Lecture 21: Operations and Security

- Role of AVL Technology in Improving Service Delivery
  - AVL Applications
  - Service and Operations Control
  - Real-time Control Strategies
  - Real-time Passenger Information Systems
  - Decision Tree for IT applications

- Security
  - General
  - Terrorism
AVL Applications

1. Service and operations control
2. Passenger information
   • pre-trip
   • en route
   • automated stop announcements
3. Emergency response
4. Signal priority
5. Performance monitoring
6. Operations planning
7. Incident investigation
8. Automatic fare collection schemes
Prior History

• significant trials in 1970s
• relying on central control
• generally disappointing results

Important Questions

• what level of “support” should be provided to the decision-maker?
• who should the decision-maker be:
  • the driver
  • the central controller
  • the field supervisor
• how early to intervene?
• what benefits are achievable?
• what is the value of additional information?
General Operations Control Problem

- Operating costs are fixed in short-run
- Provide best possible service quality
  - waiting time
  - riding time
  - transfers
Real-Time Control Strategies

- Holding: scheduled-based or headway-based
- Short-turning
- Expressing
- Deadheading
- Using reserve vehicle

**Holding**

Benefitted passengers:
- boarding beyond holding point

Disbenefitted passengers:
- those on board at holding point

Ideal scenario:
- midway along route
- few through passengers
- short preceding headway, long following headway
Real-Time Control Strategies

Short-turning

Benefitted passengers:
• reverse direction passengers boarding after short-turn point

Disbenefitted passengers:
• passengers travelling past short-turn point
• reverse direction passengers boarding before short-turn point

Ideal scenario:
• close to end of route
• few through passengers
• heavy reverse direction passenger flow
• long preceding headway, short following headway
Expressing

Benefitted passengers:
• those travelling beyond the express segment
• those boarding after the express segment

Disbenefitted passengers:
• those travelling to skipped segment
• those boarding in skipped segment

Ideal scenario:
• start and end express segment at major boarding points
• long preceding headway, short following headway
Real-Time Control Strategies

Deadheading

Similar to expressing but no passengers carried over express segment

Need to start deadhead at a terminal

Using Reserve Vehicles

Issues:

• how many vehicles to hold in reserve
• when to deploy them
Real-Time Passenger Information Systems

Objectives:

- to increase public transport ridership
- to improve satisfaction of current riders

Pre-trip information systems aim to influence:

- mode selection
- trip timing

En route systems aim to influence:

- customer satisfaction
- ease of use

Focus has been on “en route” systems with many European systems:

- London, etc.
Findings to Date:

- forecasting bus arrival time is feasible
- passengers place value on the information
- ridership gains have been modest
- cost-effectiveness of AVL systems for this purpose alone is highly uncertain
- not a substitute for good static information

Other analysis (Hickman 1993) suggests:

- modest benefits from real-time information on transit path choice for realistic networks

Real-time information is only one element of higher public transport service quality: increasing ridership will require a much more comprehensive approach.
Decision Tree for Application of Information Technologies

Main Problem

OMC = Operations Monitoring and Control
PIS = Passenger Information Systems

OMC, possible PIS

PIS Gradual OMC

OMC?

Non Real-Time "APC" Systems

Restructure, or Impose OMC to cause restructure

Recontrollable

Service Plan

Service Quality

Security

Public Image

Real Time

Planning/Priority

Non Real-Time "APC" Systems

Service Operations Unreliability

Operations Cost

Supervisory Inefficiency

Non-Controllable

Other (e.g. lack of information or speed)

Real Time

Service Plan

Controllable

Service Plan

Non Real-Time "APC" Systems

Restructure, or Impose OMC to cause restructure

OMC

Public Image

Real Time

Planning/Priority
Summary

Operation Control Findings

• typical impact of AVL on operations control has been small
• value of providing the vehicle operator more information
• defining role of “controller” as supporting the operator
• decision support systems not developed to date

Passenger Information Findings

• benefits are largely speculative in terms of ridership and revenue
• real-time systems not a substitute for good static information
• may be useful “add-on” to AVL system where service reliability is a chronic problem

Performance Monitoring, Operations Planning, and Operations Analysis

• increasingly important functions
• no real-time requirements
• low-cost technology
Conclusions

1. Getting the drivers support is critical.

2. Full benefits from AVI/AVL/AVM systems require multiple uses of data.

3. A “systems level” view is required in designing these applications.

4. Most of the critical questions raised are unanswered.
Transit Security

- Security is the freedom from intentional danger
- Safety is the freedom from danger
- The perceptions of security are a critical factor in discouraging transit use
- General security vs terrorism
Strategies for Improving Security

• Ordinances regulating quality of life crimes
• Concessions
• Management options
• CCTV
Ordinances Regulating Quality of Life Crimes

- Regulations against various offenses on transit property, e.g. disorderly conduct, drunkeness, etc.
- Agencies can then enforce these regulations to ensure customers do not feel the transit environment is out of control: zero tolerance policing
Concessions

• Concessions can be located in different areas:
  • directly outside the station area
  • in large intermodal stations as mixed-use development
  • within station but outside paid area
  • at platform area

• Station area concessions generally believed to deter crime by increasing level of activity

• Within station is more controversial -- can contribute to violation of regulations (littering, eating and drinking on vehicles, etc.)
Management Options

• Who provides the security services: transit police, local police, security guards, non-security personnel

• Evolution from fare collector to station managers with AFC systems

• Good combination is:
  • security guards trained to maintain order, including issuing fines and tickets
  • work in partnership with local police, station staff, and maintenance workers
  • station agents should manage the station area, provide information and ensure maintenance
  • maintenance staff
Closed Circuit Television

- Widely used in transit to monitor station areas and deter offensive behavior
- CCTV installation can be + or - in terms of perceptions
Terrorism

• Transit is by design an open infrastructure

• Depends on high volumes and rapid passenger flows onto vehicles, into stations

• Can be a critical element in responding to terrorism threats elsewhere

• Need to have well-established and visible plans and well-trained staff
  • to deter attacks
  • to minimize risks if an attack does occur
Key Agency Security Efforts

Transit Response

- Training employees
- Outreach to customers
- Sharing of best practices between transit agencies
- Increased visibility
- Increased staffing presence
- Vulnerability assessments
- Use of canine units
- Development/refinement of security & emergency preparedness plans
- Develop/strengthen inter-agency coordination
- Employee & contractor background checks
- Drills (field and table-top)
Key Agency Security Efforts

Capital Projects

- Upgrade of radio communications
- Automatic vehicle location (AVL)
- CCTV (facilities and vehicles)
- Access control (fencing, locks, smart cards)
- Intrusion detection
- Employee/contractor ID
- Chemical agent detection
- Overall design to enhance security
Industry Challenges and Needs

Future Focus

• Sources of Direct Transit Funding for New Era Security Needs
• Ongoing Technical and Training Support
• Verifying Effectiveness of Security Technologies
• Low Cost “Real-Time” Chem/ Bio/ Radiological Detection
• Maintaining an Effective Public Transit ISAC
• Frequent/ Aggressive Communication to Industry
• Application of Threat Advisory Guidelines
• Inter-agency Emergency Coordination, Communications & Drills
• Security Sensitive Procurement Processes