

# Seeing what you feel – robot-assisted powder characterization

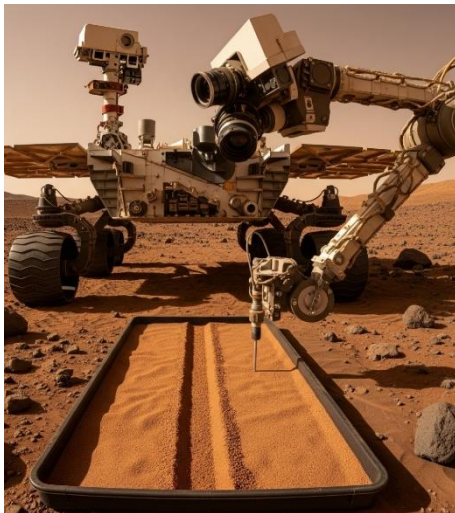


Figure 1: Mars rover with tools

(Created with ChatGPT, OpenAI)

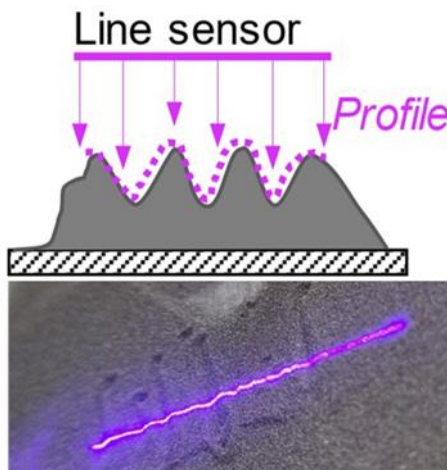


Figure 2: Laser line triangulation for  
measuring surface profiles

## Topic

The Cluster of Excellence “The Martian Mindset” is investigating the realization of a resource-efficient production line. The primary raw material available is regolith (rock powder), from which components are produced via multi-stage process chains. However, the targeted design and optimization of these processes requires detailed knowledge of the physical and morphological properties of the powder.

Therefore, this work aims to investigate the extent to which powder properties can be characterized using robotics. This involves tactile interaction (furling, smoothing) and optical recording of the resulting powder topography. The focus is on the question of which surface properties (powder wave height, shape, or surface structure) enable the differentiation of powders with different particle sizes and morphologies. For this purpose, a robot-assisted test setup will be implemented in which a powder bed is tactilely manipulated and the resulting surface is recorded using laser line triangulation

## Possible Tasks


- Development of a robot-assisted test procedure for tactile powder manipulation
- Optical recording and analysis of the surface structures produced
- Evaluation of simple geometric surface features for powder differentiation


## Requirements

- Programming skills in Python or willingness to learn
- Experience with controlling robots or similar devices is advantageous


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