Title: On-demand shared-use autonomous bike service – How will it alter the management of bike sharing systems?

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Bike-sharing systems gain momentum as a sustainable element of human centered urban transport. They can benefit public transport by providing a flexible mode for the last or first mile. Tourists and inhabitants use them to discover a city or simply to go from one point to another. Cargo bikes can add to such systems by providing a viable alternative to transport goods, errands and children. Therefore, they form a worthwhile means to reduce car traffic.

Although bike-sharing usage strongly increases in cities worldwide, even state-of-the-art systems have major drawbacks inherent to the fundamental design of the system. Bikes are passive in the sense that they remain at the destination of the last ride until the next usage. Three corresponding drawbacks exist. Firstly, locations of high travel demand tend to run out of bikes leaving demand unsatisfied and prospective users disappointed. Secondly, operators try to overcome this issue by putting high efforts in redistributing bikes, resulting in huge operational costs. Thirdly, conventional bike-sharing is limited to dense urban areas. Citizens in suburban areas, characterized by high shares of car use and poor public transport, do not have access to those modes for last and first mile, errands and leisure trips.

In this contribution, we will present the concept of an on-demand shared-use autonomous bike service. We fundamentally alter bike-sharing by introducing active and self-driving bikes. They can autonomously drive to the next point of demand after a manual ride by a user. The first section describes our concept and elaborates the benefits for urban transport with respect to human-centered cities and autonomous car fleets. Following, we describe necessary modifications in the design of bike-sharing services. The last section elaborates new management principles, corresponding challenges and ideas to solve them. We will close with a discussion and outlook.