Scientific Modelling Computer Lab Cover Letter

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Dr. Pollner Péter

Eötvös Lóránd University

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Dear Dr. Pollner:

I am pleased to submit my report entitled “Numerical simulation of quantum transport phenomena using the kwant package” as homework assignment for the course “Scientific Modelling Computer Lab”. I investigated several types of quantum transport phenomena using a numerical simulation package, written in python.

In this report, I present my recent achievements in numerical simulation of quantum transport phenomena. These include a simple quantum point contact, a quantum point contact placed in magnetic field, a graphene lattice showing minimal conductivity near the Dirac-point, and a Topological Anderson Insulator.

In my work, I used *kwant* a python package designed to simulate quantum transport phenomena within the tight-binding model. In this report I cover the theoretical background of my work, as well as the results achieved.

All the code I have written is available as a zip file through the moodle page of the course.

My work is a profound investigation of the capabilities of the kwant package, although the results often do not match previous publications, but this is due to the lack of the available time and computational power.

Thank you for your help and motivation!

Best regards,

Dániel Nagy