Florida Department of Transportation Research

A Synthesis on Data Mining Methods and Applications for Automated Fare Collection (AFC) Data

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Current Situation

Automated fare collection (AFC) is a common means for issuing and accepting public transit fares. With AFC, a vending machine issues a fare card, usually a paper card with a magnetic strip. The user inserts the card into a turnstile or similar barrier to gain entrance to the public transit service, and the appropriate fare is deducted from the card. Each card has a unique identifier which can be recorded to provide bias-free, low-cost, and continuous observation of rider behavior. Although AFC data do not include trip purpose or demographics, AFC information is valuable for both short- and long-term planning.

Research Objectives

Florida International University researchers performed a comprehensive review of the literature to provide an overview of existing knowledge and experience in utilizing AFC data, as found in practice and in research.

Project Activities

The researchers conducted an expanded review of the published literature, including topics such as improving services for special populations, smart card applications, fare evasion, inferring origin-destination

Automated fare collection systems create a continuous and valuable stream of information about rider behavior.

demand, and many others. The researchers also reviewed data mining and big data techniques applied to AFC areas such as transit service and performance, travel behavior, travel demand, management, resilience, health and safety, and other topics. The researchers examined reports on many applications of AFC, including using AFC data to understand fare increases, infer trip purposes, relate fare structure to social vulnerability, estimate carbon emissions, and more.

The literature review helped identify case studies where transit agencies have used AFC data to develop methods and applications to improve efficiency. Three case studies were selected to enhance the literature review: Metropolitan Transportation Authority (New York City), Massachusetts Bay Transportation Authority, and the Utah Transit Authority.

The researchers found that most work on the use of AFC data was purely academic research, and agencies looking to utilize AFC data for insight will need additional resources and training. First, the data must be prepared and analyzed, which requires capacity to capture and store data as well as specialized tools to manage and analyze data. Second, agencies would need to install the necessary fare equipment. Third, agencies would need software and training for data visualization as a critical aid to understanding and communicating analysis results. Fourth, incorporating data-driven decision making might be new to an agency and require training that supports a cultural change. Fifth, the type of data analysis recommended in this report can create many possibilities for agencies and decision makers to ask new kinds of questions, revise services, and create new ones. This suggests additional training and information sharing among agencies to fully utilize this new capacity.

Project Benefits

This project lays a foundation for transit agencies and funding authorities to improve public transit services through AFC data collection and analysis.

For more information, please see www.fdot.gov/research/.