Mobility studies
Dynamic pedestrian simulations
Summary

Activities in transport and mobility studies

Dynamic pedestrian simulations
  - Introduction
  - Tool and methodology
  - Progress of a study

References and examples
**Setec company**

- Multidisciplinary engineering
- 254 M€ turnover in 2015
- 2,400 employees in the world
- Independant
  *(100% of the capital held by its employees)*
- Created in 1957 in Paris
Team: 30 engineers, with Masters in economics and geography

Activities:

- **Transport planning**
- **Mobility and urbanization**
  - Urban travel plans
  - Mobility/transports: urban projects evaluation, *Functional studies of poles of exchange*
  - Sustainable mobility
- **Traffic modeling**
  - Urban/Interurban
  - Travelers/merchandise
  - All modes of transport
  - Static and *dynamic models*
- **Socio-economic feasibility studies**
- **Economic and financial studies**
Dynamic simulations of pedestrians are at the crossroads of the expertise of the planning department at Setec International

- Functional studies of poles of exchange
- Implementation of dynamic simulation tools initially for the road section

Development of an in-house competence on the basis of an initial partnership with EMSSYS, French company marketing Anylogic

Application to exchange centers, airport terminals, railway stations, tram stations, and all types of buildings with complex flow problems (volumes, circulations ...)

- In classic running operation,
- In exceptional operation: emergency evacuation for example
Multi-agent approach simulation

Organization of flows in a constrained space is a very complex problem. Simulation process aims to simplify this problem, and – based on hypothesis – to make it work in order to learn from it about a new situation. Simplification is made through several types of agents:

- « space » agents: waiting areas, circulation areas..
- Dynamic agents who have the ability to move on their own initiative and generate flows: visitors, pedestrians, vehicles ...
- Static agents who – unlike dynamic agents – are fixed or can be moved by other agents: escalators, control lines, ticket outlets...

Anylogic integrates the above three types of agents and allows to model the pedestrian behavior on 3 levels of intelligence: reflexive, reactive and cognitive.
**Progress of a study**

- **Collection of input data:**
  - Flow to simulate: volume, characteristics, and all associated hypothesis (share of groups, share of travelers buying a ticket at the cashier or at the counter, time spent in each part of the building…)
  - Plans of the spaces to be simulated and the characteristics of the different equipment (width of escalator or stairs, number of queues, etc.)

- **Creation of simulation model with Anylogic and adjustment of the model parameters to reproduce a known situation,**

- **Realization of simulations and edition of results:**
  - Density maps,
  - Numerical indicators (waiting time, queue length, max density at a point …)
  - 2D and 3D animations,

- **Results analysis in order to:**
  - Resize some equipments,
  - Propose new flow management alternatives,
  - Propose new space organisation

- **Simulations of new configurations**
Bourse du Commerce for the Pinault Paris Collection

In 2017, the city of Paris conceded for 50 years the building of Bourse du Commerce to host Pinault Collection of art, including firstly important works of restoration of the building, whose studies was led by Setec.

Setec international was asked to perform dynamic simulations to ensure fluidity and comfort for the flow of visitors expected.
New metro line in the central station of Montreal

Central station of Montreal is very frequented today: crossing of different flows (train users arriving or waiting for departure, transit flow, commercial areas). The project of a new metro line will add an important amount of pedestrians in the hall of the station.

Setec international was asked to perform dynamic simulations to analyze saturation points and judge the level of service in this situation.
Implementation of a prototype of access control on a tram station in Lyon

To combat fraud on its network, a study was ordered in 2010 to examine various access control devices operable at a tram station.

Setec International had to make sure that the devices envisaged are compatible with the pedestrian flows generated by the tramway, now and in the future.
Nice-Côte d’Azur Airport : redevelopment of commercial areas

As part of the overhaul of the shops of the terminals T1 et T2 of Nice Airport, Setec International proposed to simulate pedestrian flows for these 2 terminals.

Based on real flight plans, flow simulations purpose is to test the proposed solutions and ensure the correct dimensioning of the resources of the terminals. Analyzed resources are:

- Number of checkpoints,
- Organization and surfaces of queues,
- Agent paths.
Louis Vuitton Foundation for creation

Louis Vuitton Foundation for creation, created by LVMH company, has the ambition to promote art and culture. The building was designed by the architect Frank Gehry.

The Foundation asked setec international to analyze flows in the building, and propose organizational scenario to host the different types of events planned, and evaluate expected performance using a dynamic simulation model.
French pavilion of the Universal Exhibition of Milan 2015

As part of the competition launched by FranceAgriMer for the construction of the french pavilion for the Universal Exhibition of Milan 2015, X-TU Architects, asked to setec international to study flow management.

Based on a dynamic simulation of the pavilion, setec international took part in the conception of the project for the flow organization.
Thank you!

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