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master thesis – numerical

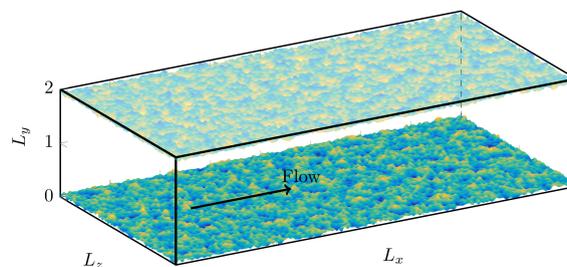
Data-driven modeling of flow over roughness

Background

Flow over rough surfaces occurs in a wide range of engineering applications. The performance of a flow-related equipment can be altered considerably due to the increased momentum transfer brought by roughness. In order to predict and optimize the effect of roughness, the flow properties of the roughness should be modeled. In this thesis DNS data of rough surfaces with a variety of topographical properties will be analyzed. A data-driven model of the roughness is built in this work.

Content of the Thesis

Within the scope of this master thesis, the skin friction of the turbulent flow over rough surfaces will be investigated. An predictive model is planned to be built in sense of data-driven approaches. The simulations / experiments of the interested roughness are carried out in fully developed turbulent, rough channels as schematically shown in the figure below. The database of flow over rough channel is provided by the community as well as from the simulation campaign at the institute. Original entries of new roughness topographies are also encouraged. At first, student will familiarize with the turbulent flow over roughness and the metrics that are commonly used for characterizing a rough surface. Roughness database will be summarized by student. With the help of the database, predictive model with different techniques, e.g. neural network, random forest, will be built and validated. Expand of the database is also planned in the present thesis, the new rough surfaces of interest will be generated with the help of the random roughness generation method which is already implemented at the institute.



Requirements

basic knowledge in fluid mechanics and programming

Beneficial Skills

Matlab
Python

Start: immediately

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