crowd:it – new elevator features

1.1 Elevators: new features

crowd:it uses **new elevator features**, for a better simulation of **pedestrian behavior.**

This white paper elaborates on:

> › what these new features are about
>
> › how to use them
>
> › what additional insights they can yield

And showcase them in a shopping mall example.

New elevator features are launched to enhance understanding of pedestrian behavior around elevators

1.1.1 What's new?

With the new features, pedestrian behavior around elevators can be simulated in greater detail:

Boarding behavior:

Currently, pedestrians simply vanish into the elevator. Now, agents walk into the elevator and once inside the elevator, they try to make room for other boarding pedestrians (until boarding time is over). This approach exhibits detailed information on the overall boarding process.

Boarding, waiting and deboarding behavior around elevators is exhibited in greater detail and thus yielding insights

Current   **New**

1 Boarding behavior: comparing current and new features using agent traces

Waiting and deboarding behavior:

To date, pedestrians waiting for an elevator form a dense queue and evade neither people passing by nor people deboarding - as the elevator stops, they vanish into the elevator. Now people evade if people deboard or if other people want to trespass. This imitates real waiting and deboarding processes and thus yields insights on areas of special interest

Current   **New**

t = 1s

t = 2s

t = 3s

30 m
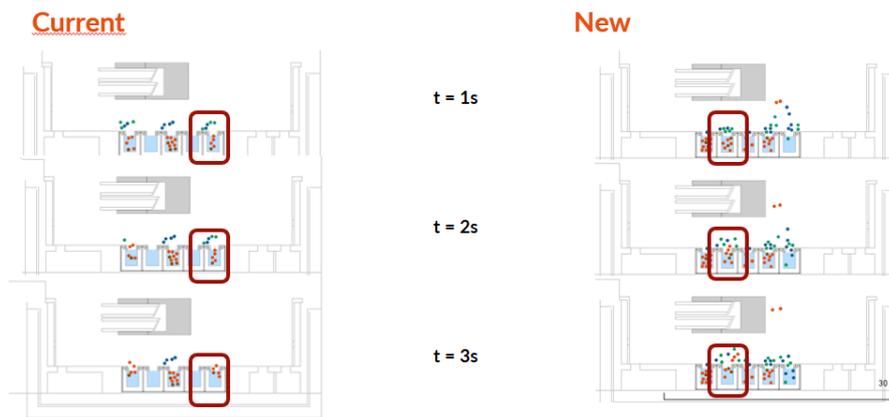
2 Waiting and deboarding behavior: comparing current and new features looking at agent movements over 3 seconds: waiting differences can be observed on all elevators, a deboarding process is highlighted.

1.1.2   How to use?

First of all, let's **model the elevator as a simulation object in your CAD file:**

The elevator is modelled as a simulation object only on the floor it rests at when no one calls the elevator. On all floors the elevator connects, the doors need to be open so people can board and deboard – they can't enter the space when the elevator is not there.
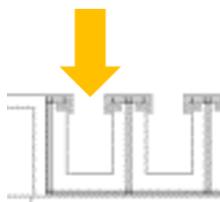
3 elevators must be modeled with open doors

Now let's **specify the elevator settings in crowd:it**:

On the elevators resting floor, specify the simulation object as "elevator" (now its marked blue, using the standard visualization settings).

Now following settings can be specified:

Best practices: CAD-modelling of elevators:

Use a rectangle to model the elevator

Lay the simulation object on a CAD-layer named _crowdit_sim_object-<name> or _crowdit-<name>

Show the elevator on the floor it rests

Lines, except for simulation object lines, are interpreted as obstacles in crowd:it. Check if there are any lines in the CAD-file closing the elevator and remove or freeze them

› (upper limit) **capacity**. Setting the capacity to zero allows people to enter the elevators until there is no space left.

› (upper limit) **boarding time**

› **floors** the elevator connects

› **journey-times-matrix**

To set the elevator parameters, **right-click on elevator** and **select properties** (see figure below, (1))

› set **name**, **boarding time** (in seconds) and **capacity** (2)

› click **Journey-times-matrix** to set connecting **floors** and **Journey-times-matrix** (3)

› click **Apply** to apply changes (4)
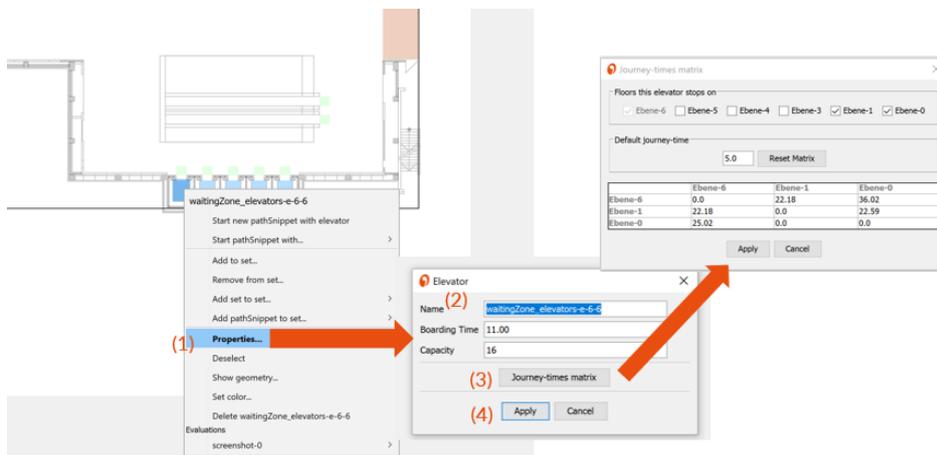
4 Setting an elevator in crowd:it

In Detail: the journey-times-matrix

The matrix includes the overall time the elevator needs traveling from floor to floor (in seconds). This is:

› the traveling time between floors plus

› the time it takes to close the doors on one floor and open them again for boarding

The matrix is composed in the following way (see example below): Travelling times on one floor are zero (marked grey) and they are listed from left to right. In this example below the elevator takes 25,02 seconds to go from the first floor OG to the underground Floor UG, and 36,02 seconds when travelling from UG to OG:

	UG	EG	OG
UG	0	22,18	36,02
EG	22,18	0	22,59
OG	25,02	10	0

Background information: The following settings are defined in crowd:it:

Agents automatically

› walk into the elevator

› try to make room for other boarding, waiting or departing pedestrians (until boarding time is over)

Elevators automatically

› depart when people board faster than specified in boarding time, i.e. boarding time serves only as an upper limit

› go to the closest floor. Example:
  • Ped 1: EG -> OG2
  • Ped 2: OG1 -> OG2
  • Resting Floor: OG2
  So, the elevator would operate as follows:
  OG2 -> OG1   -> EG -> OG2

1.1.3   What to expect?

With the new features, you can look into pedestrian behavior around elevators in greater detail:

› waiting and boarding are visualized in a more informative way than currently, as the **complete boarding process from waiting to going into the elevator** is captured.

› **evasion and deboarding movements are captured**.

Enhanced visualization and insights on elevators

1.2   Example: shopping mall

Download an example to showcase the new elevator features (Password: elevator) in a real-life setting: in a shopping mall pedestrians use elevators, escalators or stairs to move between underground parking area (UG) to ground (EG) and first floor (OG) shopping areas. Take a look!

Take a look on what additional insights the new features may yield with an example