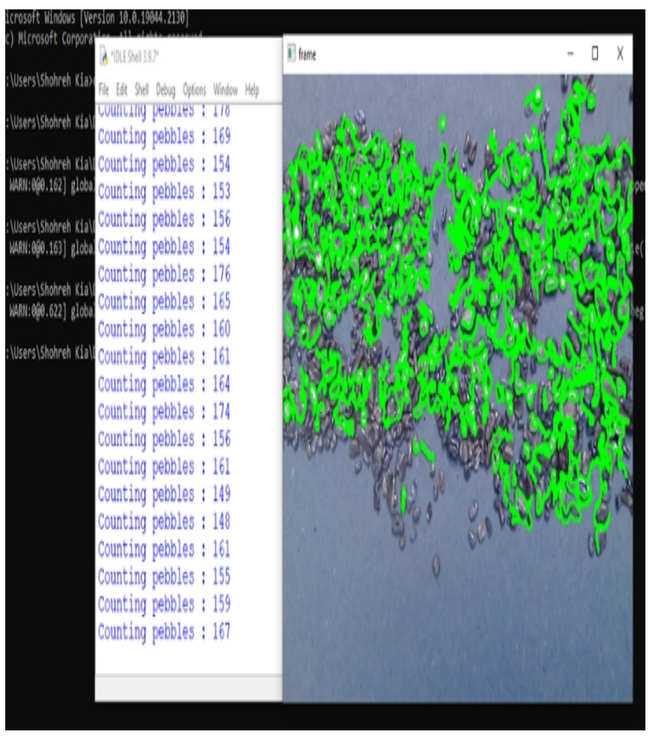
[2]

Material Identification



[3]

Material Count



[4]

[1] Sensor installation
[2] Conveyor belt monitoring
[3]Material classification using image processing
[4] Material counting

A robust solution for recycling industries, addressing challenges such as dust, noise, and material variability. Integrating image processing and lightweight machine learning offers a cost-effective and efficient alternative to traditional methods, paving the way for more sustainable and precise recycling practices.

ETCE LAB

The ETCE Lab conducts interdisciplinary research at the interface of computer science and sustainability. Our research focuses on resilient food production as an adaptation to climate change, the development of educational offerings in the field of sustainability and digitalization solutions in the context of the circular econom

YOUR CONTACT PERSON

M.Sc. Shohreh Kia

Shohreh.kia@tu-clausthal.de

www.etce-lab.com

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