Key market positions

Traffic Planning and Optimisation
> Global #1 with PTV Vision suite (VISUM, VISSIM)

Traffic Data Management
> Innovative Management Systems

Mobility & Navigation Solutions
> Global leader and pioneer
Advanced telematics components (PAYD, Toll-Collect)
> World leader

Logistics Planning (software and consulting)
> European leader

Pedestrian Modelling
> Scientifically developed, comprehensive, integrated solution

Business units

PTV Asia Pacific
Traffic Mobility Logistics

The Software Suite for the Transportation Professional

Organisations using PTV Vision Software
PTV Asia-Pacific

- Regional business unit of PTV worldwide
- Permanent offices in Asia-Pacific since December 2005
  - Singapore, Brisbane & Melbourne
- PTV Software – Key Users in Asia-Pacific
  - Queensland Transport, TransLink
  - VicRoads Design and Metropolitan regional offices
  - Land Transport Authority, Singapore
  - Hong Kong Airport Authority
  - Hong Kong Mass Transit Rail Corporation
  - Local authorities, consultants, universities
- Thirty staff and growing

Why Simulate Pedestrians?

Normal infrastructure operation
- Capacity analysis
- Level of Service
- Queuing
- Travel Times

Urban Planning
- Design Conceptualisation
- Visualisation
- Shared Space Applications

Exhibition Road, London, UK
Brandenburg Gate, Berlin, Germany
Safety Assessment of Building Design

Why Simulate Pedestrians?

- Pedestrians have always been an important aspect in transport modeling.
- In junction modeling pedestrian flows play a more important role in other situations:
  - bus terminals
  - railway and underground stations
  - Airports
  - Large Scale Carnival Events

The Research

Pedestrians in VISSIM

- A simple link based behavior model was sufficient for these applications:
  - pedestrian flows play a more important role in other situations:
    - bus terminals
    - railway and underground stations
    - Airports
    - buildings (retail, residential, commercial)
    - sports stadiums
- For these applications, a more sophisticated area based behavior model was included in VISSIM: The social force model

The Social Force Model

- Developed by Prof. Helbing, Federal Institute of Technology Zurich, 1995
- Each pedestrian is influenced by a number of forces,
  - attractive forces from other pedestrians,
  - repulsive forces from other pedestrians,
  - repulsive forces from borders and
  - driving force towards the desired direction of motion.

\[ \frac{d\vec{v}}{dt} = \vec{f}_a(t) + \vec{f}_r(t) \]

\[ \vec{f}_a(t) = \vec{f}_a(\vec{v}) + \sum_{\text{ped}} \vec{f}_a(\vec{v},\vec{v}_p) + \sum_{\text{borders}} \vec{f}_a(\vec{v},\vec{b}) \]

Model calibration: empirical data

- Measurement technique: video analysis

\[ \text{Density} \]
Conditions of pedestrian characteristics

- Results of measurements of pedestrian traffic depend on many variables.
  - Temperature
  - Age
  - Hour of Day

Model calibration: Experiments

Source: Technical University of Delft
Source: Technical University of Dresden
Source: T. Kretz, University of Duisburg-Essen

Flow through a bottleneck: dependence on the width

- The specific flow decreases with the width and a width of 70 cm results in a nearly constant flow.

VISSIM Pedestrian Model Development

Extensions to VISSIM simulation mechanics

- Movement of objects in areas, not lane-oriented
- Rectangles or polygons
- Interaction of flows in different directions on the same lane

How pedestrians find their way: potential fields

- The VISSIM network infrastructure is transformed to general 2D areas. Potential fields are created so the pedestrians can navigate through the most complex environment.

Potential field for navigation
Modeling pedestrian facilities in VISSIM

- defining pedestrian Facilities and destinations

Pedestrian attributes

- user defined pedestrian types
  - physical dimensions
  - social force parameters
  - desired speed distribution

Modeling principle: everything is defined by areas

- pedestrians move on areas
- special areas for entries, exits, counters, routing etc.

Model calibration: counterflow simulation

- many other pedestrian modeling packages produce full blockages
- in reality, pedestrians organise themselves into lanes

Evaluations

- Travel Time:
  - from any area to any area
  - Locally
    - density
    - average speed and flow in an area
  - Level-of-Service
    - density based FRuin-LOS (a common measure in pedestrian design)
    - Time-aggregated
      - occupancy of areas

Project Methodology

- Similar to traffic studies!!
  - Scope
  - Base Year
  - Data Collection
  - Composition
  - Site Visits
  - Model Build
  - Calibrate
  - Performance Measures
  - Scenarios
  - Data Collection – video observation / CCTV assists
Case Study: North Melbourne Station

Services

Demand

Growth Areas

Aerial View

Concourse View (from north)

Melbourne CBD
Base Model Development

- Morning Peak hour model (7:30-8:30)
- Platforms / Concourse represented as Pedestrian Areas
- Furniture / Shelter represented as Obstacles (physical barrier)
- Platform and Concourse levels connected with Ramps
- Concourse currently only at northern end of station
- Six Platforms
  - Three Southbound (Up Direction)
  - Three Northbound (Down Direction)
- Various Rolling Stock (Regional / Metropolitan services)
  - Number of Doors
  - Number of Services per Platform
  - Boarding and Alighting Passenger Numbers
  - Passenger Interchange Patterns per Service

Dwell Time at station based on calculation:
- Occupancy + boarding + alighting
- Five classes of stationary time
- Boarding volumes based on spare capacity
  - If train is near full, not all passengers can board
  - Passengers alight before passengers board
  - Site Investigations identify that:
    - Crowding on platform near to shelters
    - High volumes of passengers alight near to ramps
      (placement on train to minimise journey times)

Future Scenario Options – managed within spreadsheet

- Change of Rolling Stock (change capacity)
- Additional Services (add more rows)
- Impacts of Service Delays (change in arrival times)
- Change Passenger Volumes or Interchange Distribution
- Change in Station Operations (change in platform arrival)