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Charging stations location model based on spatiotemporal electromobility use patterns

Raphaela Pagany, Anna Marquardt, and Roland Zink
Technology Campus Freyung, Deggendorf Institute of Technologie, Germany

One of the major challenges for mainstream adoption of electric vehicles is the provision of infrastructure for charging the batteries of the vehicles. The charging stations must not only be located dense enough to allow users to complete their journeys, but the electric energy must also be provided from renewable sources in order to truly offer a transportation with less CO_2 emissions. The examination of potential locations for the charging of electric vehicles can facilitate the adaption of electromobility and the integration of electronic vehicles in everyday life. A geographic information system (GIS) based model for optimal location of charging stations in a small and regional scale is presented. This considers parameters such as the forecast of electric vehicle use penetration, the relevant weight of diverse point of interests and the distance between parking area and destination for different vehicle users. In addition to the spatial scale the temporal modelling of the energy demand at the different charging locations has to be considerate. Depending on different user profiles (commuters, short haul drivers etc.) the frequency of charging vary during the day, the week and the year. In consequence, the spatiotemporal variability is a challenge for a reliable energy supply inside a decentralized renewable energy system. The presented model delivers on the one side the most adequate identified locations for charging stations and on the other side the interaction between energy supply and demand for electromobility under the consideration of temporal aspects. Using ESRI ArcGIS Desktop, first results for the case study region of Lower Bavaria are generated. The aim of the concept is to keep the model transferable to other regions and also open to integrate further and more detailed user profiles, derived from social studies about i.e. the daily behavior and the perception of electromobility in a next step.