

NEXTSTATION

MARRAKECH 2015

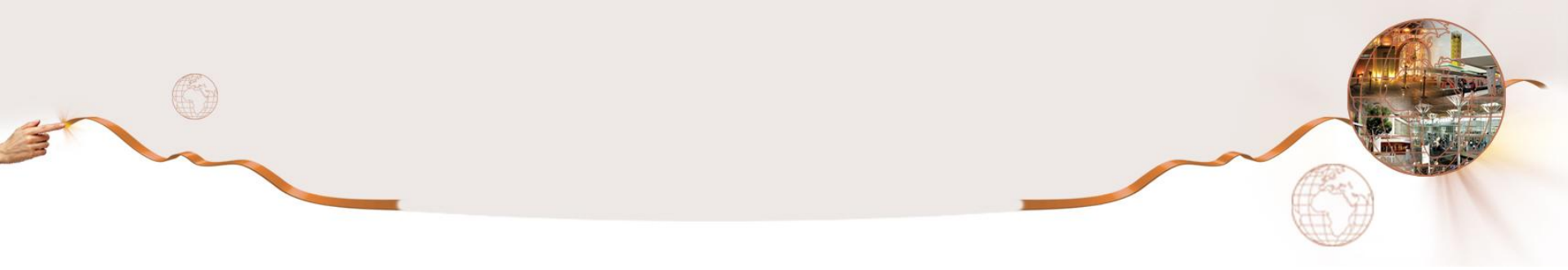


5TH INTERNATIONAL CONFERENCE ON RAILWAY STATIONS



Palmeraie Palace

Marrakech, 21-22 october 2015



2D discrete crowd motion model : Application to pedestrian flows in railway stations

Navier



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- Country : France
- Number and session name : session 3B, Technologies





- • **The 2D discrete crowd motion model**
 - Non-smooth mechanics & Discrete Element Method

- • **Pedestrian flows in railway stations**
 - Input data : line, station and platform levels...
 - Simulation & results : dwell time estimation





crowd motion model

- Types of events : **self-organized processes/evacuation/traffic control**
- Environment representation : **discrete**
- Crowd representation : **discrete (agents)**
- Types of walks : **normal/emergency**
- Pedestrian geometry : **2D (3 DoF)** 
- Travelling strategies : **shortest/fastest path**





- **Discrete Element Method (DEM)**

Granular Media



Adaptation



Crowd

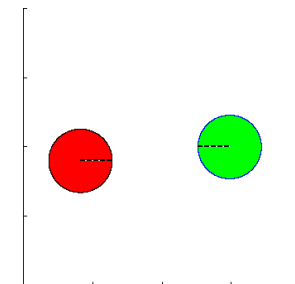
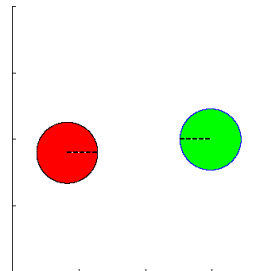
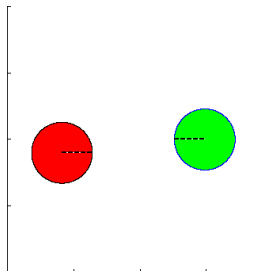


Non-smooth mechanics

(Frémond, 1995; Dimnet, 2002;
Dal Pont and Dimnet, 2008)

(Pécol et al, 2010,2011)

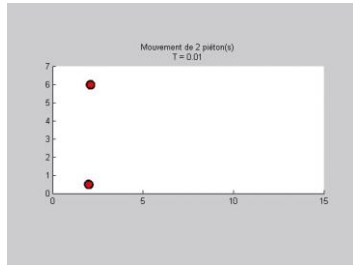
- **Interactions management : collision**



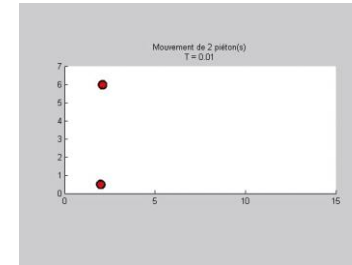


crowd motion model

- Interactions management : avoidance

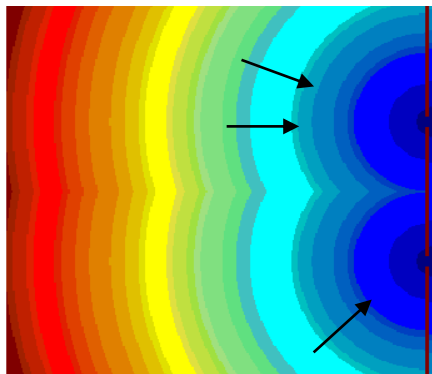


Repulsive forces

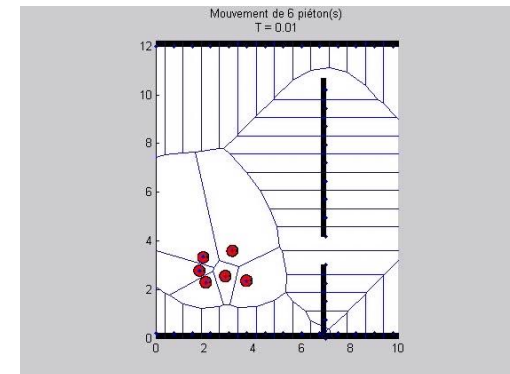
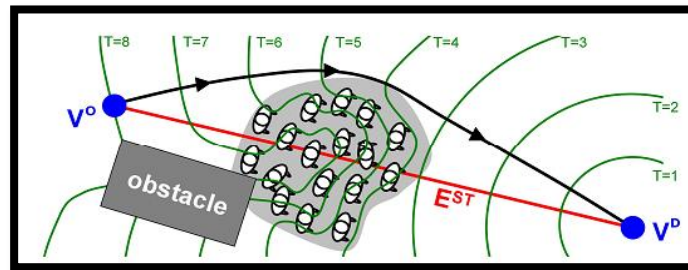


Cognitive approach

- Walking strategy (long range) : shortest path



exits



Method based on static and dynamic fields.
We implement a scalar function which increases with
the distance to the destination point.



in railway stations

Line level

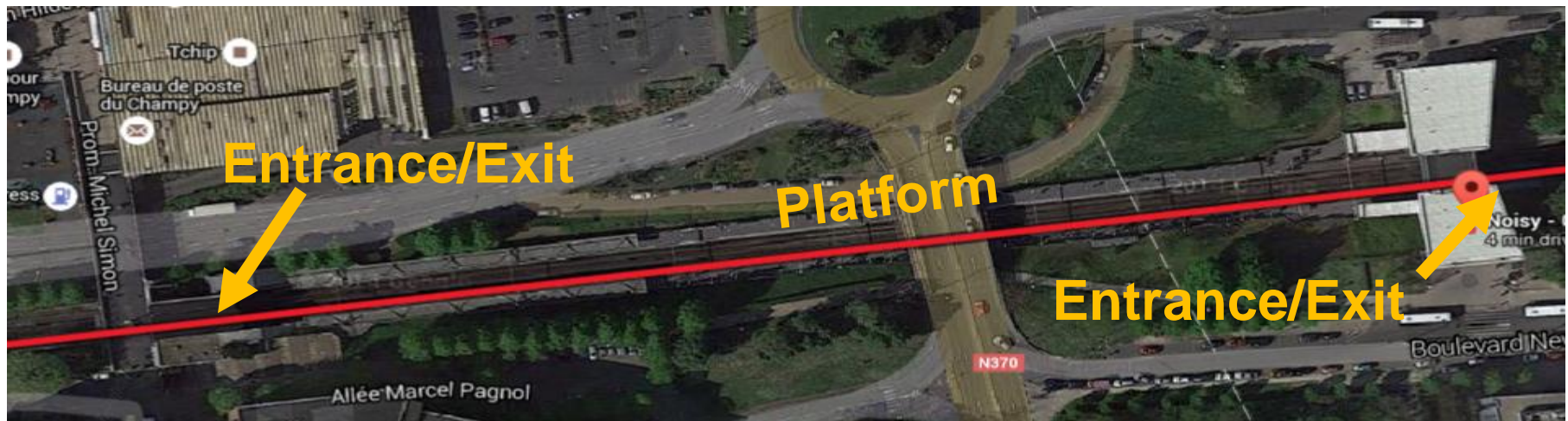
- Train traffic data

Field measurements => Headway = 6 min

- Passenger demand per train for Noisy-Champs station :

CapTA model => 59 for alighting / 304 for boarding

Station level (1) : geometrical data

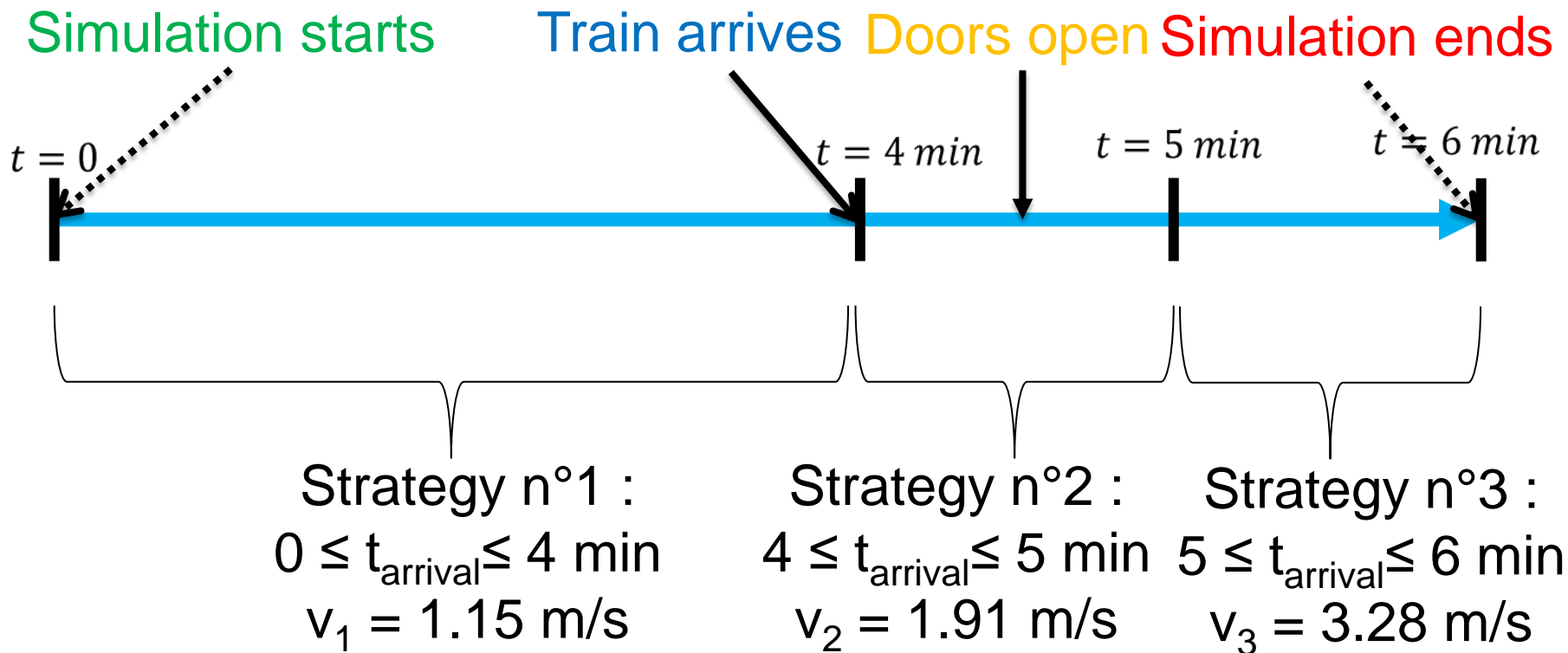




in railway stations

Station level (2)

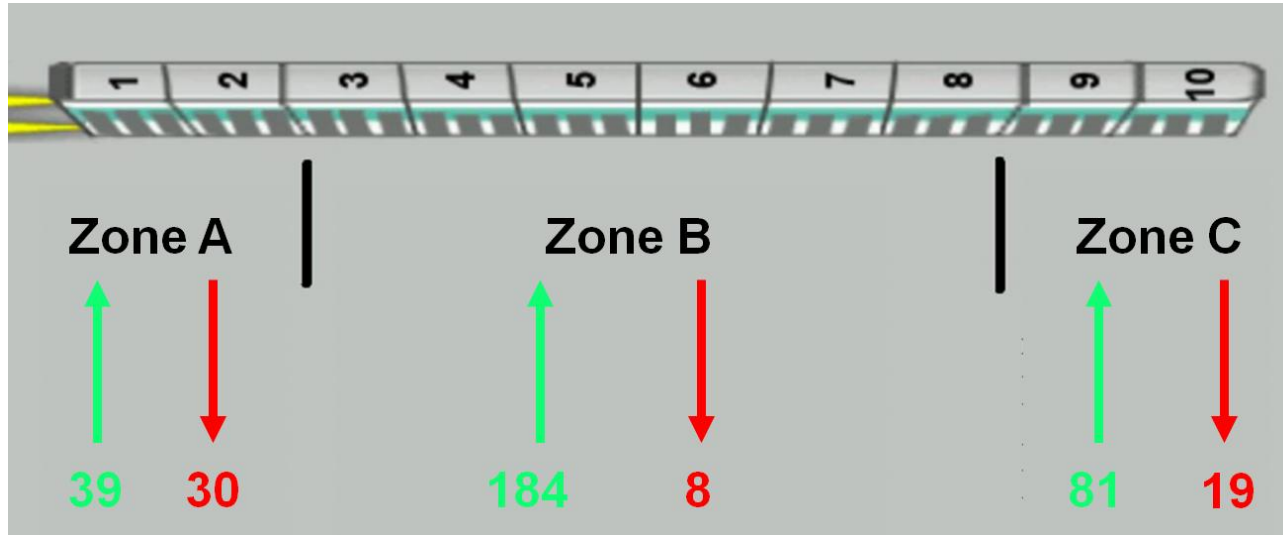
Hypothesis on the time schedule and pedestrians' travelling strategies





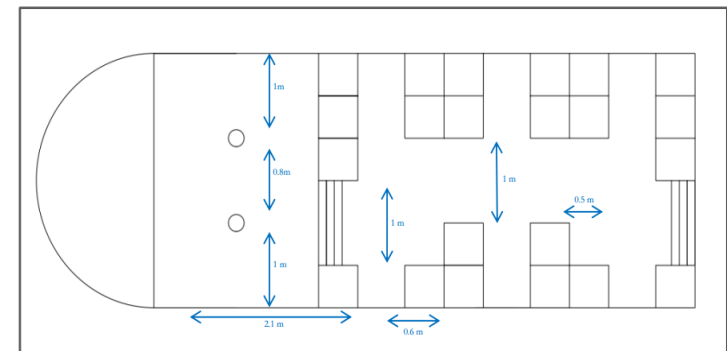
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Platform level : platform and train's geometry



MI09 train

2D representation

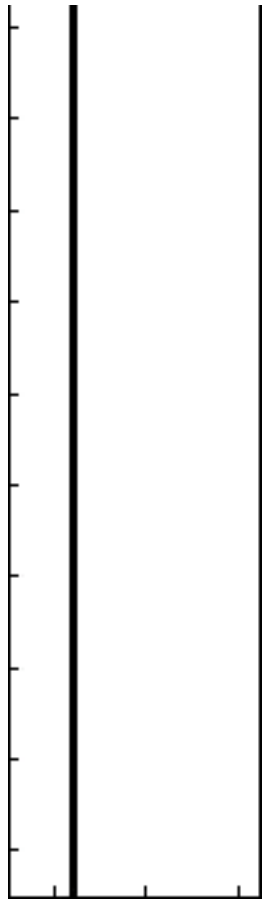


MI09 2D model



in railway stations

Simulation of passengers alighting and boarding a train :
Aggressive & polite strategies





in railway stations

Preliminary results for passenger demand and dwell time at Noisy-Champs station

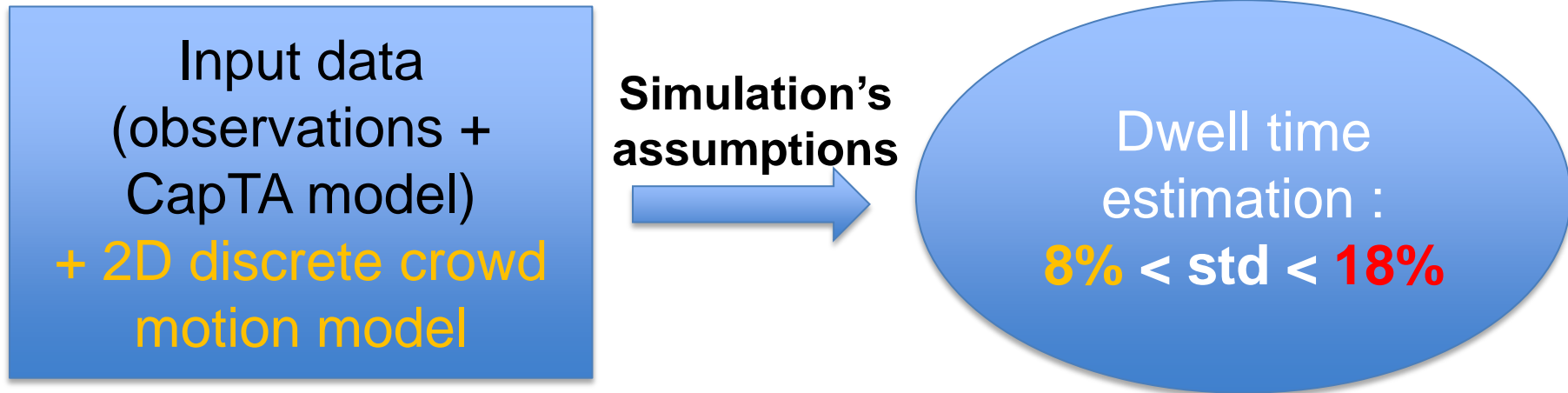
	Observations			Simulation
Boarding passengers	257	242	240	238
Alighting passengers	57	28	64	59
Total	314	270	304	297
Dwell time (s)	27	35	38	32





in railway stations

➤ Conclusions :

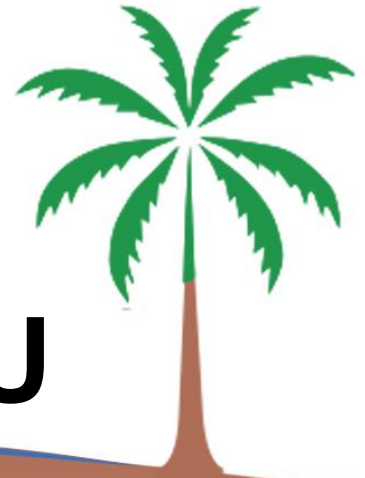


➤ Further developments :

- refine the assumptions : time subdivision and pedestrians' travelling strategies (by taking into account the age, the gender, the motives...)
- study bigger and more complex stations (Marne-la-Vallée/Chessy, suburban train network + TGV OUIGO)



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THANK YOU

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