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To Who it May Concern,

It is my pleasure to strongly recommend support for the KWANT Project. As a theorist in condensed matter physics, I have been using this code in my group for the past five years with tremendous success. I believe the work achieved by the KWANT developers is of extremely high quality and interest for the condensed matter community at large, not limited to theorists.

We started to use the first version of the code, KNIT, in 2010, and very quickly shifted to the current version of KWANT. Our prime interest was to investigate spin transport in magnetic devices. What attracted us at first were the robust theoretical framework under which this code was developed, as well as a very handy control of the detailed Hamiltonian and shape of the system. Another fascinating feature of this code is the impressive computational efficiency of KWANT that allows for a realistic treatment of disorder. This way, it was possible to tune our system from quantum to semiclassical and even diffusive transport continuously.

Four of my PhD students have been using KWANT quite intensively and two of them graduated this semester with a PhD entirely based on output produced using KWANT.

The topics include

- Spin torque in (anti)ferromagnetic spin-valves (1 Phys. Rev. B, 1 submitted)
- Spin torque in magnetic tunnel junctions (1 submitted)
- Magnetic domain walls and skyrmions (1 Phys. Rev. B, 2 submitted)
- Topological insulators (1 submitted)
- Datta-Das transistors (1 submitted)
- Spin-orbit transport in disordered systems (1 Phys. Rev. B, 1 submitted)

In the field of spin electronics, I cannot think of a (non-interacting) system that we cannot model with this method. What is even more impressive is that the results obtained using KWANT were successfully used to explain experimental data in two of these cases (Datta-Das transistor calculations and spin torque in domain walls).

We have recently started to work on T-KWANT, the time-dependent version of the code. We have already obtained promising preliminary results about dynamics spin/charge pumping.

Overall, KWANT developers have been providing a superb service to the condensed matter physics community at large by providing an open-source code that is both computationally efficient and user-friendly. The massive impact KWANT has on the condensed matter community is nicely illustrated by the tremendous activity of the online forum moderated by KWANT team.

As a user and research director, the code's features I value the most are (i) the ability of the code to model any type of non-interaction systems without any technical difficulties (disorder, magnetic texture, multiorbitals, complex shape etc.), (ii) the massive amount of time my students save by not developing their own code - and thereby focusing on the physics at stake rather than on computational hurdles -, (iii) the possibility to model very large systems and observe transition from quantum to semiclassical regimes, which is both instructive as a teacher and inspiring as a research.

The latter point is of great interest for academic purposes. In Spring 2015, I developed a graduate course entitled "Quantum Transport in Disordered Systems", where various fundamental concepts of quantum transport were illustrated using KWANT (quantum Hall effect, Aharonov-Bohm effect, transition from quantum to size-effect and diffusive regimes, weak localization, Anderson localization etc.). This code was again exceptionally useful for my students to build their own understanding of quantum transport.

Overall, KWANT is an excellent - and quite unique in my view - compromise between the flexibility of an open-source code and the robustness, efficiency and technical support of a commercial software. As far as I can tell, there is currently no commercially available software that is able to produce numerical results of the quality of KWANT.

As a conclusion, I believe that by continuously developing KWANT, the developers are providing an extraordinary service to condensed matter physics, not limited to theorists. I therefore strongly recommend this project for financial support.

Sincerely Yours,

Aurelien Manchon