

**Source of Data**

The raw time-series data are collected by sensors installed in Ulsan, South Korea.

- **DSRC data**: road name, road location, and vehicle detectors.
- **Inductive loop data**: road name, road location, direction, speed, and volume. Resolution: every 15 minutes.
- There is a historic dataset over a total period of over two years, as well as real-time dynamic stream data.

**Summary**

We present an interactive visual analytics system that enables traffic congestion exploration, surveillance, and forecasting based on vehicle detector data.

**Tasks**

- Quoted from the paper:
  - Analysis of congestion patterns, changes, and trends with historical data.
  - Real-time congestion surveillance across the city.
  - Real-time congestion propagation estimation.
  - Real-time predictive analysis of near-future congestion conditions, and
  - Real-time maintenance of malfunctioning vehicle detectors.

**Linked views** have been used in traffic visualisation in the past, but for different tasks.

- **Clock view**: positions on the diagram correspond to times on a clock.
- **Data Visualised**:
  - Traffic volume in each direction.
  - Geographical position of the roads.
  - Traffic speed in each direction.
  - Congestion information: 2D Spatial time series data.

**View**

- **Colour map**
  - Traffic speed encoded as a sequential colour map.
  - Green over 40 km/h: unimpeded
  - Orange between 20 and 40 km/h: slow
  - Red below 20 km/h: impeded
  - Which are conventions in the domain.

- **Existing Systems**
  - **VSRivers** stands for ‘Volume-Speed Rivers’: large volume and low speed means high importance.
  - Lines on a geographic map
  - Width: traffic volume
  - Colour: traffic speed

- **Data for individual roads**
  - Speed encoded as colour and displayed directly.
  - Volume encoded as length of bars.
  - Can be sorted: good for searching congested roads.

**View**

- On a higher level: analyse congestion patterns, discover places of interest, and derive prediction of future congestions.
- On a lower level: locate and explore congested roads, and query the historical and temporal congestion information of roads.
**View**

- Calendar view
  - Y-axis: days in a week; X-axis: weeks in a year
  - Speed encoded as colours
  - Holidays highlighted using black outlines
  - Aggregated speed and volume for each week and each day in a week shown at the end of the calendar

- In-detail view
  - Speed encoded as colours
  - Highest resolution

- "Snapshots"
  - Segments of the main map highlighted
  - Linked to main map

- Linked view
  - Map and table of roads: shared data, different encoding
  - Map & table: subset of data; clock & calendar: detailed data
  - Linked navigation

**Evaluation**

- Three case studies
  - ‘Understanding City Traffic Congestion Patterns’
  - ‘Investigation on Congestion Improvement Projects’
  - ‘Broadcasting Traffic Congestion Conditions’ - in real time
  - Expert interview

**Critique**

- Strengths
  - Design process with a focus on tasks
  - Massive item reduction to improve visual clarity
  - Interlinked views makes navigation easy

- Weaknesses
  - Do we really want to perform real-time and retrospective analysis using the same application?
  - Colour map - low resolution and accessibility issues
  - Evaluation - would a quantitative study be possible?

**Thank you!**

Any questions?