Chapter 10

SIMULATION-BASED EVALUATION OF ADVANCED PUBLIC TRANSPORTATION INFORMATION SYSTEMS (APTIS)

Pierluigi Coppola, Luca Rosati
Department of Civil Engineering, “Tor Vergata” University of Rome, Italy

Abstract: Despite the great success and the broad diffusion of Advanced Public Transportation Information System (APTIS), there is a lack of studies, in the literature, investigating “systematically” how and to what extent such systems can affect network performances and travelers’ path choices. In this paper, we use a realistic case study of the city of Naples (South-Italy), to investigate the impacts of information offered in a Public Transportation (PT) network under different network conditions, i.e. irregular vs. regular services, congested vs. un-congested lines. The focus is on APTIS deploying shared en-route descriptive information. The results presented are based on the simulation of the three main components of the PT system, namely the network, the information provider (i.e. the Operation Control Center) and the travelers. The simulation of these components and their interaction is achieved using different modeling approach as: the schedule-based approach for the network representation and traffic assignment, a statistical model based on the Kalman filter for the prediction of the link travel times within the simulation period, and behavioral discrete choice models, following the Random Utility Theory, for simulating travelers’ behavior.

1. INTRODUCTION

Advanced Public Transportation Information Systems (APTIS) is the generic term under which all those technologies aiming at providing Public Transportation (PT) travelers with information on the performance of a transit network, are included. Different kinds of information can be provided for different phase of the trip. For example information could be the line, or the sequence of lines, to reach a given destination available through an internet web-site; the arrival time of a bus (referred to as a “run”) available
through Variable Message Signs (VMS) at the bus-stop, as well as the name of the next stop for the travelers on board.

In general, information can be available either before trip departure (pre-trip) or during the trip (en-route). Pre-trip information systems are a means of alleviating the uncertainty about transit schedules and routes that is often cited as a reason for not using transit. Providing accurate and timely information to all travelers before their trips, enables them to make more informed decisions about routes and departure times.

En-route information systems offer a wide variety of information to public transit riders who are already traveling. This information can be communicated via in-terminal or wayside media such as electronic signs, interactive information kiosks, and closed-circuit television monitors, or via in-vehicle information devices (e.g. display and/or real-time or automated enunciators) supplying a combination of audible and visual messages such as: next stop, major intersections, and transfer points. While different agencies use different approaches, the overall goal is to provide information that will provide real-time bus arrival and departure times, so as to reduce waiting anxiety, and increase customer satisfaction.

In general, information provided can be either descriptive or prescriptive. In the former case travelers are provided with a description of network conditions, e.g. waiting time at the stop for a given transit line. This aims mainly to improve travelers’ knowledge and awareness of the actual state of the network, contrary to prescriptive information that includes advice on travel choices (departure time, route choice, …) which travelers can follow or not. In transit networks, pre-trip information can be either descriptive or prescriptive, while en-route information is typically descriptive.

Finally information can be classified as either Individual or Shared, the former being information specific to the individual traveler (e.g. the travel time to destination), the latter being information which can be used effectively by different traveler groups (e.g. the arrival time of buses at a stop).

APTIS have been broadly expanding during the last decade. VMS’s at the bus-stops deploying information such as the arrival time of approaching buses, are widely used, no just in the core of the big metropolis but also in medium-size cities. Moreover, many transit agencies offer trip itinerary planning via touch-tone telephone, as well as via the Internet, kiosks, cable television, hand/held data receivers and/or other communication devices.

The benefits that such systems offer in terms of customer satisfaction, increasing Public Transport patronage travelers choices and so on are well-documented by different studies reporting the results of the introduction of APTIS in specific case-studies. These are mainly based on before-and-after