Pre-viva report: Ieva Capaite

The thesis of Ieva Capaite considers the problem of counterdiabatic driving – evolving a quantum system quickly so that unwanted diabatic terms become a problem, but minimising these via driving with correcting terms to return to near adiabaticity. The main point is that by using a quantum control structure the driving can be optimised to get close to the target state. This is the basic new science described in the thesis, counterdiabatic optimised local driving (COLD).

After the introduction the thesis presents two background chapters, the first on adiabatic (slow) and near-adiabatic (faster) driving in quantum systems, introducing the adiabatic gauge potential as a means of characterisation of the driving quality. Then counterdiabatic driving is introduced in general terms. The second background chapter concerns quantum optimal control theory and describes methods that can be used for this.

The next two chapters provide a description of the main features of COLD and its use of a particular cost function. Two chapters follow on the applications of COLD in different systems: two spin annealing and the Ising chain. Finally there is a summary of the work and outlook, before appendices.

Overall the thesis contains new research, which has been published. It is easily of the required scientific standard for award of the degree. It is very well-written, in an informal style that does not detract from the science.

I have some questions that arose from reading the thesis that can be addressed by the candidate at the viva and there are a few minor typographical errors that will need correcting. Otherwise I see no major problems.

John Jeffers