Integrated Model to Plan Advanced Public Transportation Systems

by

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(ABSTRACT)

The primary objective of this study is to develop an integrated public transportation planning framework to evaluate and plan Advanced Public Transportation Systems (APTS). With this purpose, a systems approach point of view is adopted to study the influence of new APTS technology in supply and demand transit variables. In this project the Systems Dynamics methodology is adopted to track the dynamic behavior of model variables and feedback loops forming among them. The proposed framework is illustrated in a case study involving automated vehicle location systems (AVL) applied to a small transit community.

The proposed approach follows the same steps of the Systems Dynamics method; First, identify some key variables which are not only susceptive to AVL technology but also affect the supply-demand relationship of a bus transit environment. Second, trace and simplify the causal relationships of the variables considering impacts of facility supply changes to passenger demand responses and vice versa. To accomplish this, four detailed sub-models representing parts of the transit system are developed and combined under the Systems Dynamics methodology point of view. Theses Sub-models are: 1) demography, 2) urban transportation planning, 3) bus operations, and 4) evaluation. Finally, to validate the model procedure, the model is applied to a case study. This study attempts to encompass as many as possible factors around a bus transit system environment which can be impacted by new APTS technology to illustrate the use of the proposed framework. Some of these factors include: 1) Demographic characteristics; 2) urban or social activity of the study area and 3) changes to transportation facilities. The case study illustrates how the physical characteristics of the transit systems such as traffic demand, traffic conditions along the transit route, route layout, and bus performance can be affected by the new technology.

Since APTS impacts are time dependent a continuous multi-loop simulation technique is adopted to track dynamic changes of all model variables. The analysis of the transit system is carried over a 20-year life cycle to illustrate the long term dynamics of the feedback structures inherent in the model.

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