

Bachelor thesis evaluation  
“Motion Planning for Autonomous Car  
Manipulator”

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The goal of the thesis was to design, implement and test methods capable of planning and executing the movement of an autonomous vehicle. This vehicle must be able to transport passenger cars from a production line to a storage area. The primary focus of the thesis is to implement a capability to perform (un-)loading manoeuvres in a fast, reliable, safe and precise way. Rather than making a theoretical contribution, the thesis is oriented toward producing a reliable software component deploy it in a real logistics system and evaluate its efficiency. The work was rather challenging as deploying and testing the system on an actual vehicle required careful step-by-step testing due to the safety implications of moving a 4 ton vehicle carrying a 1.5 ton car at speeds up to 2 m/s with less than 3 cm error.

During the work that led to the system’s implementation, the student was working systematically, making steady progress towards the goal. She consulted her work regularly and actively participated in experimental trials that did not concern just the implementation of the loading manoeuvre, but other components of the autonomous manipulator. The resulting work presents the systematic nature of her work as she provides an (albeit brief) overview of state of the art, following by the vehicle description and problem specification. At the beginning of the chapter, where she describes the solution, the student points to experiments that assess the kinodynamic model of the vehicle. Based on these experiments, she concludes that due to the uncertainty of the vehicle motion and reliability requirements, the best way to approach the problem is to implement plans that consist of a set of predefined motion primitives. Then, she describes the three fixed plans that she implemented, tested and evaluated. Finally, she provides a summary in the thesis conclusion.

The work performed by the student resulted in a system that implements a fixed sequence of manoeuvres leading to fast and reliable car pickup. The software component is nowadays used in a proof-of-concept logistical system at the Skoda Auto manufacturing plant at Mlada Boleslav. However, while the work performed was rather extensive, the thesis itself is relatively brief, and several technical issues are not described in detail sufficient to understand certain design decisions. In particular, the state of the art section should provide more detailed

insight into the problem background. The lack of detail might lead to misunderstanding of the thesis aim and correctness of the presented solution. While the thesis has certain drawbacks, the primary goal of the thesis was achieved and I classify the work performed as

**B** - very good.

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