

PLM RESEARCH SEMINAR



INVITATION

Urban last mile deliveries with autonomous vehicles

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Abstract: Autonomous vehicles have not been deployed at a large scale yet contrary to many prediction from a few years ago. How will increasing robotisation and connectedness shape our cities? What is the current state of the art in robotic deliveries? After discussing this context, some of the research at the Anthropolis chair will be presented focusing on various operational aspects of robot deliveries. First, two-echelon urban deliveries using robots for 2nd-level route delivery were considered. In this concept, a mothership van carries robots on the 1st-level route and drops them off and picks them up at rendezvous nodes, while the robots handles deliveries on the 2nd-level routes. In this first version, only robots are able to deliver to customers. Our target areas are pedestrianized zones in city centers or campuses. We proposed mathematical models to simulate various test cases and performed a sensitivity analysis for vehicle speed combinations. Second, we extended our models to incorporate range restrictions and recharging operations for vans and robots. We allowed robots to be recharged in the vans during recharging stops but also en-route. We finally considered a very general problem variant where robots and vans are performing pickup and delivery operations in city. Robots can visit areas with van access restrictions, such as pedestrianized areas or university campuses. The van stops at parking nodes to drop off and/or pick up its robot, and to replenish its robot and/or swap its robot's battery if needed. In a case study considering the city of Xi'an, we performed a comparative analysis with more classical delivery approaches.

About the speaker: Jakob Puchinger, Anthropolis Chair holder, is responsible for the research axis Scientific Computing and Optimization at IRT-SystemX as well as Professor of Industrial Engineering and responsible for the Operations Management team at the Industrial Engineering Research Department at CentraleSupélec and co-director of the Futures Cities Lab at Centrale Pékin. His main research interests are in urban logistics, human centered innovation for urban mobility, disruptive technologies and algorithmic optimization of the underlying transport systems. After completing his doctoral studies at the TU Vienna in 2006, Jakob Puchinger worked at the NICTA Research Centre at the University of Melbourne. He joined the Austrian Institute of Technology in 2008 where he became head of the business unit Dynamic Transportation Systems in 2014.

