Intelligent Transport Services (ITS)

Massachusetts Institute of Technology

Urban Transportation Planning
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Scope

- Summary
- TeleComs:
  - Enabling Technologies
- ITS:
  - Concept and Goals
  - Automobile Oriented
  - Transit Oriented
- Policy Arena:
  - From deployment of new technologies towards organizational changes
Summary: ITS in a nutshell

- Objectives:
  - Originally to address road congestion
  - Later, transit, safety, logistics, demand management, security …
  - Intermodal perspective

- Technology:
  - TeleComs as the starting point
  - Technical compatibility and integration
  - Market driven
  - Promises and realities
  - Often, solutions in search of problems
Summary: ITS in a nutshell

- Policy Arena:
  - Need to share and exchange information
  - Institutional cooperation
  - From a tactical tool towards a strategic approach
  - Recent boost on behalf of road safety
Summary: ITS in a nutshell

Main applications in the US:

- **ATIS:**
  - Advanced Traveler Information Systems

- **AVCS**
  - Advanced Vehicle Control Systems

- **CVO:**
  - Commercial Vehicle Operations

- **APTS:**
  - Advanced Public Transportation Systems

- **ARTS:**
  - Advanced Rural Transportation Systems

Ref: “Perspectives on Intelligent Transportation Systems” by Joseph M. Sussman, Springer 2005
TeleComs: Telecommunications + Computing sectors

- Fastest growing sector in Europe
- 5% GDP: 4 million employed
- 300,000 new jobs (‘95 - ‘97)
- More to come:
  - Audio visual (3G video services)
  - New mobile services, as...
- More cellular phones than computers!
Telecom jobs are booming

Figure by MIT OCW.
Projected E-commerce growth

Sources: various forecasts as indicated

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Technology evolution

Functionality and Capabilities

- Speech
- Circuit data <9.6 kbps
- HSCSD 38.4 kbps / 57.6 kbps
- GPRS 115 kbps
- EDGE/EGPRS 384 kbps
- WCDMA 2 Mbps
- IMT-2000 Capable Systems

Time

Figure by MIT OCW.
Technology evolution

- SMS
- SIM Toolkit
- WAP
- GPRS
- Bluetooth
- Terminals
- Smartcards
- E-commerce
- Security
- Positioning
The challenges of telecom providers...

- Mobility - taking services from the desktop to the pocket for the ultimate in convenience
- Towards ubiquitous computing
- Security, payment, browsing and devices are key technology
Secure electronic financial transactions:

- Business-to-business, retail and administrative transactions
- Billing, payment, accounting
- Anonymous small payments .. (Credit card usage at Newbury St for parkmeters)
- Reliable, tamper-proof smart cards and personal tokens – (using phones to pay for transit in Japan)
Europe Today

- Leads in:
  - Mobile communications
  - Digital television
  - Digital local access
  - Electronic payments and smart cards

- Lags in:
  - Corporate IT investment
  - Use of the Internet
  - Electronic commerce
  - PC industrial and technology development
What sort of Information Society?

- EU Desideratum:
- Employment rich
- Socially inclusive
- Economically stable
- Culturally diverse
- Environmentally sustainable
From TeleComs to: New ways to work

- Flexibility in time and place
- Better use of skills
- Reduced investment for new job creation
- Reduced overhead costs
- Financial viability for more new kinds of work
- Greater responsiveness
“The result … is the creation of a global network, Web-enabled playing field that allows for multiple forms of collaboration – sharing knowledge and work – in real time, without regard to geography, distance, or in the future, even language”

Thomas Friedman, “The World is Flat”, NY 2005
From TeleComs to: **Teamwork and tele-work:**

- Teamwork across borders and timezones
- Real-time and asynchronous
- Linking different types of workplaces
- Intra-company and inter-company
- New tools and standards
ITS: Intelligent Transport Services
(As Part of the Information Society)

ITS: Control, management and information tools aimed to improve the efficiency, safety and quality of service of the transportation system

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eEurope: Main Targets

- Key challenge is to meet the growing demand for mobility within the finite transport networks
- Congestion in road transport
  - Speed up the development and deployment of Intelligent Transport Systems
- Safety of road, rail, air and maritime transport
  - Active safety systems in vehicles
  - Enhanced 112 with location information (equiv to US 911)
Timely and reliable information and guidance services (in real time, pre-trip/on trip)

Effective congestion and demand management strategies (to reduce delays and to improve the environment, safety and intermodality)

Efficient incident and emergency management (detection, verification, response)
eEurope Targets: Road Safety

- Safety of road:
  - New emphasis on account of 42,000 yearly deaths
  - All new cars sold in Europe equipped with more efficient active safety enhancing systems

- All citizens on the move throughout Europe should have access to:
  - call localization and
  - emergency services through the 112 number, recognizing the language challenge
Urban Traffic:

- Traffic Signals
- Monitoring throughput:
  - Recommended speeds
  - Ramp metering
- Incident Management
- Signal priority for:
  - Emergency vehicles
  - Public transport
Intelligent Transport Services (ITS)

Real-time Information:

- Automobile traffic
- Public transport
- Parking
- Airport arrivals/departures
- Points of interest (POI)
- News, banking, stocks…
Intelligent Transport Services (ITS)

Payment Systems:
- Tolls
- Transit fares
- Parking
- Electronic purse
- Mobile-business
Urban Goods distribution:

- Fleet Management
- Real-time location
- Load consolidation
- Hazmat management
Intelligent Transport Services (ITS)

Sectors involved:

- Transport
- Automobile industry
- Telecoms
- Banking
- Consumer electronics
- Tourism
- Mass Media

...............................

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ITS and the Automobile

- Traffic Information Systems
- Route Guidance and Navigation
- Location-based Services
- Parking Information
- Safety
ITS and the Car:
Traffic Information Systems

pre-trip:
- trip request at departure
- trip recommendation

on-trip:
- deviations from indicated travel times
- new travel times and routes

RTI center

location

Car

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ITS and the Car:
Traffic Information Systems

![Diagram showing the flow of traffic information and user data to refined content]

- Traffic Information
- User Data
- Map Information
- Positioning Data
- City Information

Refined Content

Close
"The next pharmacy..."

City Navigation
"The fastest route..."

My Profile
"Do not forget the birthday of your mother-in-law..."

My Program
"My nicest day..."

Watchdog
"My flight is delayed..."

City Highlights
"Which club is still open..."

Figure by MIT OCW.
From Data to Information

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Figure by MIT OCW.
ITS and the Car:

Traffic Information Systems

- Variable Message Signs
- SMS messages and WAP
- Digital Audio Broadcasting (DAB)
- Traffic Message Channel (TMC)
Parking Information

- Information on availability
- Reservation and ID

Guidance to:
- Available facility
- Actual spot
From Traffic Control Centers (TCC) to Traffic Management Centers (TMC)

Just a name change?
Real time information on the Web

Updated every minute
From color coded maps to actual photographs of the traffic stream
You can check in real time an incident

Even choosing to see upstream impact
Paris…

Color coded maps, time estimates … and times by transit
ITS and the Car: Route Guidance and Navigation

- Human Machine Interface (HMI)
  - Related to safety

- Speech Recognition
  - Hands free speaking and listening

- Location-Based Services
  - Accident location
  - Advanced Driver Assistance Systems (ADAS) – Collision Avoidance
  - GPS and Galileo
ITS and the Car: Last Mile Services

- Based on Pre-Trip download
- Route indication
- Services
  - 3D visualization of last mile
  - Remote POI selection

Ref: TeleAtlas
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ITS and the Car: Last Mile Services

Auto → Web → Destination

Ref: TeleAtlas

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ITS and the Car:

Road Safety (Last but not the least…)

- Emergency Calls
- Passive (airbags) and Active (collision avoidance) Safety
- Advanced Driver Assistance Systems (ADAS):
  - Driver monitoring
  - Vision enhancement
  - Collision warning and avoidance
  - Speed alert
  - Elderly and people with disabilities
ITS and the Car: Road Safety *(Last but not the least…)*

- Speed control in urban environments
- People driving through red lights

Speed on urban environments
Drivers through red lights
ITS and Public Transport

- Real-time information for:
  - Operators:
    - Fleet management
    - Travel time reliability
  - Users:
    - Waiting anxiety
    - Real-time information anytime anywhere
    - Route Planners
    - Universal smart cards
ITS and Public Transport

Operations

- Automatic Vehicle Location (AVL)
- Automatic Passenger Counters (APC)
- Automatic Fare Payment (AFP)
- Bus Priority Systems
- Advanced Ticketing
- Fleet Management
Easy to deploy within each turf, but hard to integrate across operators and modes
ITS Integration: A bumpy road

**ITS:** Information + Communication + Integration
ITS Deployment

- Important organizational changes
- A new path from control to sharing information
- A transition from hierarchical systems to networks
ITS Integration: A bumpy road

Let’s share information:
- The public needs a single source of multi-modal information
- The operators can benefit by sharing real-time info

Let’s decide with others in mind:
- Impacts or synergies on third parties?
- Modularity of equipment and architecture?
ITS Integration: A bumpy road

ITS is not a technical issue but a new frame for:

> Voluntary cooperation
> Seeing the big picture
> Bringing others into the decision process
> Adopting necessary new policies
In short, ITS other than short-term mitigation tools, may serve:

- To become catalysts for change
- To establish new two-way relationships
- To create new spaces for collaboration
- To provide a global vision of the transport system

... But, ITS involves a long complex and difficult path (*the road less traveled*)
ITS as a Tool - Main Objectives?

- To increase road capacity at low cost?
- Or, just an opportunity to promote a more efficient and diversified transport system?
- Should it be used to enhance mobility -- Or to improve accessibility? Or perhaps, just to substitute some trips on certain days?
Final thought

- We have to:
  - master the technology
  - envisage new applications from the existing technology, and
  - retain a proper global perspective

What do you think…
- Is ITS good or bad?
- What is its main contribution?
- Is technology in general good or bad?

(See the Sept 2002 issue of the Atlantic Monthly on Home Security)