

SIMULATION OF PEDESTRIAN BEHAVIOUR IN URBAN SPACES, **A Case Study Of "Sidi Gaber" Public Space, Alexandria, Egypt**

Pedestrian Behaviour Approach



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SIMULATION OF PEDESTRIAN BEHAVIOUR IN URBAN SPACES, **A Case Study Of "Sidi Gaber" Public Space, Alexandria, Egypt**

Pedestrian Behaviour Approach



The meaning of urban spaces cannot be limited only to the built environment which includes buildings, streets, plazas, trees and platforms, but also extends to people activities that play the important role in urban design.

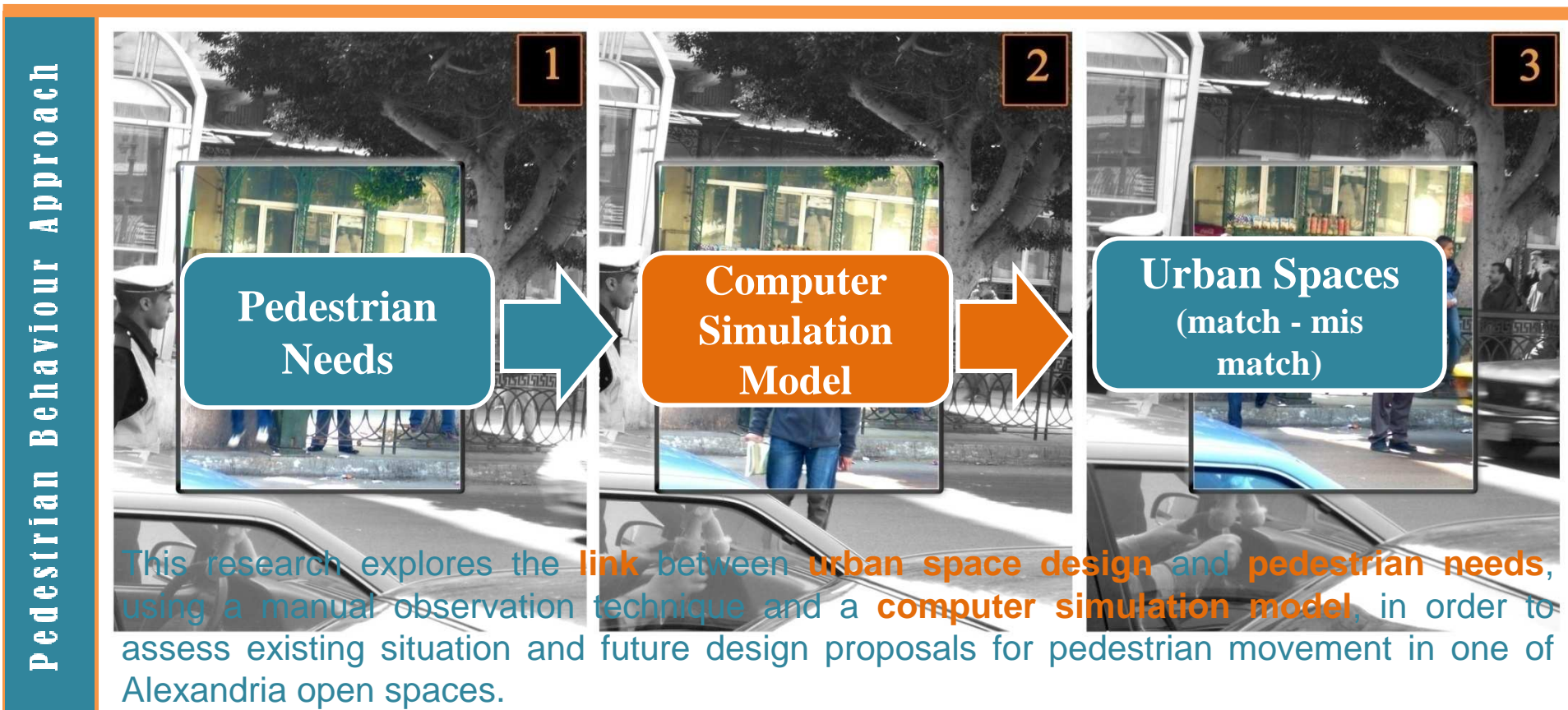
(Cowan, R. et al 2006; Ellison, 2004).

Good urban design is not only about how places look, but actually it is the art of making places for people.

Pedestrian Behaviour Approach



In urban spaces people are the **decision makers**, and they are free to choose their next steps. Where spaces are supposed to be designed to meet pedestrians' **needs** and support their activities, most of our urban spaces are not giving pedestrian movements the enough **priority** and that cause a **mis-use** problem.



The research adopts a **partially automated technique**. A **manual part** consists of direct observations, photographs and videos to analyze the existing situation. While, an **automated part** uses a pedestrian simulator software, **“SIMWALK”**, that generates several alternative scenarios based on possible urban interventions. The program is based on a simplified version of the Social Force Model with the Agent Based Model.

Pedestrian Behaviour Approach

Modeling Elements

1- Agents

2- Space

3- Behaviour

- The case study area (**simulated area**) is located in **Sidi-Gaber** Railway Station, Alexandria, Egypt, which is considered as an undefined transitional public space with less of enclosure. It has several paths and nodes.
- **No obstacles or walls** are blocking the new step.
- **No obstacles or walls** are within the pedestrians' radius.
- **No other pedestrians** are standing within a range of twice the pedestrians' radius.

Pedestrian Behaviour Approach

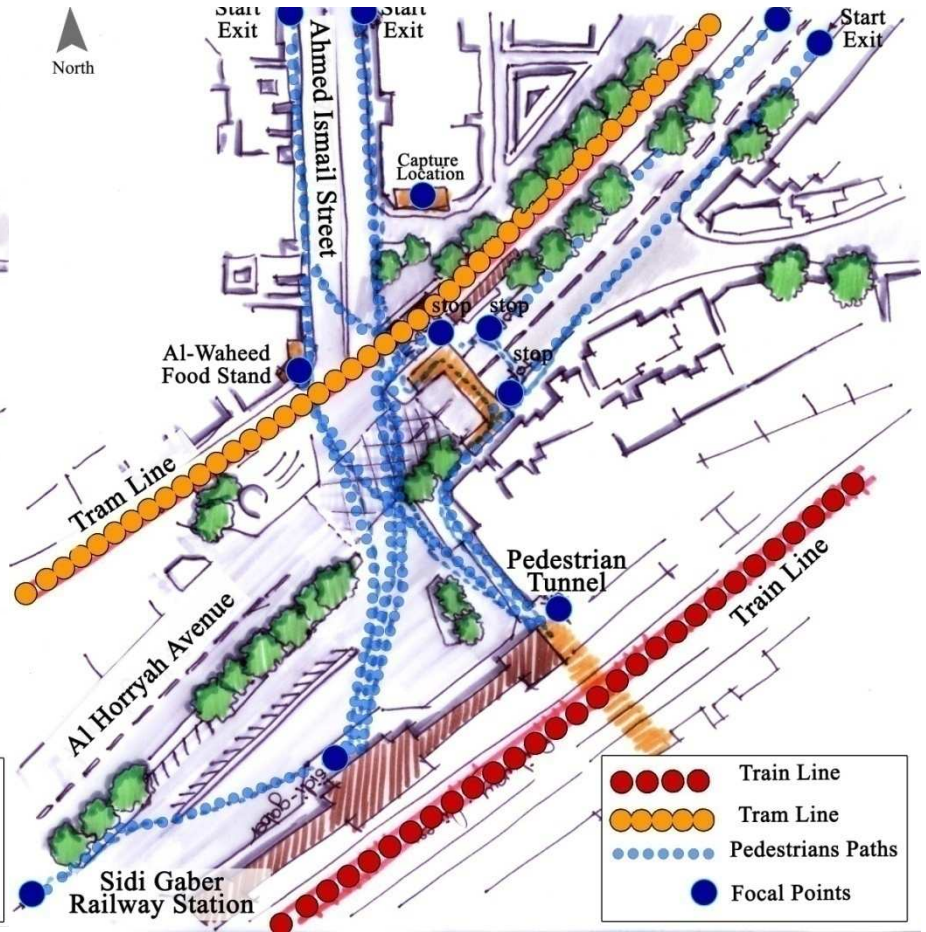
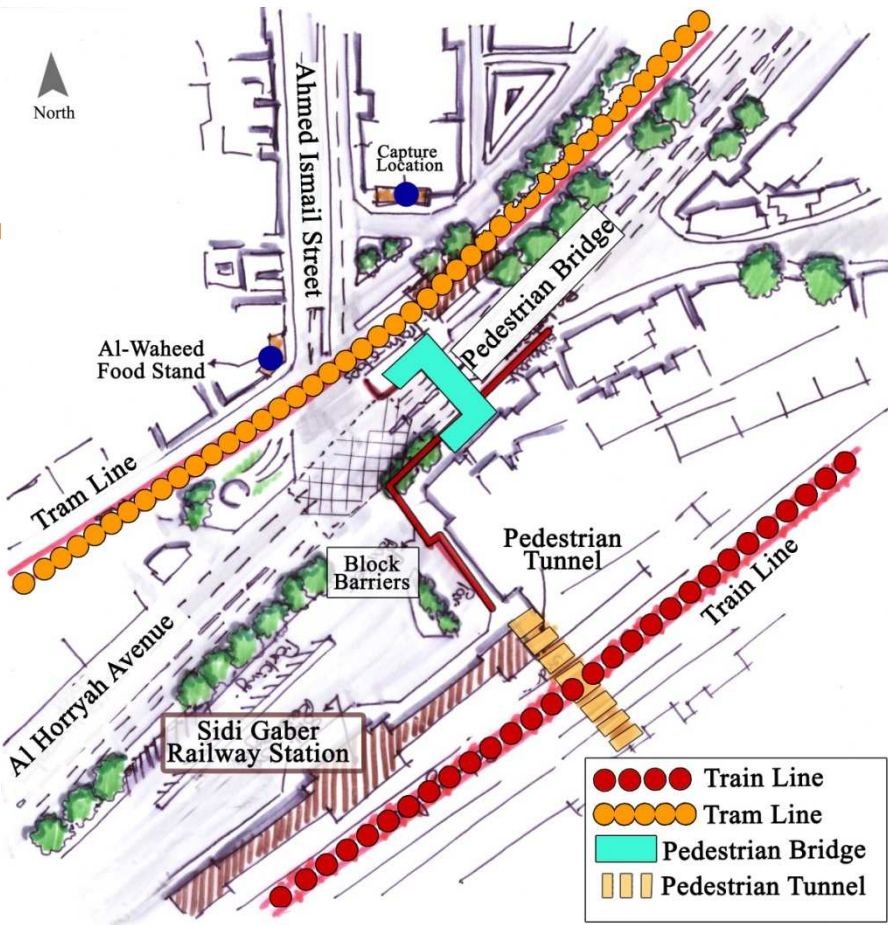


pedestrians usually cross the street from extremely critical areas that are in conflict with vehicles traffic in order to

eliminate such behaviour, the local authority constructed a pedestrian bridge and escalators that transfers the pedestrian crossing to an upper level.



Pedestrian Behaviour Approach



From the field observations on the selected space there are a number of **pedestrian paths** that have been noticed as pedestrian movement destinations. Within these paths, pedestrians need to cross “**Al-Horreyah Avenue**” in order to arrive to their targets.

4- Real Situation

Before

Before using the pedestrian bridge

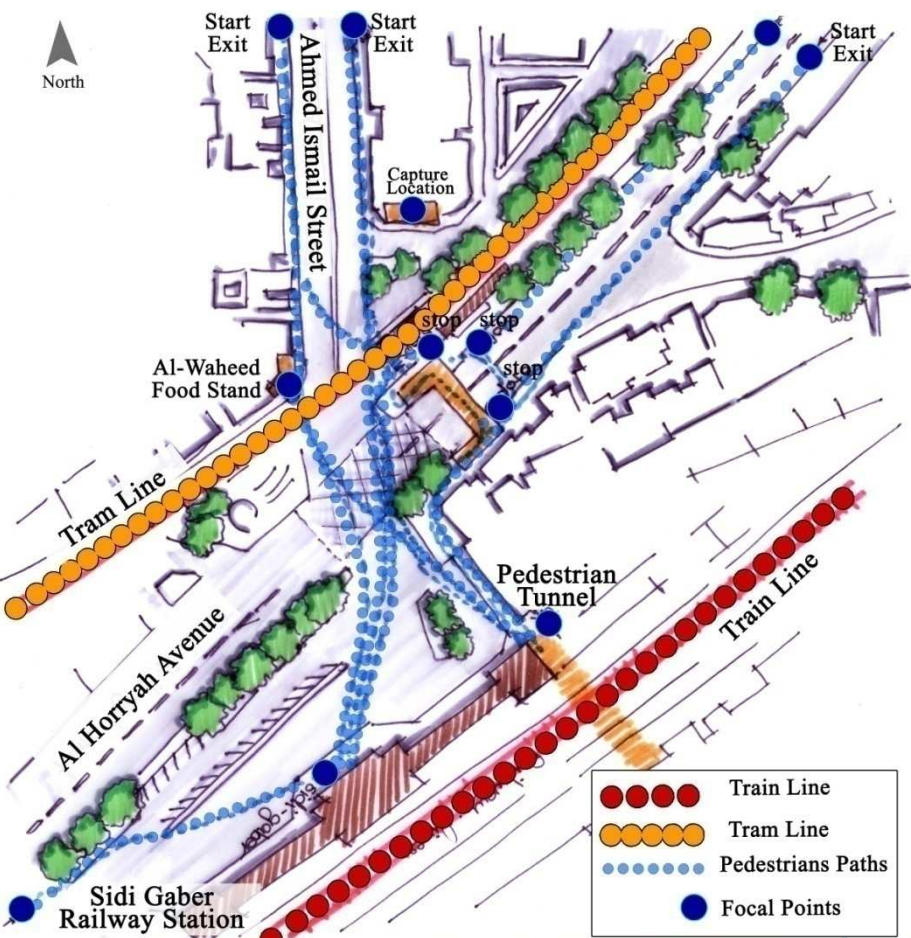


After

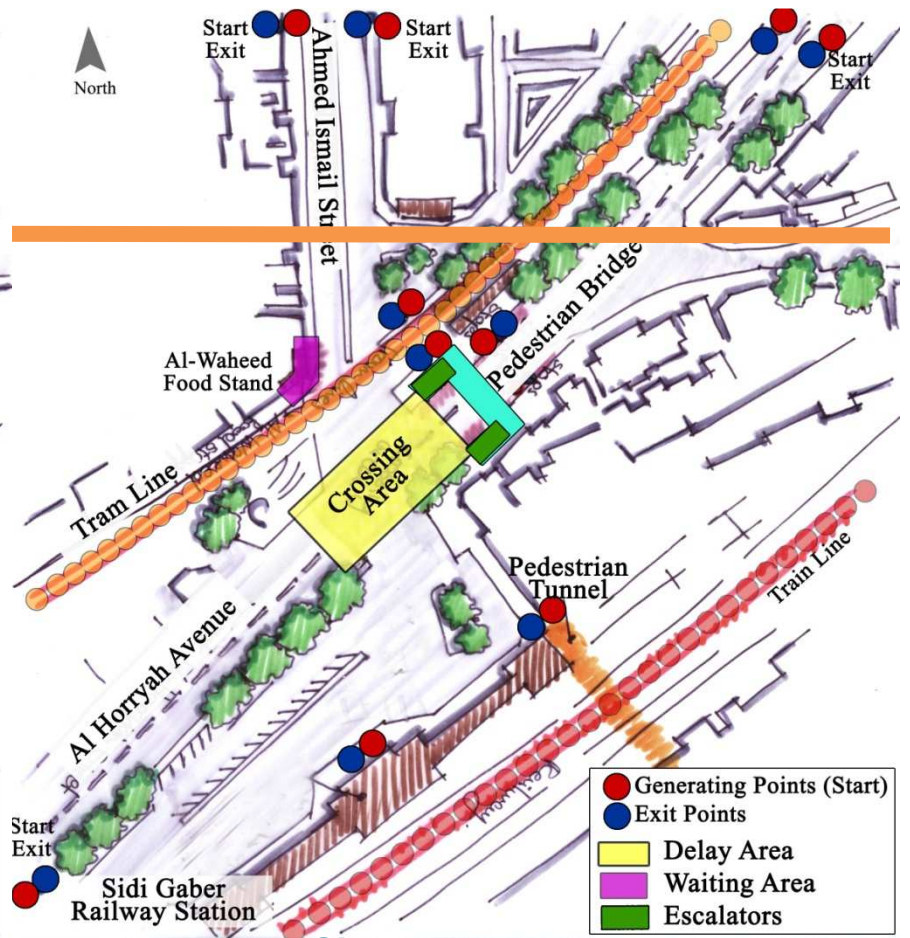
After using the pedestrian bridge as a new movement facility.



Pedestrian Behaviour Approach



- Train Line
- Tram Line
- Pedestrians Paths
- Focal Points



- Generating Points (Start)
- Exit Points
- Delay Area
- Waiting Area
- Escalators

The simulation process starts with determining **points**, according to the 'SimWalk' vocabularies, that have been applied through manual observations. These points have been analyzed and recognized depending on **pedestrians' paths** that have been observed.

SIMWALK

Pedestrian Behaviour Approach

Copyright by Savannah Simulations AG

Existingscenario View project drawing 1 350 Database server Simulator engine

Escalators Areas

| Object | Color | Delay | Capacity | Frequel | Upper | Lower |
|--------|-------|-------|----------|---------|-------|-------|
| 1 | x | | 10 | 2 | 2 | -1 |
| 2 | x | | 10 | 2 | 2 | -1 |
| 3 | x | | | | | |
| 4 | x | | | | | |
| 5 | x | | | | | |
| 6 | x | | | | | |
| 7 | ✓ | | | | | |
| 8 | x | | | | | |

Level Color

2 x Red

1 ✓ Black

0 x Black

Level

Delay Capacity Frequel Upper Lower

Object Color

10 2 2 -1

10 2 2 -1

Escalators

Name of escalator

Escalator1

Capacity 10 Agents Frequency 2 s

Delay 30

Speed limit [cm/s]

Speed reduction [%]

Utilization time [s]

Upper level Align vertical

UpperLevel

Lower level Align vertical

Rotate Delete

Waiting

Name of waiti

street

Capacity 20 Ager

Open time 60 s

Level 1 159 x 159 m Existingscenario - GroundLevel (Escalators)

Console Status Video Agents Simulation

SimWalk Vers. 3.1 - Copyright by Savannah Simulations AG

Agents Builder

Database server
Simulator engine

agents_00

| Id | Agents | Level | Start | Exit | Tmin | Tmax | Vmean | Vdev | Rmean | Rdev | Wait | Group | Units |
|----|--------|-------|---------------------------|------|------|------|-------|------|-------|------|------|-------|-------|
| 1 | 2 show | 1 | RoadL (Grou station1 (Gr | 60 | 180 | 134 | 37 | 46 | 4 | | | 1 | 0 |
| 2 | 2 show | 1 | RoadL (Grou station2 (Gr | 60 | 180 | 134 | 37 | 46 | 4 | | | 2 | 0 |
| 3 | 2 show | 1 | RoadL (Grou Tunnel1 (Gr | 60 | 180 | 134 | 37 | 46 | 4 | | | 3 | 0 |
| 4 | 2 show | 1 | RoadL (Grou Tunnel2 (Gr | 60 | 180 | 134 | 37 | 46 | 4 | | | 4 | 0 |
| 5 | 2 show | 1 | RoadL (Grou SeaR (Grou | 60 | 180 | 134 | 37 | 46 | 4 | | | 5 | 0 |
| 6 | 2 show | 1 | RoadR (Grou station1 (Gr | 60 | 180 | 134 | 37 | 46 | 4 | | | 6 | 0 |
| 7 | 2 show | 1 | RoadR (Grou station1 (Gr | 60 | 180 | 134 | 37 | 46 | 4 | | | 7 | 0 |
| 8 | 2 show | 1 | RoadR (Grou TramL (Grou | 60 | 180 | 134 | 37 | 46 | 4 | | | 8 | 0 |
| 9 | 2 show | 1 | RoadR (Grou tramR (Grou | 60 | 180 | 134 | 37 | 46 | 4 | | | 9 | 0 |
| 10 | 2 show | 1 | RoadR (Grou Tunnel1 (Gr | 60 | 180 | 134 | 37 | 46 | 4 | | | 10 | 0 |
| 11 | 2 show | 1 | RoadR (Grou Tunnel2 (Gr | 60 | 180 | 134 | 37 | 46 | 4 | | | 11 | 0 |
| 12 | 1 show | 1 | SeaL (Grou street (Grou | 60 | 180 | 134 | 37 | 46 | 4 | | | 12 | 0 |
| 13 | 2 show | 1 | SeaL (Grou station1 (Gr | 60 | 180 | 134 | 37 | 46 | 4 | | | | |
| 14 | 2 show | 1 | SeaL (Grou station2 (Gr | 60 | 180 | 134 | 37 | 46 | 4 | | | | |
| 15 | 2 show | 1 | SeaL (Grou Tunnel1 (Gr | 60 | 180 | 134 | 37 | 46 | 4 | | | | |
| 16 | 2 show | 1 | SeaL (Grou Tunnel1 (Gr | 60 | 180 | 134 | 37 | 46 | 4 | | | | |
| 17 | 1 show | 1 | SeaR (Grou street (Grou | 60 | 180 | 134 | 37 | 46 | 4 | | | | |
| 18 | 1 show | 1 | SeaR (Grou escalator (Up | 60 | 180 | 134 | 37 | 46 | 4 | | | | |
| 19 | 1 show | 1 | SeaR (Grou AlWaheed ((| 60 | 180 | 134 | 37 | 46 | 4 | | | | |
| 20 | 2 show | 1 | SeaR (Grou station1 (Gr | 60 | 180 | 134 | 37 | 46 | 4 | | | | |
| 21 | 2 show | 1 | SeaR (Grou station2 (Gr | 60 | 180 | 134 | 37 | 46 | 4 | | | | |
| 22 | 2 show | 1 | SeaR (Grou tramR (Grou | 60 | 180 | 134 | 37 | 46 | 4 | | | | |
| 23 | 2 show | 1 | SeaR (Grou Tunnel2 (Gr | 60 | 180 | 134 | 37 | 46 | 4 | | | | |
| 24 | 1 show | 1 | Station1 (Gr street (Grou | 60 | 180 | 134 | 37 | 46 | 4 | | | | |
| 25 | 2 show | 1 | Station1 (Gr SeaL (Grou | 60 | 180 | 134 | 37 | 46 | 4 | | | | |
| 26 | 2 show | 1 | Station1 (Gr SeaR (Grou | 60 | 180 | 134 | 37 | 46 | 4 | | | | |
| 27 | 2 show | 1 | Station1 (Gr TramL (Grou | 60 | 180 | 134 | 37 | 46 | 4 | | | | |
| 28 | 2 show | 1 | Station1 (Gr tramR (Grou | 60 | 180 | 134 | 37 | 46 | 4 | | | | |

Agents

First step: Start area — Start time range —
 RoadL (GroundLevel) 60 to 180 s

Next step(s): Waiting area — Waiting time — Agents —
 2 s

Last step: Exit area — Agents walking speed —
 Tunnel2 (GroundLevel) 134 +/- 37 cm/s

Show pending agents in the start area — Agents body breadth —
 46 +/- 4 cm

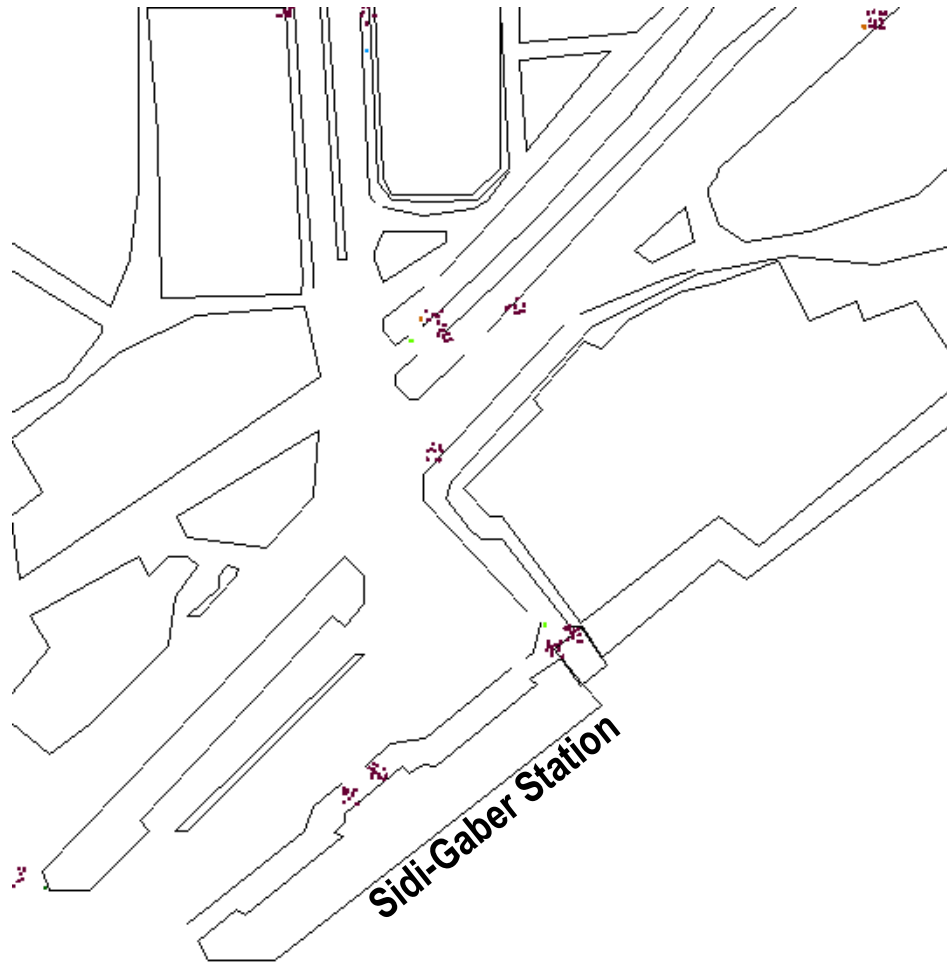
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Console Status Video Simulation Display

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Pedestrian Behaviour Approach

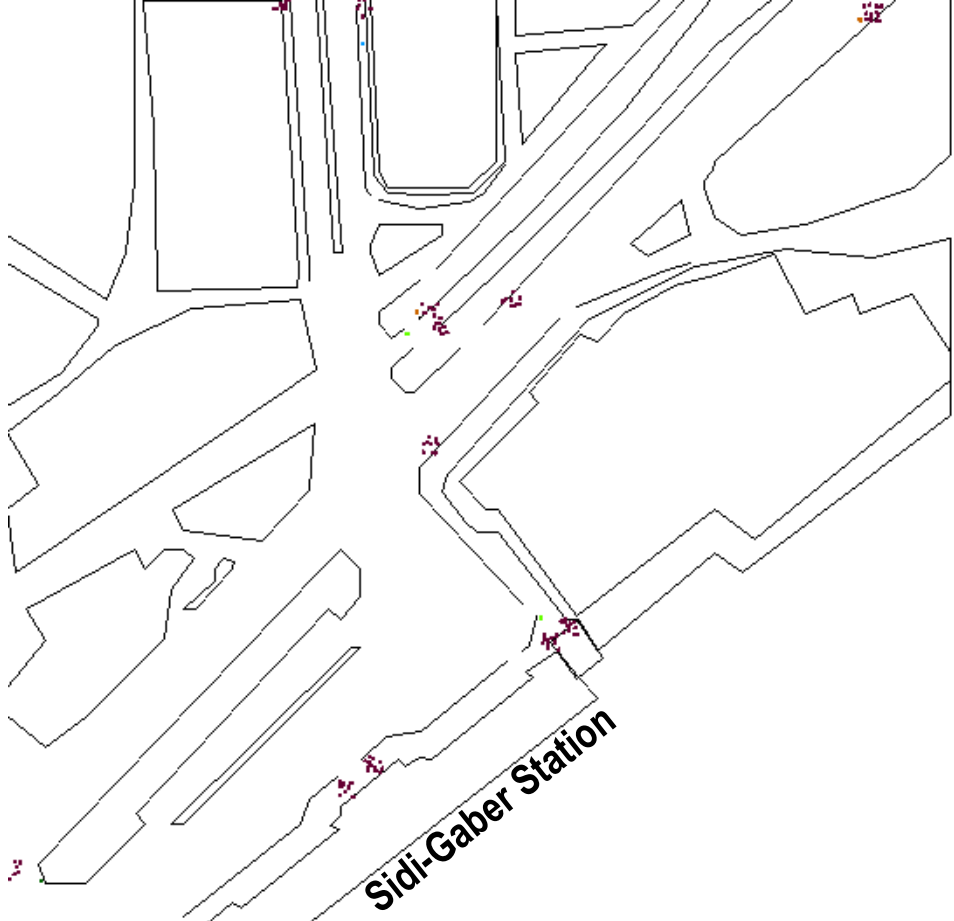


Simulation Behaviour

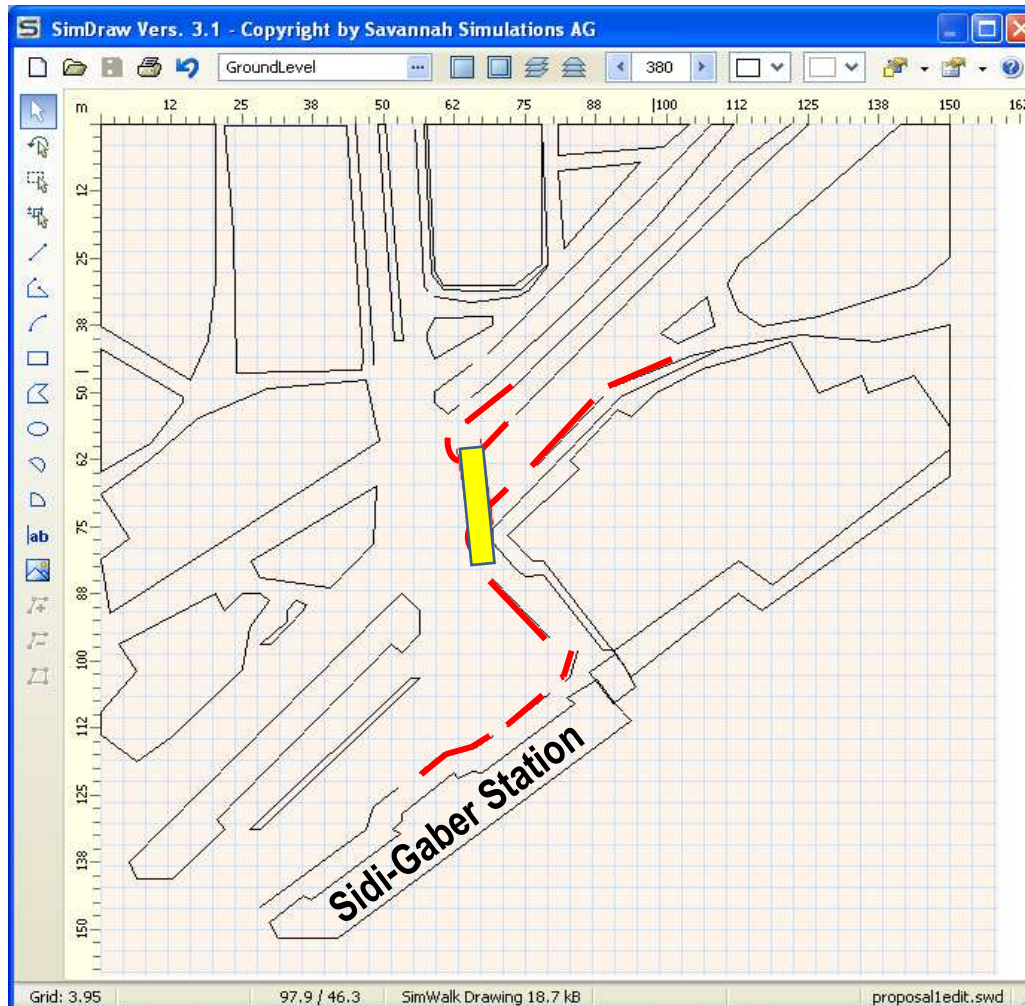
Through the simulation of the **existing situation**, it has been observed that the pedestrians could **hardly** transfer into the upper level of the pedestrian bridge using the escalators.

That might be because of the existing **location** of the bridge that does not fit on the pedestrians' destinations **direction**, although it has been tried to **attract** agents to change their level through **waiting area** located on the upper level and has been put in their path through the agents' builder.

Pedestrian Behaviour Approach



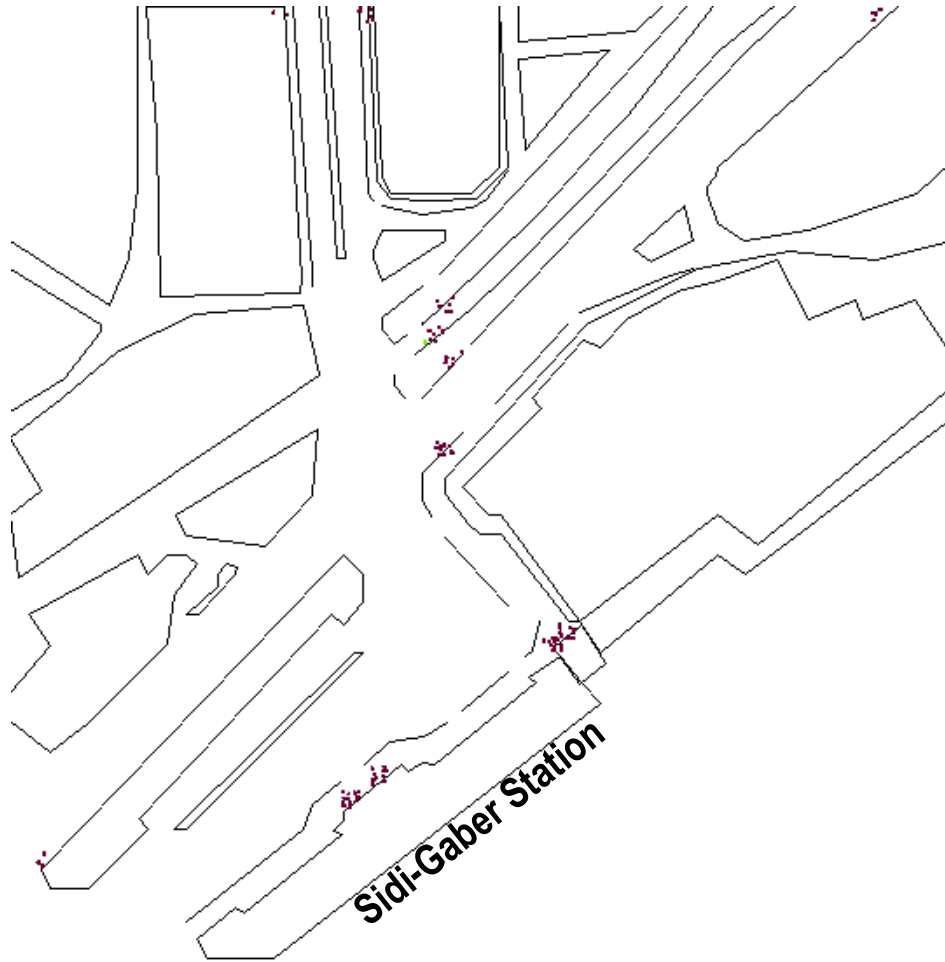
Pedestrian Behaviour Approach



Simulation Behaviour

As a trial, it has been tried to change the bridge **location** and re-assess the sidewalks' **barriers** to give pedestrians more chances for using the bridge **virtually**, through the SimWalk software, that could be more possible to be used by agents through their movement.

Pedestrian Behaviour Approach



Simulation Behaviour

The result was that the **agents** really used the bridge with its' new location, and this could be as a **proposal scenario** for such space.

Conclusion

While working through this research it has been reached out that most of urban spaces have **successful designs**, but lack the **suitable use** from pedestrians.



Here, the results are **partially expected** in advance and fill the gap between urban design and space users to help in solving the **mis-use problem** and make spaces more effective.

THANK YOU

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