Supercomputers and GPUs for Enabling Autonomous Transport

Cloud computing, AI, autonomous vehicles, and electrification are some of the hottest topics in engineering today. This is especially true in the automotive industry where major change is currently taking place. In this thesis we will be investigating this, and in particular the use of the cloud for planning the velocity of a vehicle so that the energy consumption is minimized. Utilizing the road topography and models of the vehicle for planning the velocity is called Look-ahead Control (LAC), and manufacturers like Scania and Porsche already have this in production. The question for this thesis is how the algorithm can be distributed and parallelized. One part should reside in the vehicle for autonomy and real-time performance, and the other part in the cloud where it can be parallelized and used for solving problems of a much larger problem size than can be performed in the vehicle.

In particular, the tasks involve (subject to influence by the student/-s):

- Implementing a sequential LAC controller.
- Investigate how the algorithm can be distributed and parallelized.
- For the parallelization it is of particular interest to investigate supercomputers and GPUs. The aim is to be able to handle millions of vehicles but also to plan long transportation missions.
- Implement a distributed algorithm and analyze the performance.

This work is part of the Strategic Vehicle Research and Innovation Program (FFI), under the grant FROST. FROST is a cooperation between LiU and Scania. You will have the possibility of spending half of your time at LiU in Linköping and half at Scania in Södertälje, but it is also possible to spend all time in Linköping. Compensation for work performed is paid by Scania. The work you'll be doing in this thesis is part of a bigger effort in enabling autonomy and advanced driver assistance systems. You'll get the opportunity to influence the future of transportation and at the same time work with skilled and inspiring engineers, researchers, and students.

We are looking for preferably two students, could also be one, with a background in computer science and/or with a passion for programming and a desire to use it for transforming the automotive industry. No background is needed in vehicle propulsion, we know plenty of that and we can teach you. Suitable program background is D, IT, U, Y or similar. You must have taken both or either of TDDC78 (Programming of Parallel Computers) and TDDD56 (Multicore and GPU Programming) to qualify for the position, knowledge of optimization is preferable.

Contact

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