

AGCO Seminar

Speaker: Andrés Fielbaum, TU Delft

Title: How to split the costs and charge the travellers sharing a ride? aligning system's optimum with users' equilibrium.

Abstract: Emerging on-demand sharing alternatives, in which one resource is utilised simultaneously by a circumstantial group of users, entail several challenges regarding how to coordinate such users. A very relevant case refers to how to form groups in a mobility system that offers shared rides, and how to split the costs within the travellers of a group. These are non-trivial tasks, as two objectives conflict: 1) minimising the total costs of the system, and 2) finding an equilibrium where each user is content with her assignment. Aligning both objectives is challenging, as users are not aware of the externalities induced to the rest.

In this paper, we propose protocols to share the costs within a ride so that optimal solutions can also constitute equilibria. To do this, we model the situation as a non-cooperative game, which can be seen as a game-version of the well-known set cover problem. We show that the traditional notions of equilibrium in game theory (Nash and Strong) are not useful here, and prove that determining whether a Strong Equilibrium exists is an NP-Complete problem, by reducing it to the k-Exact-Cover problem. Hence, we propose three alternative equilibrium notions (stronger than Nash and weaker than Strong), depending on how users can coordinate. For each of these equilibrium notions, we propose a (possibly overcharging) cost-sharing protocol that yields the optimal solutions equilibria.

Simulations for Amsterdam reveal that our protocols can achieve stable solutions that are close to the optimum, and that having a central coordinator can have a large impact.

When: April 13, 15:00 hrs.

Where: Sala de Seminario von Neuman, CMM, Beauchef 851, Torre Norte.

