



ITS Intelligent Transportation System

Technology of ITS

- Data processing, management & archiving technologies i.e Data Management & Archiving
- Detection technologies i.e Roadway Sensors & CCTV
- Information dissemination technologies i.e User Interfaces
- Location referencing & positioning technologies
- Traffic control & vehicle control technologies
- Electronic payment technologies
- Surveillance and enforcement technologies

Communication

Dedicated Short Range Communication (DSRC)

It offers communication between vehicle and the roadside in specific locations (ex-toll plaza).

Continuous Air Interface Long & Medium Range (CALM)

It provides continuous communication between vehicle and roadside using cellular and infra-red links.

Computational Technologies

- These uses sensors, in-vehicle computers which allowed software applications and artificial intelligence to be installed.
- These systems include internal control of model based processes for a greater transportation system.

Floating Car Data

- **Real-Time**
 - Automatic Number Plate Recognition (ANPR)
 - GPS Trace
 - Radio Signal Triangulation
- **Non Real-Time**
 - Manual Surveys
 - In-Vehicle Recoding

Intelligent Transport Systems – is the integration of information and communications technology with transport infrastructure, vehicles and users. By sharing information, ITS allows people to get more help from transport networks, in greater safety, efficiency, security and with less impact on the environment.

- ITS is an emerging transportation system.
- It is the integrated application of advanced technologies.
- Enables users to be better informed, make safer use of transport networks
- With the help of ITS, the traffic congestions, rate of road accidents, wastage of fuels will be decreased to a larger extent
- This gives the people of the country a more economic mean of transportation with advanced information of transits.

It is used to solve problems originating from:

- Rapidly growing economy
- Insufficient and inadequate public transportation system
- Low speed, increased accident rates, increased fuel consumption and increased pollution
- Impossible to build new roads to meet the demand.



Reduced Congestion



Higher Quality Mobility



Reduced Environmental Impact



Improved Safety



Improved Energy Efficiency



Increase Commuter Satisfaction

Sensing Technologies

Sensing Systems are Vehicle & Infrastructure based Networked Systems

- Pavement loops are used to sense the presence of vehicle demand at intersections and parking lot entrances.
- Pressure pads are used to sense the presence of pedestrians waiting to cross a roadway.
- Radar and acoustic sensors are also used for detecting vehicles in the roadway.
 - **Working:**
 - Transmits Radar Pulses
 - Part of Energy Reflected from Vehicle Back Toward the Sensor
 - This Energy is Received & Interpreted
 - **Benefits:**
 - Low Power
 - Easy Installation

- Most Accurate

Inductive Loop Detection (ILD)

- One or more loops of wire are embedded under the road & connected to a control box
- When vehicles pass, inductance is reduced showing a vehicle is present

Video Vehicle Detection (VVD)

- This is the most widely used method.
- It is an image processor.
- Consists of a microprocessor based CPU and software that analyzes video images.
- Statistics can be progressively transmitted to a server for real-time analysis.



Sub System for Motorways & Highways

ITS System Comprises of following Sub Systems for Motorways & Highways:

- Electronic Toll Collection (ETC)
 - Toll Collection System (Man Managed Lanes)
 - Toll Collection E-Fast (High Speed System) using Long Range Ultra High Frequency Tags
- Automatic Vehicle Classification (AVC)
- Section Speed Enforcement System (P2P).
- Fine Collection System
- Automatic Number Plate Recognition (ANPR)
- Low Speed Weigh In Motion (WIM)
- Advanced Traveler GIS Based Information System.
- Weather Information System (WIS)
- Emergency Roadside Telephone System (ERTS)
- Variable Message Sign (VMS)
- Video Enforcement Surveillance System (VES)-(CCTV)
- Web Portal
- Highway Advisory Radio (HAR)
- Traffic Incident & Emergency Management System
- **ITS Control Centre** - ITS Management Centre composed of application and database servers, operator workstations, ITS and CCTV management applications, video wall.
- ITS Communication System

Field Input Devices

Weather Information System
Roadside Emergency Telephone
Weighing in Motion
Moving Vehicle Detectors
Live CCTV's Monitoring
Journey Time
Speed Enforcement Checkpoints

TRAFFIC CONTROL CENTER



Field Output Devices

Variable Message Sign
Advisory Radio System
Web / Smartphone Applications
Ambulance Service System
Mobile Workshop & Recovery System

Physical Components & Devices in ITS

1. Field Equipment

- Inductive Loop Detectors
- Magnetic Detectors
- Infrared & Microwave
- Acoustic Detectors
- Video Imaging

2. Communication

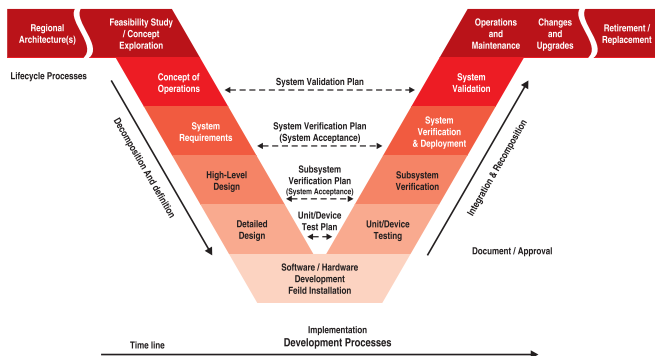
- Wired Communication
- Wireless Communication

3. Traffic Management Center

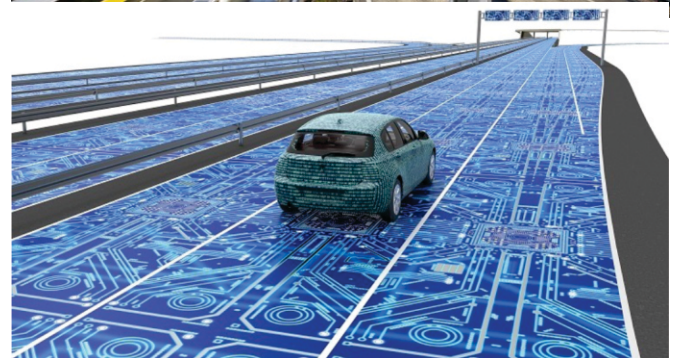
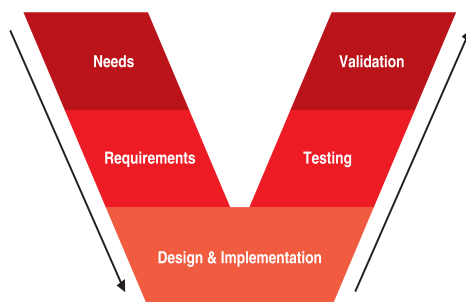
Basic Facility

- Signal Control
- Traffic Surveillance
- Freeway Control
- Integration for Regional Control
- Incident Detection
- Incident Response
- Information Dissemination
- Electronic Tolls

The Systems Engineering for ITS V



System Engineering Ties it All together



Benefits of ITS

- Reduced Crashes & Fatalities.
- It Saves Time, Money & Lives.
- Reduction in Stops & Delays at Intersections.
- Speed Control & Improvement.
- It can also enable Transportation Agencies to collect the real time data needed to measure and improve the performance of the Transportation System.
- Improve Traffic Flow, Cut Gas Consumption and Emissions.
- Incident Management.
- Reduction of Congestion.
- Maximize the Capacity of Existing Infrastructure.

Objectives of ITS

- Reduce Crashes, Delays & Travel Times
- Improve Incident Response & Clearance
- Increase Freeway throughput Capacity
- Improve Travel Time Reliability
- Provide AMBER Alerts, Silver Alerts & Law Enforcement (LEO) Alerts on Dynamic Message Signs
- Support Emergency Evacuation Operations
- Reduce Wasted Fuel & Lower Emissions
- Manage Operations more Efficiently
- Improved Trip Planning.



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