Institute for Multiscale Simulation

MSS

Master Thesis

Deep Learning Approach to three-dimensional Particle Recognition

Type

Computational.

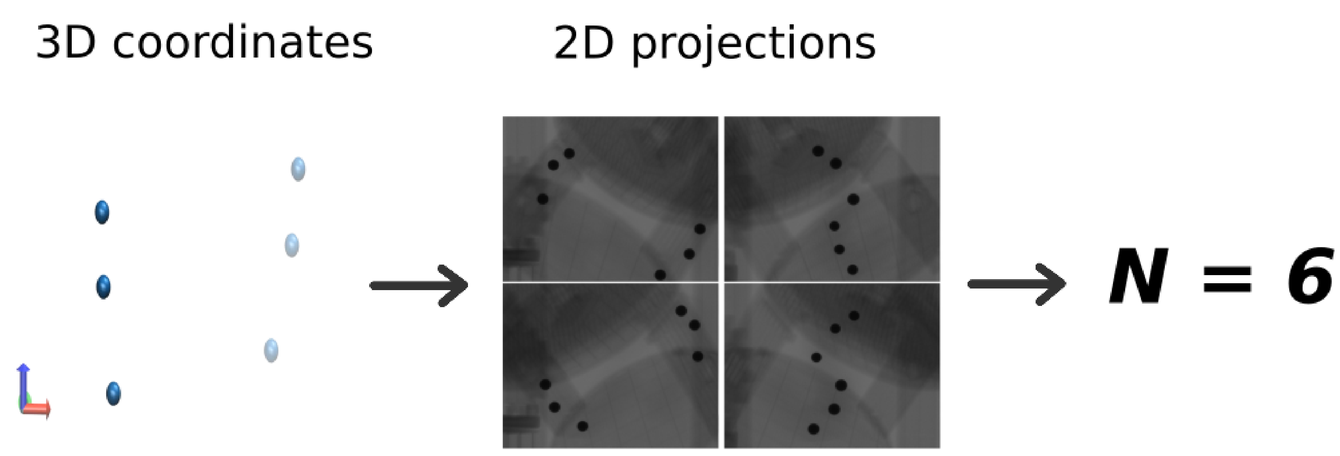
Requirements

- Knowledge on Python
- Basic knowledge on Machine Learning and Image Analysis
- Data analysis

QR code
zum pdf der Ausschreibung

Background

In many industrial and natural process the understanding of the dynamics of particles in a three-dimensional system is required. One way to obtain such dynamics has been performed by seeding the system of interest with "tracer" particles. Afterwards, it is posible to compute the trajectories of the tracers by recording and relating its movement from a finite set of cameras (projections) located at different fixed positions. This technique is known as "three-dimensional particle tracking velocimetry". Some times, because of the dynamics of the system or the illumnation on each individual projection, the recognition of the tracers in the three-dimensional space is not always possible. Nowadays, **Deep-Learning** (DL) methods have been applied as a powerful tool to recognize and track single objects in two-dimensional systems under non-well illuminated conditions. One first step towards the tracking of objects in three dimensions with a DL-based method is the correct recognition of the number of particles present in the system from two-dimensional projections. In this way, by creating gray-like images from coordinates of particles obtained via discrete element method simulations, we aim to train a neural network for the recognition of the right number of particles in a real system.



Aim

- **Generate 2 dimensional projections at different orientations from N coordinates of particles located in 3 dimensions.**
- **Create gray-like images by using such 2 dimensional projections (as is shown below).**
- **Train a neural network to identify the N particles from the gray images.**
- **Test the neural network with a real system.**

For further information please contact:

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