Simulating And Analyzing Different Evacuation Scenarios in Haspel Campus

Pedestrian Dynamics Project
Masters in Computer Simulation in Science
Bergische Universität ,Wuppertal ,Germany

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Synopsis

1.) Introduction

2.) Overview of First Floor

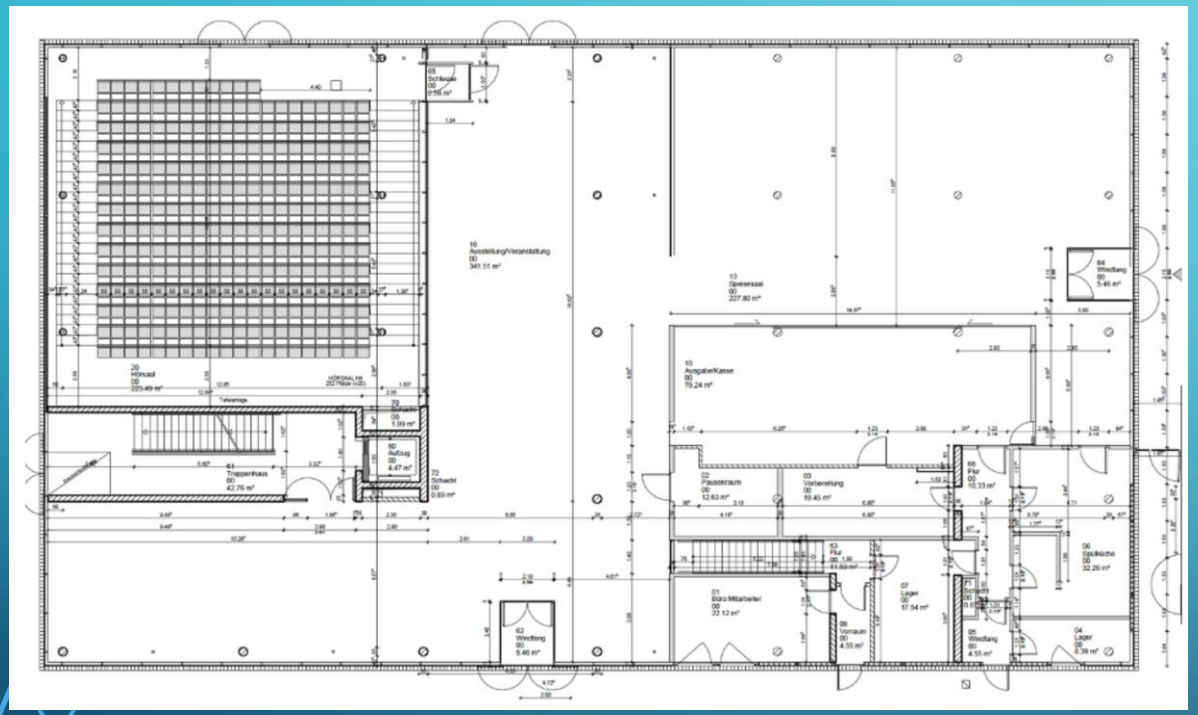
3.) Simulations and Analysis (Scenarios)

4.) Conclusion

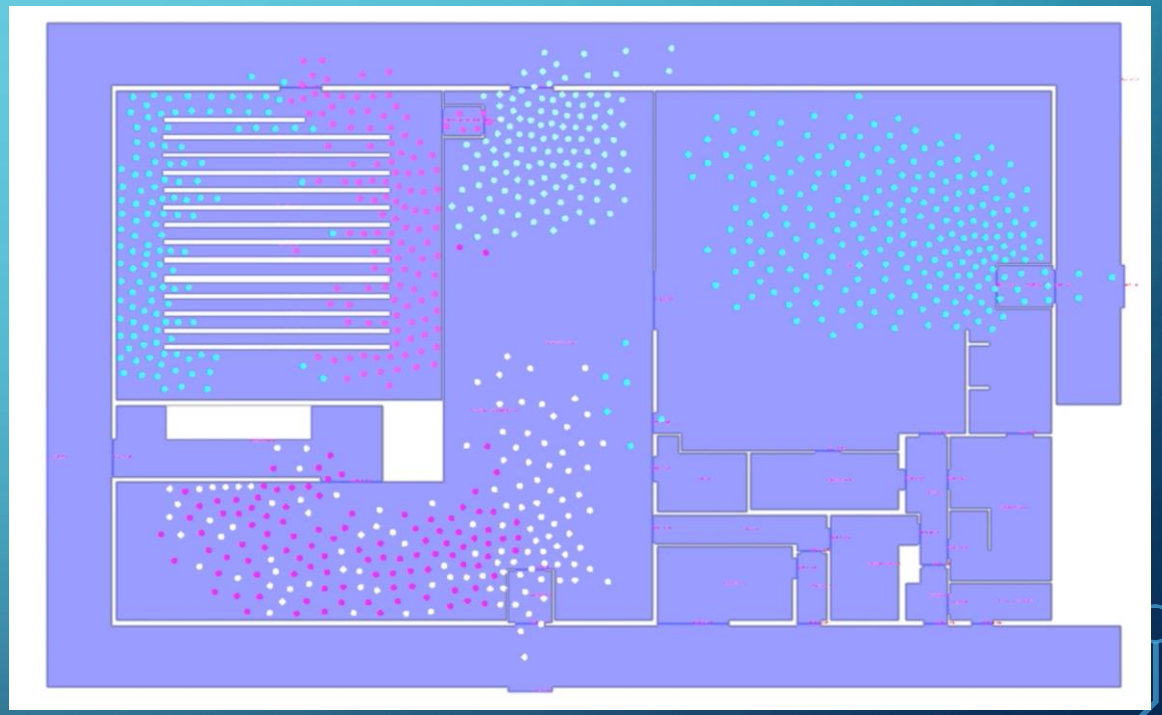
5.) Future Steps(Suggestions)

1.Introduction

The aim of this project is to create, simulate and analyze different evacuation scenarios in the first floor of Haspel campus building.



a.) Blueprint of the first floor

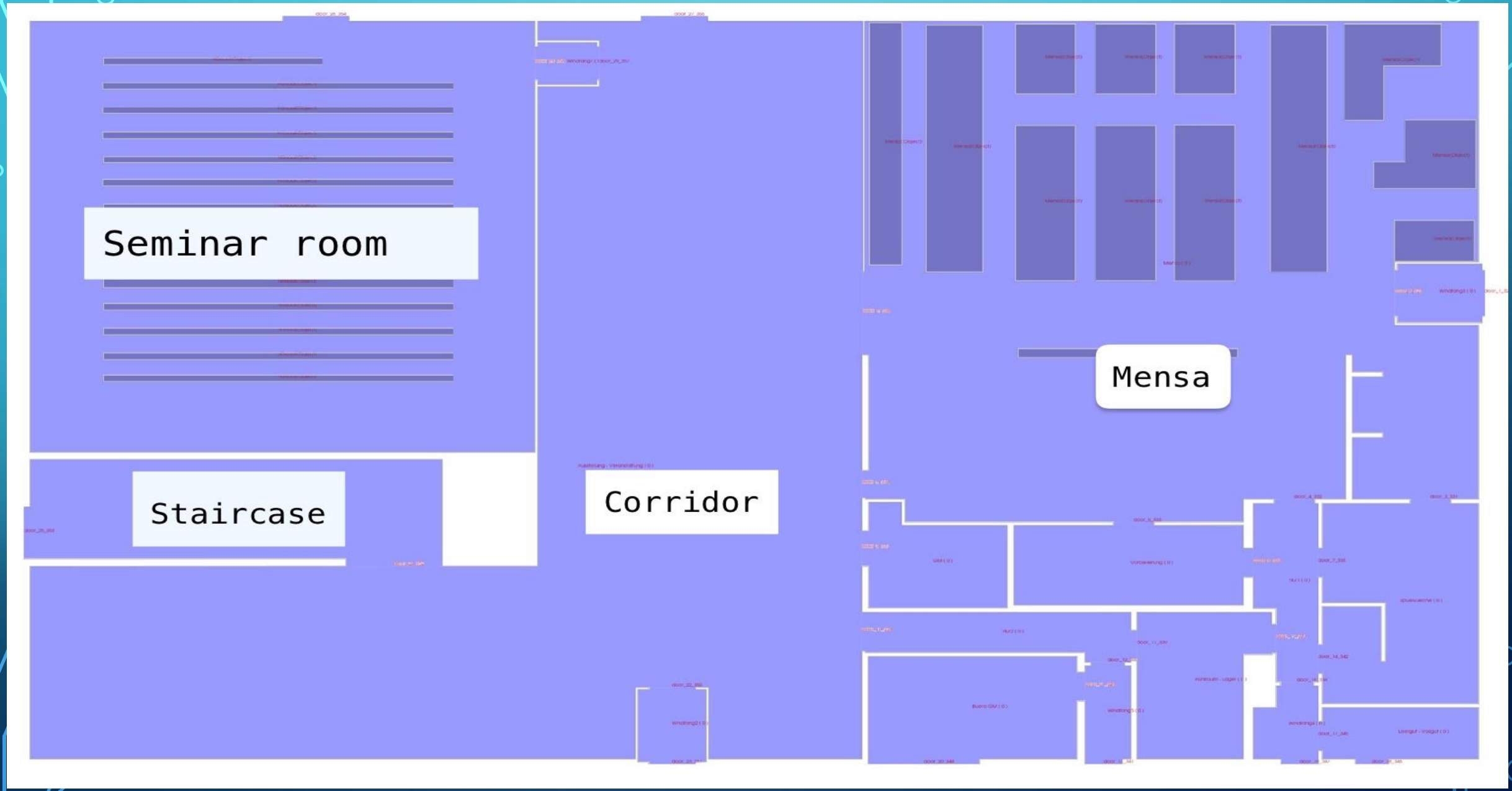


b.) Simulation of the first floor

Problem Description

The dean observes that there are more and more events and exhibitions in the foyer parallel to the lectures. He commissions an engineering firm to investigate whether it is necessary to limit the number of visitors during exhibitions in order to ensure safe evacuation. In addition, there was a fire in the cafeteria during the semester break. Therefore, additional research will be conducted to determine how a fire would affect the scenario.

2.Overview of First Floor



3. Simulations and Analysis (Scenarios)

a.) Emergency Evacuation with Doors Closed (Scenario 1)

b.) Emergency Evacuation with Doors Open (Scenario 2)

c.) Evacuation (obstacles) with Doors Closed (Scenario 3)

d.) Evacuation (obstacles) with Doors Open (Scenario 4)

e.) Fire Accident

f.) Evacuation with Bag pack

Conditions implemented for the first five scenarios :

i. Door condition

ii. Goals

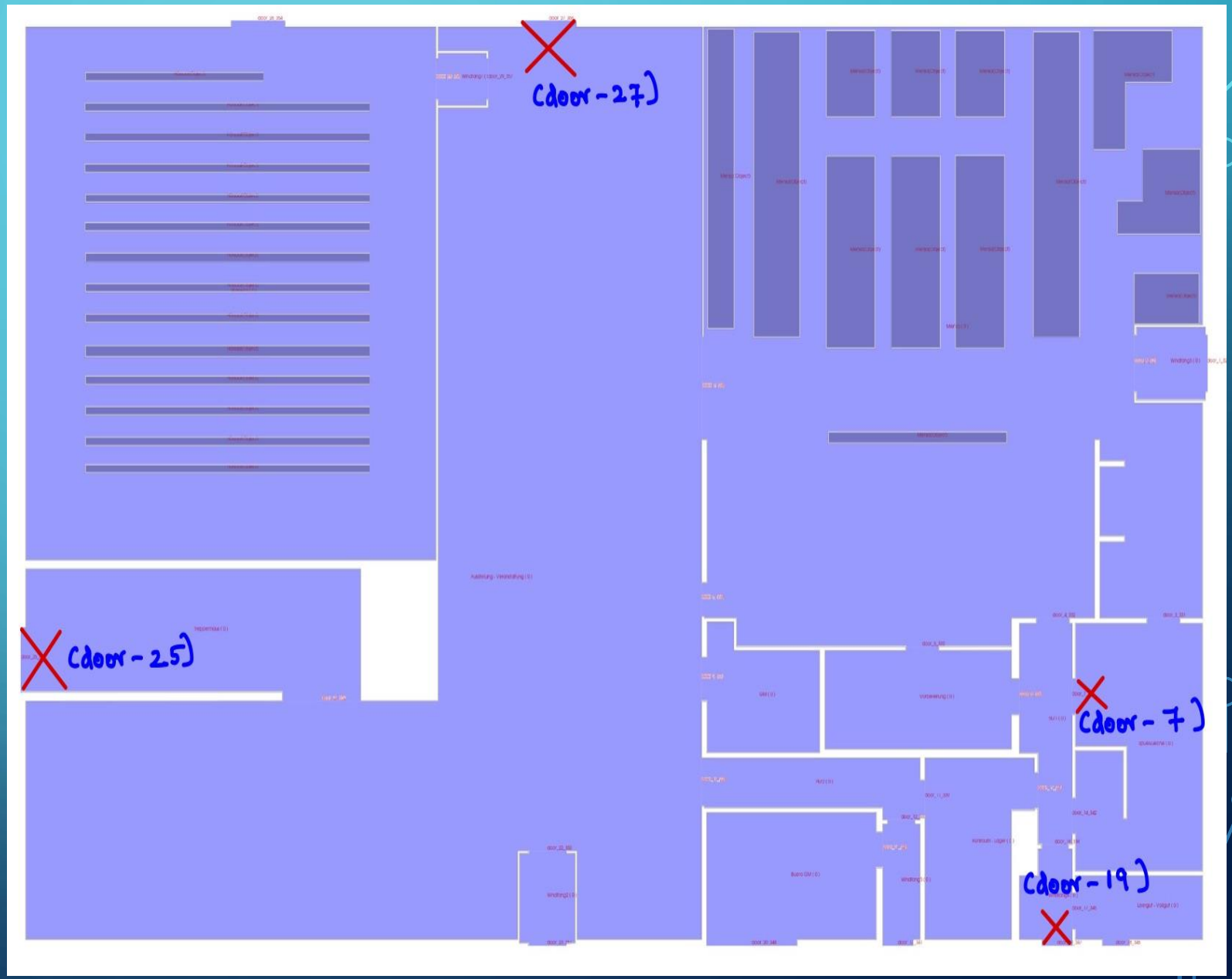
iii. Agent parameters

iv. Operational Model

v. Route choice model

i.) Door Condition

```
<!-- traffic information: e.g opend doors -->
<traffic_constraints>
    <doors>
        <door trans_id="1"  state="open"/>
        <door trans_id="2"  state="open"/>
        <door trans_id="3"  state="open"/>
        <door trans_id="4"  state="open"/>
        <door trans_id="5"  state="open"/>
        <door trans_id="6"  state="open"/>
        <door trans_id="7"  state="close"/>
        <door trans_id="8"  state="open"/>
        <door trans_id="9"  state="open"/>
        <door trans_id="10" state="open"/>
        <door trans_id="11" state="open"/>
        <door trans_id="12" state="open"/>
        <door trans_id="13" state="open"/>
        <door trans_id="14" state="open"/>
        <door trans_id="15" state="open"/>
        <door trans_id="16" state="open"/>
        <door trans_id="17" state="open"/>
        <door trans_id="18" state="open"/>
        <door trans_id="19" state="close"/>
        <door trans_id="20" state="open"/>
        <door trans_id="21" state="open"/>
        <door trans_id="22" state="open"/>
        <door trans_id="23" state="open"/>
        <door trans_id="24" state="open"/>
        <door trans_id="25" state="close"/>
        <door trans_id="26" state="open"/>
        <door trans_id="27" state="close"/>
        <door trans_id="28" state="open"/>
        <door trans_id="29" state="open"/>
    </doors>
</traffic_constraints>
```



ii.) Goals:

```
<routing>
  <goals>
<goal id="0" final="true" caption="Door 23" x_min="30" x_max="31" y_min="10" y_max="11">
  <polygon>
    <vertex px="30" py="10" />
    <vertex px="31" py="10" />
    <vertex px="31" py="11" />
    <vertex px="30" py="11" />
    <vertex px="30" py="10" />
  </polygon>
</goal>
<goal id="1" final="true" caption="Door 20" x_min="37" x_max="40" y_min="10" y_max="11">
  <polygon>
    <vertex px="37" py="10" />
    <vertex px="40" py="10" />
    <vertex px="40" py="11" />
    <vertex px="37" py="11" />
    <vertex px="37" py="10" />
  </polygon>
</goal>
<goal id="2" final="true" caption="Door 13" x_min="43.5" x_max="44.5" y_min="10" y_max="11">
  <polygon>
    <vertex px="43.5" py="10" />
    <vertex px="44.5" py="10" />
    <vertex px="44.5" py="11" />
    <vertex px="43.5" py="11" />
    <vertex px="43.5" py="10" />
  </polygon>
</goal>
<goal id="3" final="true" caption="Door 19" x_min="49.5" x_max="50" y_min="10" y_max="11">
  <polygon>
    <vertex px="49.5" py="10" />
    <vertex px="50" py="10" />
    <vertex px="50" py="11" />
    <vertex px="49.5" py="11" />
    <vertex px="49.5" py="10" />
  </polygon>
</goal>
<goal id="4" final="true" caption="Door 18" x_min="51.6" x_max="52.5" y_min="10" y_max="11">
  <polygon>
    <vertex px="51.6" py="10" />
    <vertex px="52.5" py="10" />
    <vertex px="52.5" py="11" />
    <vertex px="51.6" py="11" />
    <vertex px="51.6" py="10" />
  </polygon>
</goal>
```


```
<goal id="5" final="true" caption="Door 1" x_min="55" x_max="56" y_min="27" y_max="28.5">
  <polygon>
    <vertex px="55" py="27" />
    <vertex px="56" py="27" />
    <vertex px="56" py="28.5" />
    <vertex px="55" py="28.5" />
    <vertex px="55" py="27" />
  </polygon>
</goal>
<goal id="6" final="true" caption="Door 27" x_min="30" x_max="32" y_min="38" y_max="39">
  <polygon>
    <vertex px="30" py="38" />
    <vertex px="32" py="38" />
    <vertex px="32" py="39" />
    <vertex px="30" py="39" />
    <vertex px="30" py="38" />
  </polygon>
</goal>
<goal id="7" final="true" caption="Door 26" x_min="19" x_max="22" y_min="38" y_max="39">
  <polygon>
    <vertex px="19" py="38" />
    <vertex px="22" py="38" />
    <vertex px="22" py="39" />
    <vertex px="19" py="39" />
    <vertex px="19" py="38" />
  </polygon>
</goal>
<goal id="8" final="true" caption="Door 25" x_min="10" x_max="11" y_min="18" y_max="20">
  <polygon>
    <vertex px="10" py="18" />
    <vertex px="11" py="18" />
    <vertex px="11" py="20" />
    <vertex px="10" py="20" />
    <vertex px="10" py="18" />
  </polygon>
</goal>
<waiting_area caption="wa1" id="5" waiting_time="20" max_peds="10" is_open="true" room_id="0" subroom_id="1" global_timer="false" >
  <polygon>
    <vertex px="11" py="1" />
    <vertex px="14" py="1" />
    <vertex px="14" py="4" />
    <vertex px="11" py="4" />
    <vertex px="11" py="1" />
  </polygon>
  <next_wa id="2" p="0.75"/>
  <next_wa id="3" p="0.25"/>
</waiting_area>
</goals>
  </routing>
```

iii.) Agent parameters

```
<!--persons information and distribution -->
<agents operational_model_id="3">
    <agents_distribution>

        <group group_id="0"  room_id="3" goal_id="7"  number ="70" agent_parameter_id="2" x_min="11.9" x_max="19" y_min="22.8" y_max="36.5" router_id="1" subroom_id="0" />

        <group group_id="1"  room_id="6" goal_id="5"  number ="15" agent_parameter_id="2" x_min="37.1" x_max="52" y_min="26.18" y_max="28" router_id="1" subroom_id="0" />

        <group group_id="2"  room_id="3" goal_id="5" number ="70" agent_parameter_id="2" router_id="1" subroom_id="0" />

        <group group_id="3"  room_id="8" goal_id="0" number ="30" agent_parameter_id="2" router_id="1" subroom_id="0" />

        <group group_id="4"  room_id="9" goal_id="5" number ="10"  agent_parameter_id="2" router_id="1" subroom_id="0" />

        <group group_id="5"  room_id="2" goal_id="0" number ="10" agent_parameter_id="2" router_id="1" subroom_id="0" />

        <group group_id="6"  room_id="1" goal_id="1" number ="20" agent_parameter_id="2" router_id="1" subroom_id="0" />

        <group group_id="7"  room_id="7" goal_id="5" number ="25" agent_parameter_id="2" router_id="1" subroom_id="0" />

        <group group_id="8"  room_id="4" goal_id="2" number ="10"  agent_parameter_id="2" router_id="1" subroom_id="0" />

        <group group_id="9"  room_id="0" goal_id="0" number ="50" agent_parameter_id="2" x_min="12" x_max="29" y_min="12" y_max="17.5" router_id="1" subroom_id="0" />

        <group group_id="10" room_id="0" goal_id="0" number ="50" agent_parameter_id="2" x_min="27.26" x_max="36.42" y_min="12" y_max="25" router_id="1" subroom_id="0" />

        <group group_id="11" room_id="0" goal_id="5" number ="50" agent_parameter_id="2" x_min="27.26" x_max="36.42" y_min="25" y_max="37" router_id="1" subroom_id="0" />

        <group group_id="12" room_id="6" goal_id="5" number ="10" agent_parameter_id="2" x_min="37.1" x_max="51.03" y_min="20.9" y_max="25.60" router_id="1" subroom_id="0" />

        <group group_id="13" room_id="6" goal_id="5" number ="45" agent_parameter_id="2" x_min="37.1" x_max="48.40" y_min="28" y_max="37.15" router_id="1" subroom_id="0" />

        <group group_id="14" room_id="6" goal_id="5" number ="25" agent_parameter_id="2" x_min="48.40" x_max="55.17" y_min="28" y_max="37.15" router_id="1" subroom_id="0" />

        <group group_id="15" room_id="6" goal_id="5" number ="10" agent_parameter_id="2" x_min="51.53" x_max="55.17" y_min="20.83" y_max="37.15" router_id="1" subroom_id="0" />

    </agents_distribution>
</agents>
```

iv.) Operational Model

- We have implemented Collision free speed model (velocity based model) as operational model with strategy 8
- Step size as 0.01 to get more accuracy
- Wall avoid distance as 0. 2 meter

```
<!-- These parameters may be overwritten -->
<operational_models>
    <model operational_model_id="3" description="Tordeux2015">
        <model_parameters>
            <stepsize>0.01</stepsize>
            <exit_crossing_strategy>8</exit_crossing_strategy>
            <delta_h>0.0625</delta_h>
            <wall_avoid_distance>0.2</wall_avoid_distance>
            <use_wall_avoidance>true</use_wall_avoidance>
            <linkedcells enabled="true" cell_size="2.2" />
            <force_ped a="5" D="0.2" />
            <force_wall a="5" D="0.02" />
        </model_parameters>
```

➢ Agent parameter (Tordeux2015):

- We have used average speed for first 4 scenarios mu = 1.45 and sigma = 0.18 (from PED talk 80)

```
    <agent_parameters agent_parameter_id="2">
        <v0 mu="1.46" sigma="0.18" />
        <v0_upstairs mu="0.668" sigma="0.167" />
        <v0_downstairs mu="0.750" sigma="0.188" />
        <v0_idle_escalator_upstairs mu="0.5" sigma="0.0" />
        <v0_idle_escalator_downstairs mu="0.5" sigma="0.0" />
        <bmax mu="0.15" sigma="0.0" />
        <bmin mu="0.15" sigma="0.0" />
        <amin mu="0.15" sigma="0.0" />
        <atau mu="0." sigma="0.0" />
        <tau mu="0.5" sigma="0.0" />
        <T mu="1.2" sigma="0.0" />
    </agent_parameters>
```

v.) Route choice model

- Here we used ff global shortest as router model

```
    <route_choice_models>
        <router router_id="1" description="ff_global_shortest">
            <parameters />
        </router>
    </route_choice_models>
</JuPedSim>
```

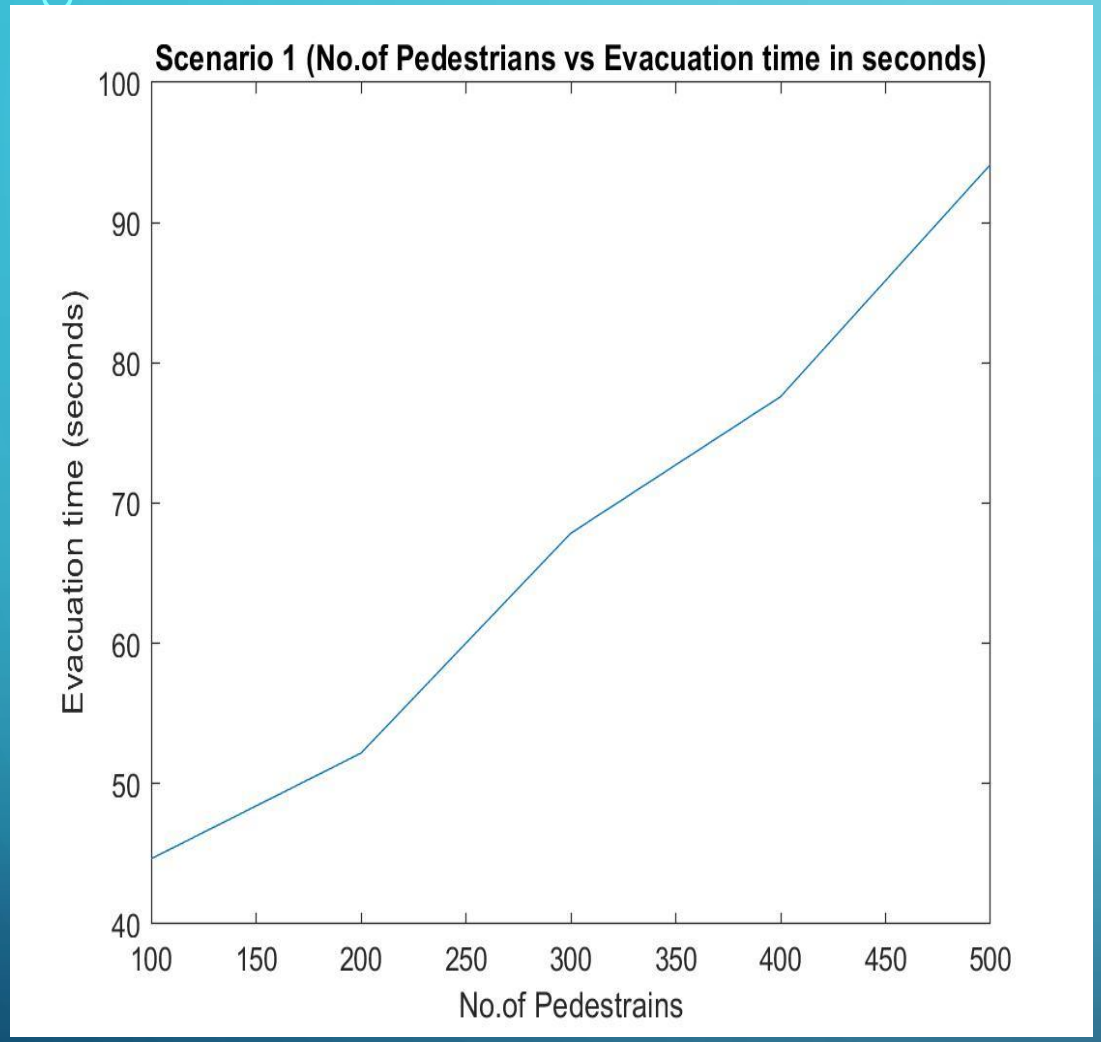
a.) Emergency Evacuation with Doors Closed (Scenario 1)

- For the first scenario, We assume that above mentioned four doors were closed.
- We assigned different goals to each group id.
- Each group moves with same speed.
- Pedestrians belong to same age groups.
- We didn’t consider any obstacles in this scenario.
- We repeat this scenario for number of Pedestrians (500 ,400,300,200,100).

Situation :

Lecture halls, Mensa and Corridors are filled with Number of pedestrians
There is a fire accident in Mensa, Every pedestrians have to evacuate .
We will calculate the Evacuation time and compare it with the scenario 2 and Scenario 3


File Visualisation View Options Tools Help
Pedestrians: 500 Time: 0 Sec
Prev
Next
Rewind
x1
0/253 (0.00 s)
rec off fps: 8 File: //wsl.localhost/Ubuntu-20.04/home/jarvis/project/Pedestrian-Dynamics/Scenario/Scenario_1/results/trajectories-Scenario1.txt x:5.95 y:9.98



No of Pedestrians	Evacuation Time
500	94.15
400	77.60
300	67.86
200	52.18
100	44.65

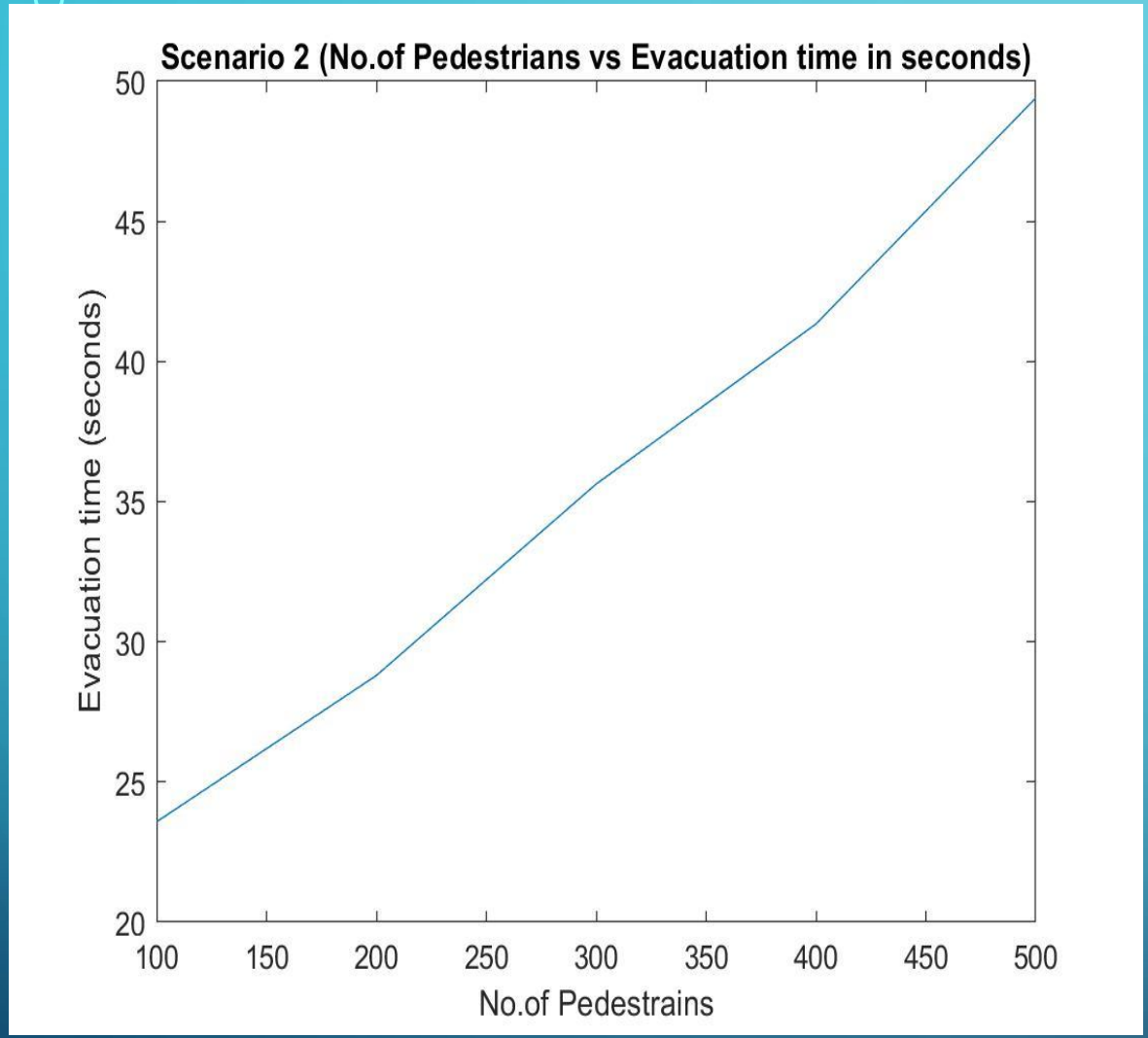
b.) Emergency Evacuation with Doors Open (Scenario 2)

- For the Second scenario, We assume that all doors were opened.
- We didn’t assign any goal to group id.
- Each group moves with same speed.
- Pedestrians belong to same age groups
- We didn’t consider any obstacles in this scenario.
- We repeat this scenario for number of Pedestrians (500 ,400,300,200,100).

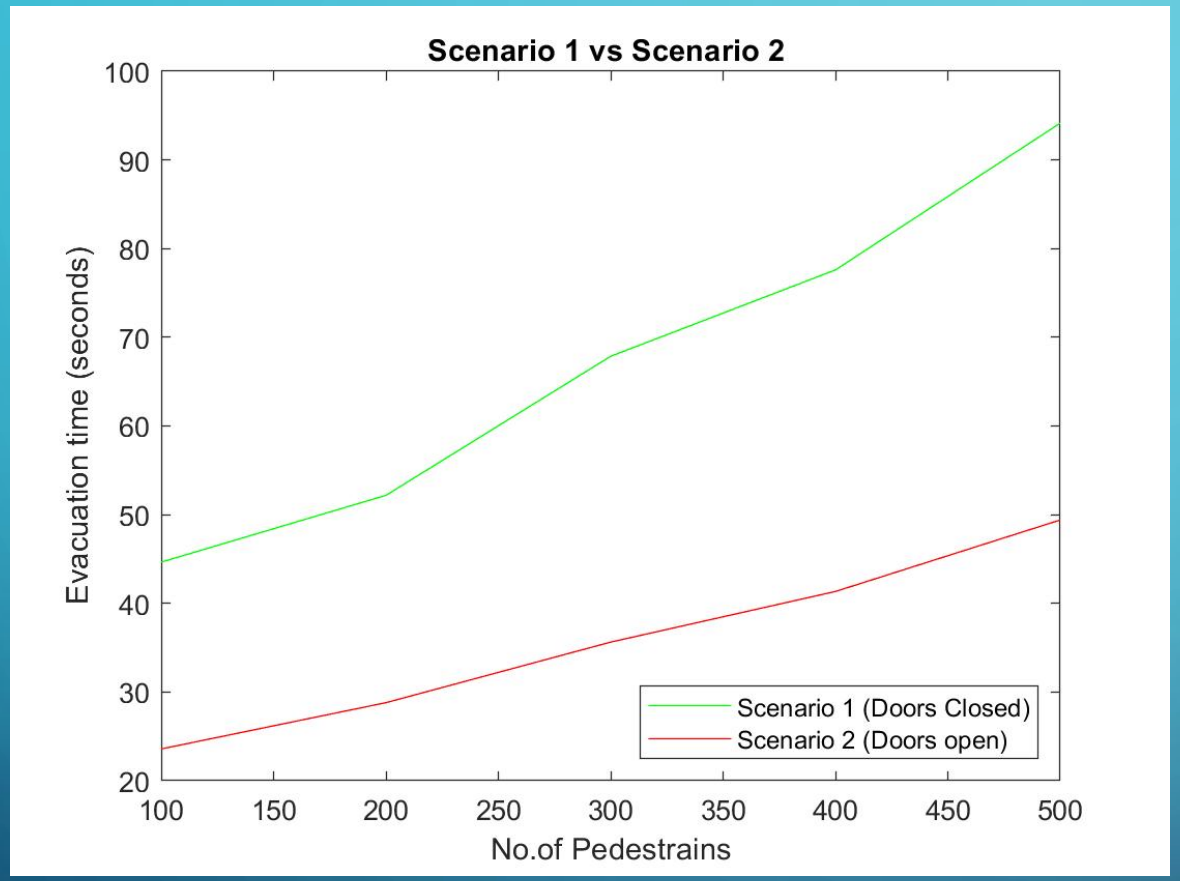
Situation :

Lecture halls, Mensa and Corridors are filled with Number of pedestrians
There is a fire accident in Mensa, Every pedestrians have to evacuate .
We will calculate the Evacuation time and compare it with the scenario 1


File Visualization View Options Texts Help
Pedestrians: 500 Time: 0 Sec
Prev
Next
Rewind
x1
0/395 (0.00 s)
rec off fps: 8 File: //wsl.localhost/Ubuntu-20.04/home/jarvis/project/Pedestrian-Dynamics/Scenario/Scenario_2/results/trajectories-Scenario2.txt x:65.34 y:10.85



No of Pedestrians	Evacuation Time
500	49.40
400	41.34
300	35.63
200	28.80
100	23.58



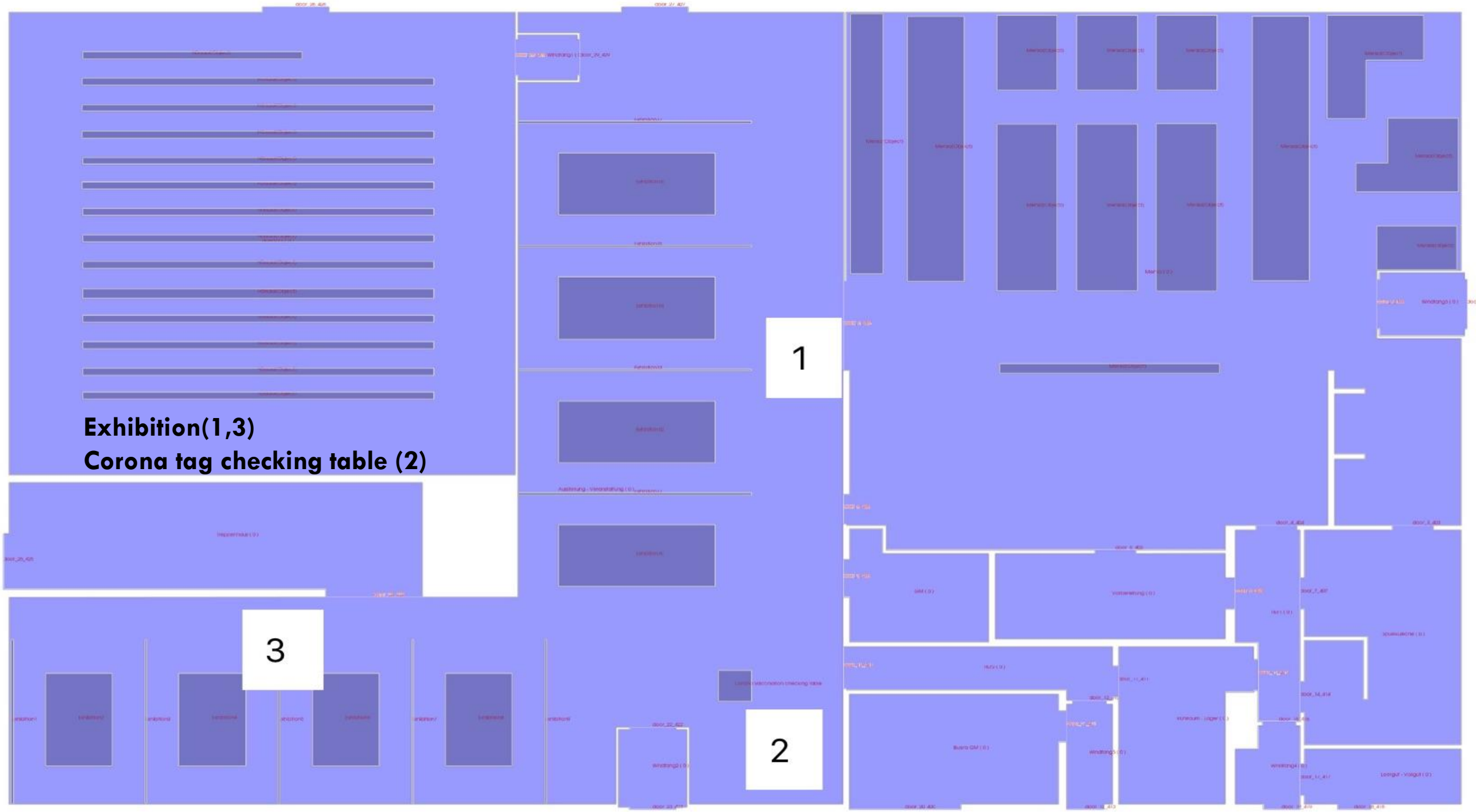
No of pedestrians	Scenario 1	Scenario 2
500	94.15	49.40
400	77.60	41.34
300	67.86	35.63
200	52.18	28.80
100	44.65	23.58

c.) Evacuation (Obstacles) with Doors Closed (Scenario 3)

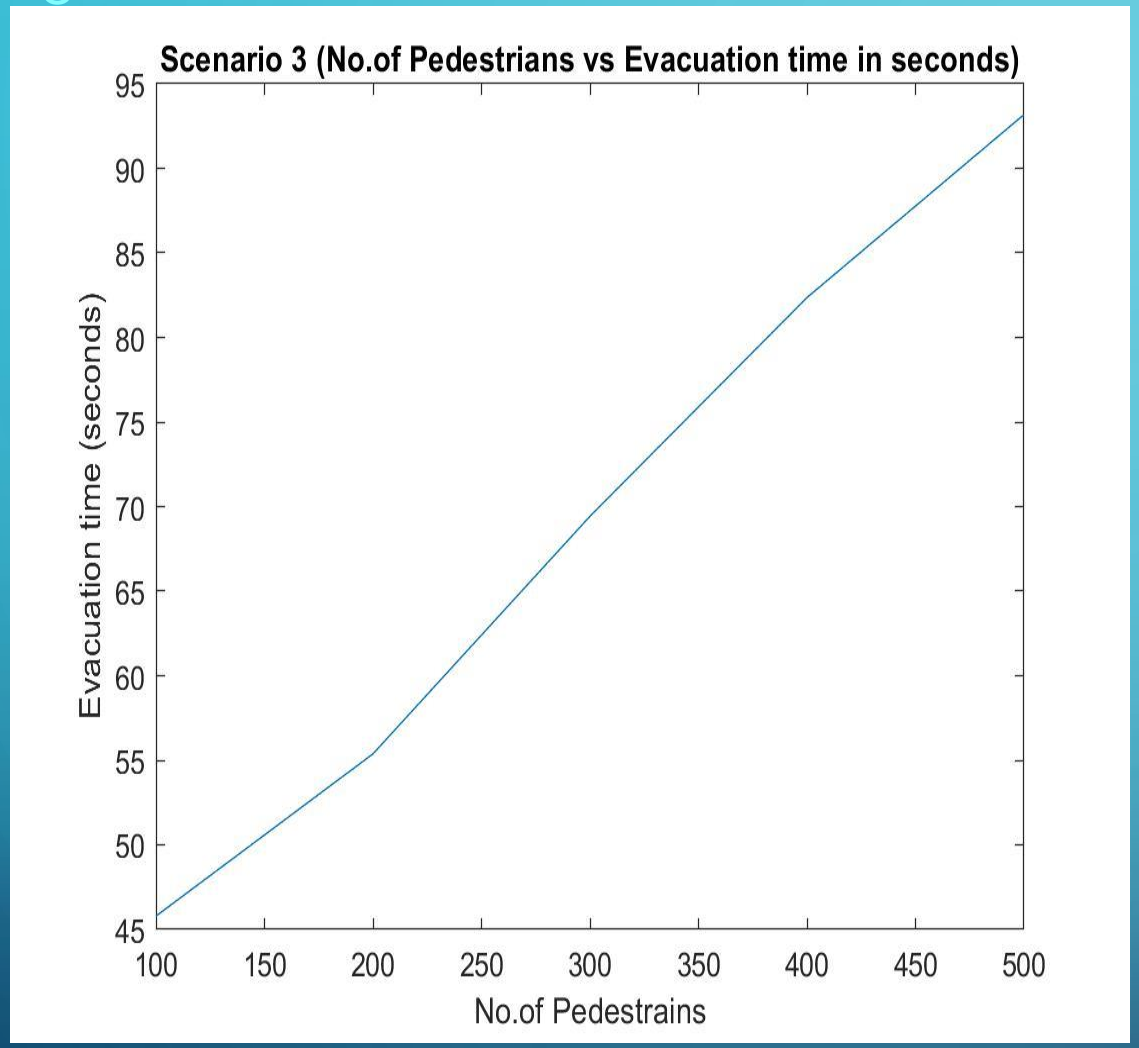
- For the third scenario, We assume that above mentioned four doors were closed.
- We assigned different goals to each group id.
- Each group moves with same speed.
- Pedestrians belong to same age groups
- We consider obstacles (exhibition) in this scenario.
- We repeat this scenario for number of Pedestrians (500 ,400,300,200,100).

Situation :

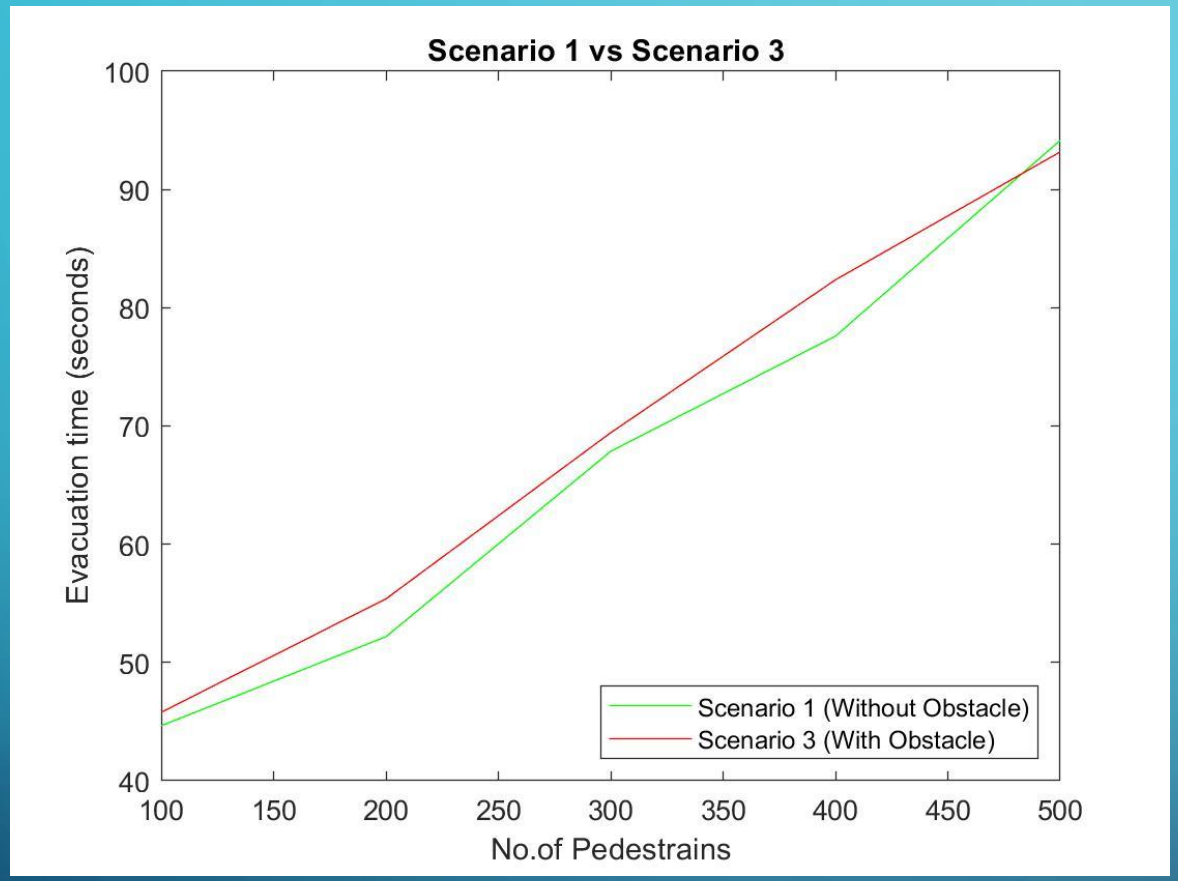
Lecture halls, Mensa and Corridors are filled with Number of pedestrians.
There is a fire accident in Mensa, Every pedestrians have to evacuate .
In addition to that, Exhibition were taken place at Corridors.
We will calculate Evacuation time and compare it with scenario 1 and 4 .


Exhibition(1,3)
Corona tag checking table (2)
1
2
3


File Visualisation View Options Tools Help
Pedestrians: 500 Time: 0 Sec
Prev
Next
Rewind
x1
0/745 (0.00 s)
rec off fps: 8 File: //wsl.localhost/Ubuntu-20.04/home/jarvis/project/Pedestrian-Dynamics/Scenario/Scenario_3/results/trajectories-Scenario3.txt x:3.13 y:12.10



No of Pedestrians	Evacuation Time
500	93.18
400	82.36
300	69.43
200	55.38
100	45.79



No of pedestrians	Scenario 1	Scenario 3
500	94.15	93.18
400	77.60	82.36
300	67.86	69.43
200	52.18	55.38
100	44.65	45.79

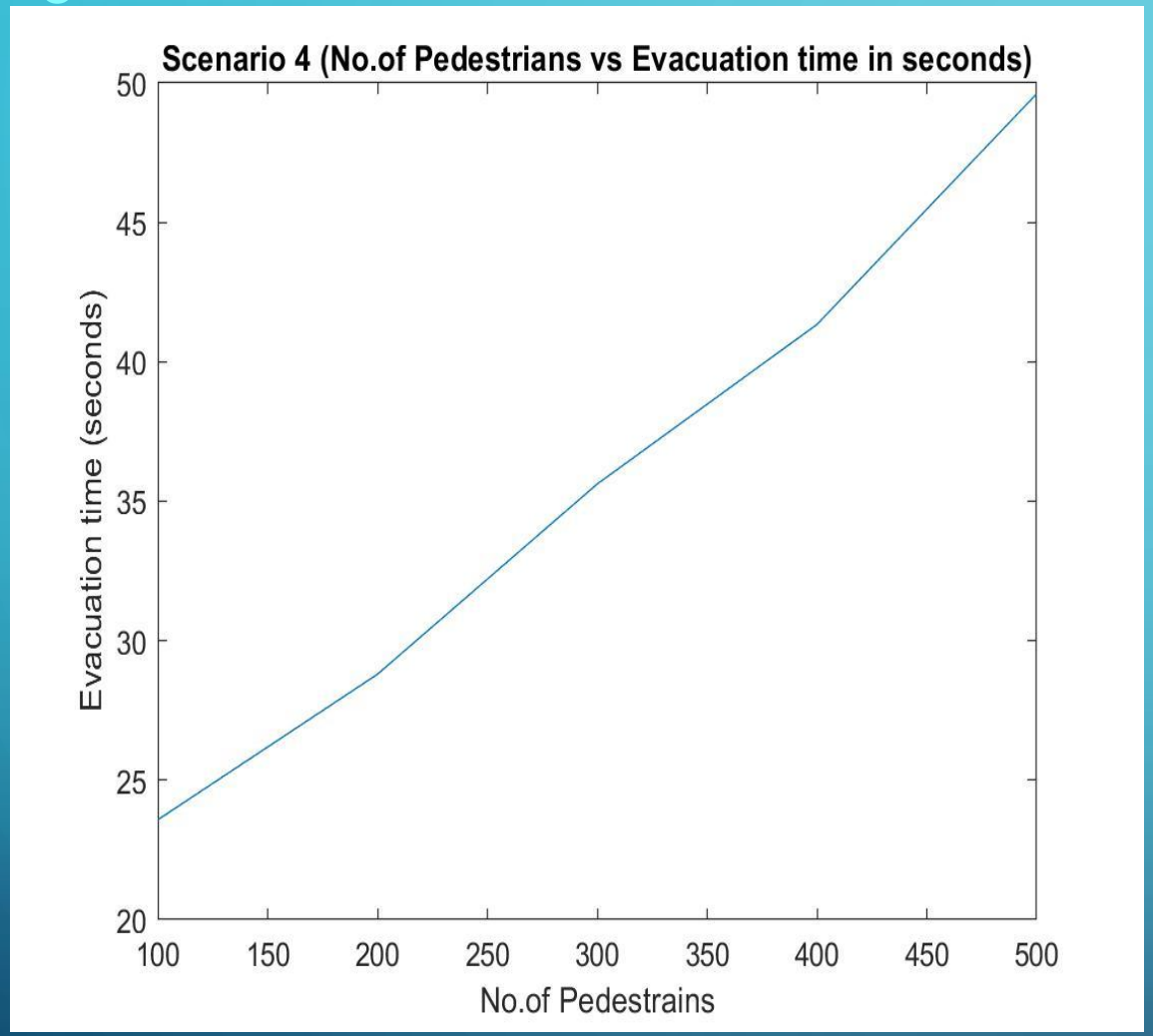
d.) Evacuation (obstacles) with Doors Open (Scenario 4)

- For the Fourth scenario, We assume that all doors were opened.
- We didn’t assign any goal to group id.
- Each group moves with same speed.
- Pedestrians belong to same age groups
- We consider obstacles (Exhibition) in this scenario.
- We repeat this scenario for number of Pedestrians (500 ,400,300,200,100).

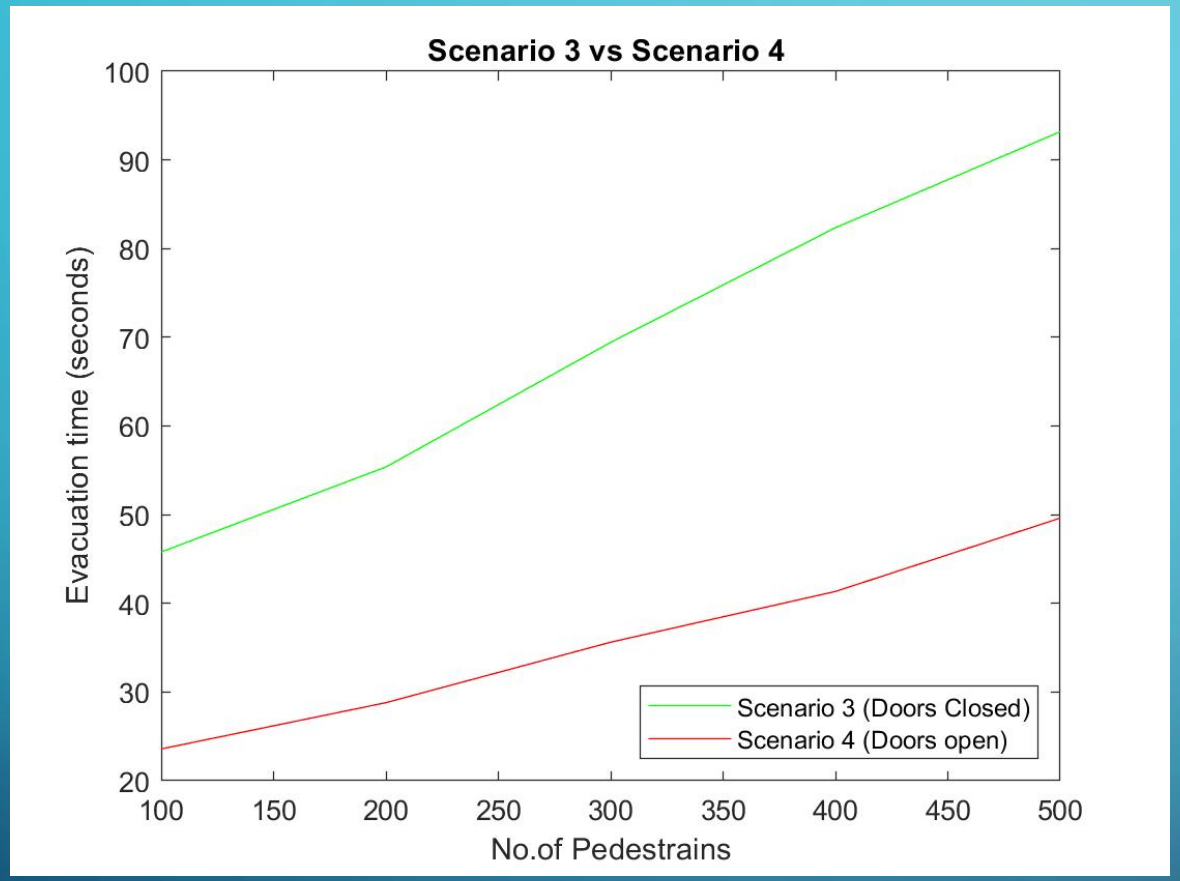
Situation :

Lecture halls, Mensa and Corridors are filled with Number of pedestrians.
There is a fire accident in Mensa, Every pedestrians have to evacuate .
In addition to that, Exhibition were taken place at Corridors.
We will calculate Evacuation time and compare it with scenario 1 and 4 .


File Visualization View Options Texts Help
Pedestrians: 500 Time: 0 Sec
Prev
Next
Rewind
x1
0/396 (0.00 s)
rec off fps: 8 File: //wsl.localhost/Ubuntu-20.04/home/jarvis/project/Pedestrian-Dynamics/Scenario/Scenario_4/results/trajectories-Scenario4.txt x:38.73 y:10.01



No of Pedestrians	Evacuation Time
500	49.61
400	41.34
300	35.62
200	28.80
100	23.58



No of pedestrians	Scenario 3	Scenario 4
500	93.18	49.61
400	82.36	41.34
300	69.43	35.62
200	55.38	28.80
100	45.79	23.58

e.) Fire Accident

- In this Scenario, We assume that above mentioned four doors were closed.
- We assigned different goals to each group id.
- Each group moves with **Different** speed.
- Pedestrians belong to different age groups
- We consider obstacles (exhibition) in this scenario.
- We repeat this scenario for number of Pedestrians (500 ,400,300,200,100).

Situation :

Lecture halls, Mensa and Corridors are filled with Number of pedestrians.
There is a fire accident in Mensa, Every pedestrians have to evacuate .
In addition to that, Exhibition were taken place at Corridors.
We will calculate Evacuation time.

```
<!--persons information and distribution -->
<agents operational_model_id="3">
    <agents_distribution>

        <group group_id="0"  room_id="3" goal_id="7"  number ="70" agent_parameter_id="4" x_min="11.9" x_max="19" y_min="22.8" y_max="36.5" router_id="1" subroom_id="0" />

        <group group_id="1"  room_id="6" goal_id="5"  number ="15" agent_parameter_id="3" x_min="37.1" x_max="52" y_min="26.18" y_max="28" router_id="1" subroom_id="0" />

        <group group_id="2"  room_id="3" goal_id="5" number ="70" agent_parameter_id="4" router_id="1" subroom_id="0" />

        <group group_id="3"  room_id="8" goal_id="0" number ="30" agent_parameter_id="2" router_id="1" subroom_id="0" />

        <group group_id="4"  room_id="9" goal_id="5" number ="10"  agent_parameter_id="1" router_id="1" subroom_id="0" />

        <group group_id="5"  room_id="2" goal_id="0" number ="10" agent_parameter_id="3" router_id="1" subroom_id="0" />

        <group group_id="6"  room_id="1" goal_id="1" number ="20" agent_parameter_id="5" router_id="1" subroom_id="0" />

        <group group_id="7"  room_id="7" goal_id="5" number ="25" agent_parameter_id="6" router_id="1" subroom_id="0" />

        <group group_id="8"  room_id="4" goal_id="2" number ="10"  agent_parameter_id="5" router_id="1" subroom_id="0" />

        <group group_id="9"  room_id="0" goal_id="0" number ="50" agent_parameter_id="2" x_min="12" x_max="29" y_min="12" y_max="17.5" router_id="1" subroom_id="0" />

        <group group_id="10" room_id="0" goal_id="0" number ="50" agent_parameter_id="2" x_min="27.26" x_max="36.42" y_min="12" y_max="25" router_id="1" subroom_id="0" />

        <group group_id="11" room_id="0" goal_id="5" number ="50" agent_parameter_id="2" x_min="27.26" x_max="36.42" y_min="25" y_max="37" router_id="1" subroom_id="0" />

        <group group_id="12" room_id="6" goal_id="5" number ="10" agent_parameter_id="1" x_min="37.1" x_max="51.03" y_min="20.9" y_max="25.60" router_id="1" subroom_id="0" />

        <group group_id="13" room_id="6" goal_id="5" number ="45" agent_parameter_id="2" x_min="37.1" x_max="48.40" y_min="28" y_max="37.15" router_id="1" subroom_id="0" />

        <group group_id="14" room_id="6" goal_id="5" number ="25" agent_parameter_id="3" x_min="48.40" x_max="55.17" y_min="28" y_max="37.15" router_id="1" subroom_id="0" />

        <group group_id="15" room_id="6" goal_id="5" number ="10" agent_parameter_id="4" x_min="51.53" x_max="55.17" y_min="20.83" y_max="37.15" router_id="1" subroom_id="0" />

    </agents_distribution>
</agents>
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```
<!-- These parameters may be overwritten -->
<operational_models>
    <model operational_model_id="3" description="Tordeux2015">
        <model_parameters>
            <stepsize>0.01</stepsize>
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            <delta_h>0.0625</delta_h>
            <wall_avoid_distance>0.2</wall_avoid_distance>
            <use_wall_avoidance>true</use_wall_avoidance>
            <linkedcells enabled="true" cell_size="2.2" />
            <force_ped a="5" D="0.2" />
            <force_wall a="5" D="0.02" />
        </model_parameters>

        <agent_parameters agent_parameter_id="1">
            <v0 mu="1" sigma="0.25" />
            <v0_upstairs mu="0.668" sigma="0.167" />
            <v0_downstairs mu="0.750" sigma="0.188" />
            <v0_idle_escalator_upstairs mu="0.5" sigma="0.0" />
            <v0_idle_escalator_downstairs mu="0.5" sigma="0.0" />
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            <amin mu="0.15" sigma="0.0" />
            <atau mu="0." sigma="0.0" />
            <tau mu="0.5" sigma="0.0" />
            <T mu="1.2" sigma="0.0" />
        </agent_parameters>

        <agent_parameters agent_parameter_id="2">
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            <v0_downstairs mu="0.750" sigma="0.188" />
            <v0_idle_escalator_upstairs mu="0.5" sigma="0.0" />
            <v0_idle_escalator_downstairs mu="0.5" sigma="0.0" />
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            <atau mu="0." sigma="0.0" />
            <tau mu="0.5" sigma="0.0" />
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        <agent_parameters agent_parameter_id="3">
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            <v0_idle_escalator_upstairs mu="0.5" sigma="0.0" />
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            <atau mu="0." sigma="0.0" />
            <tau mu="0.5" sigma="0.0" />
            <T mu="1.2" sigma="0.0" />
        </agent_parameters>
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In order to change the moving speed ,We have to alter the mu and sigma.

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        <agent_parameters agent_parameter_id="4">
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            <v0_upstairs mu="0.668" sigma="0.167" />
            <v0_downstairs mu="0.750" sigma="0.188" />
            <v0_idle_escalator_upstairs mu="0.5" sigma="0.0" />
            <v0_idle_escalator_downstairs mu="0.5" sigma="0.0" />
            <bmax mu="0.15" sigma="0.0" />
            <bmin mu="0.15" sigma="0.0" />
            <amin mu="0.15" sigma="0.0" />
            <atau mu="0." sigma="0.0" />
            <tau mu="0.5" sigma="0.0" />
            <T mu="1.2" sigma="0.0" />
        </agent_parameters>

        <agent_parameters agent_parameter_id="5">
            <v0 mu="2.5" sigma="0.25" />
            <v0_upstairs mu="0.668" sigma="0.167" />
            <v0_downstairs mu="0.750" sigma="0.188" />
            <v0_idle_escalator_upstairs mu="0.5" sigma="0.0" />
            <v0_idle_escalator_downstairs mu="0.5" sigma="0.0" />
            <bmax mu="0.15" sigma="0.0" />
            <bmin mu="0.15" sigma="0.0" />
            <amin mu="0.15" sigma="0.0" />
            <atau mu="0." sigma="0.0" />
            <tau mu="0.5" sigma="0.0" />
            <T mu="1.2" sigma="0.0" />
        </agent_parameters>

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            <v0 mu="0.5" sigma="0.25" />
            <v0_upstairs mu="0.668" sigma="0.167" />
            <v0_downstairs mu="0.750" sigma="0.188" />
            <v0_idle_escalator_upstairs mu="0.5" sigma="0.0" />
            <v0_idle_escalator_downstairs mu="0.5" sigma="0.0" />
            <bmax mu="0.15" sigma="0.0" />
            <bmin mu="0.15" sigma="0.0" />
            <amin mu="0.15" sigma="0.0" />
            <atau mu="0." sigma="0.0" />
            <tau mu="0.5" sigma="0.0" />
            <T mu="1.2" sigma="0.0" />
        </agent_parameters>

        <agent_parameters agent_parameter_id="7">
            <v0 mu="0.2" sigma="0.25" />
            <v0_upstairs mu="0.668" sigma="0.167" />
            <v0_downstairs mu="0.750" sigma="0.188" />
            <v0_idle_escalator_upstairs mu="0.5" sigma="0.0" />
            <v0_idle_escalator_downstairs mu="0.5" sigma="0.0" />
            <bmax mu="0.15" sigma="0.0" />
            <bmin mu="0.15" sigma="0.0" />
            <amin mu="0.15" sigma="0.0" />
            <atau mu="0." sigma="0.0" />
            <tau mu="0.5" sigma="0.0" />
            <T mu="1.2" sigma="0.0" />
        </agent_parameters>
    </model>
</operational_models>
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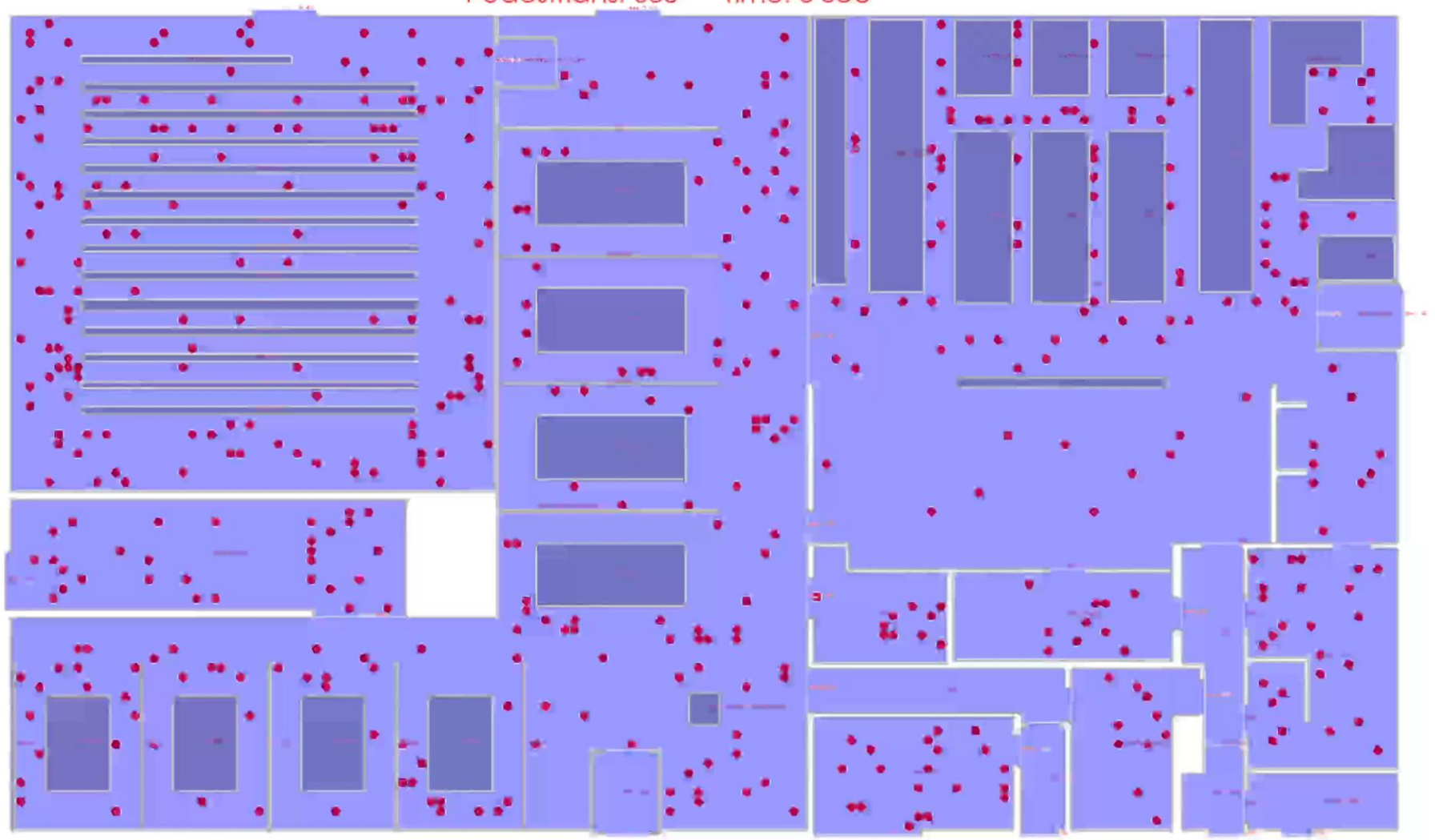
File Visualisation View Options Tools Help



Prev Next Rewind x1

0/1039 (0.00 s)

rec off fps: 8 File: //wsl.localhost/Ubuntu-20.04/home/jarvis/project/Pedestrian-Dynamics/Scenario/Scenario_7/results/trajectories-Scenario7.txt x:4.00 y:20.16

F.) EVACUATION WITH BACK PACK

OBJECTIVE:

- To simulate and analyze an evacuation scenario with back pack

SIMULATIONS:

Case (a): Without back pack

Case (b): With back pack

Doors conditions:

- Condition 1: Certain Doors were closed (previous)
- Condition 2: All doors open

METHODOLOGY

Operational model:

Collision-free speed model

Model parameters:

Step size = 0.01

Exit crossing strategy = 8

Delta h = 0.0625

Wall avoid distance = 0.2

Force wall a = 5 & D = 0.02

Use wall avoidance = true

Linked cells enabled = true

Cell size = 2.5

Force ped a = 5 & D = 0.2

Agent parameters:

- bmax mu= 0.15 & sigma = 0.0
- bmin mu= 0.15 & sigma=0.0
- amin mu= 0.15 & sigma= 0.0

Route choice model:

- Ff global shortest

Experimental studies of one-dimensional pedestrian walking
Behaviour with backpacks, suitcases, pushchairs and wheelchairs
Georgia bateman and arnab majumdar
Department of civil and environmental engineering
Imperial college london

A) WITHOUT BACK PACK

Agent parameters:

U0 mu= 1.46 & sigma = 0.18

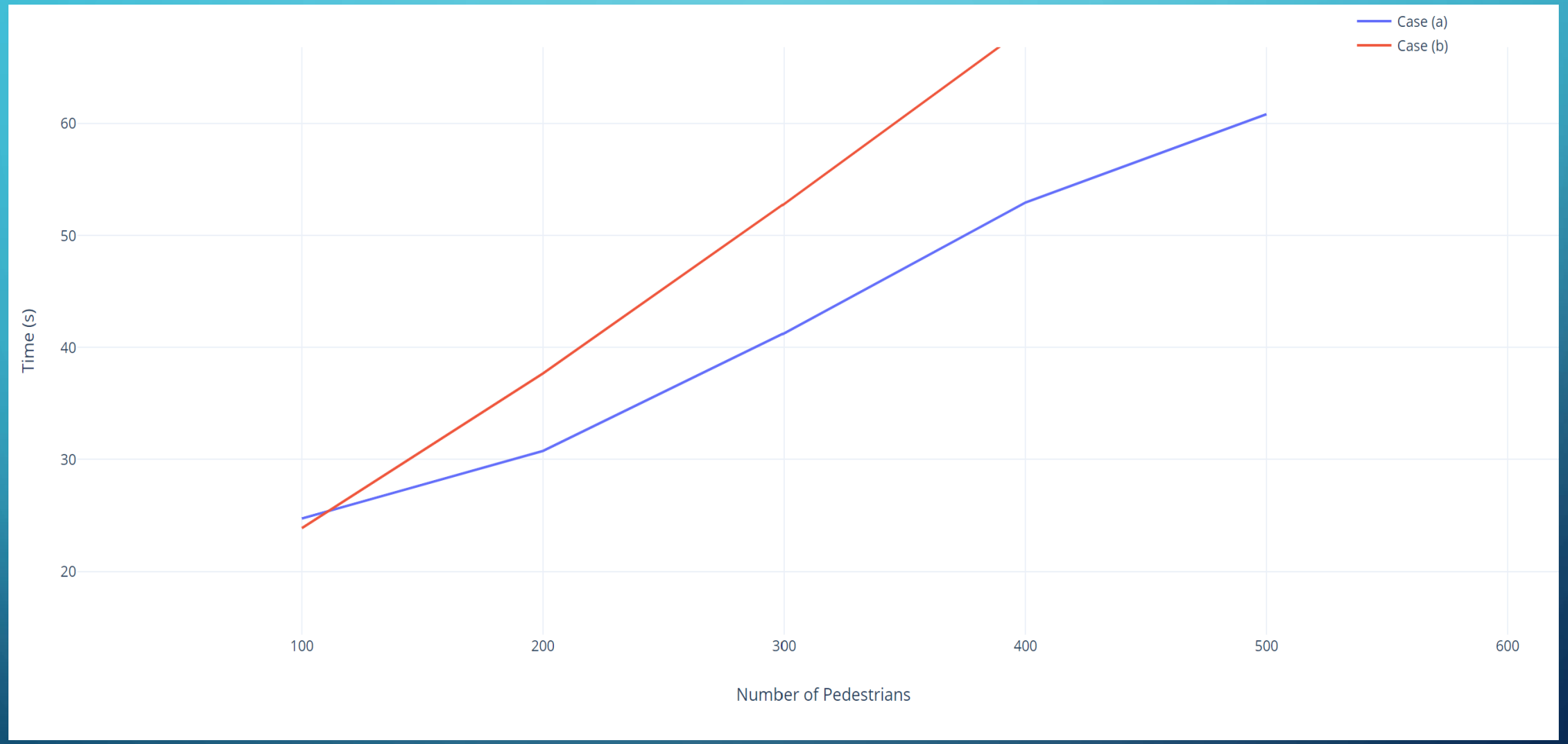
B) WITH BACK PACK

Agent parameters:

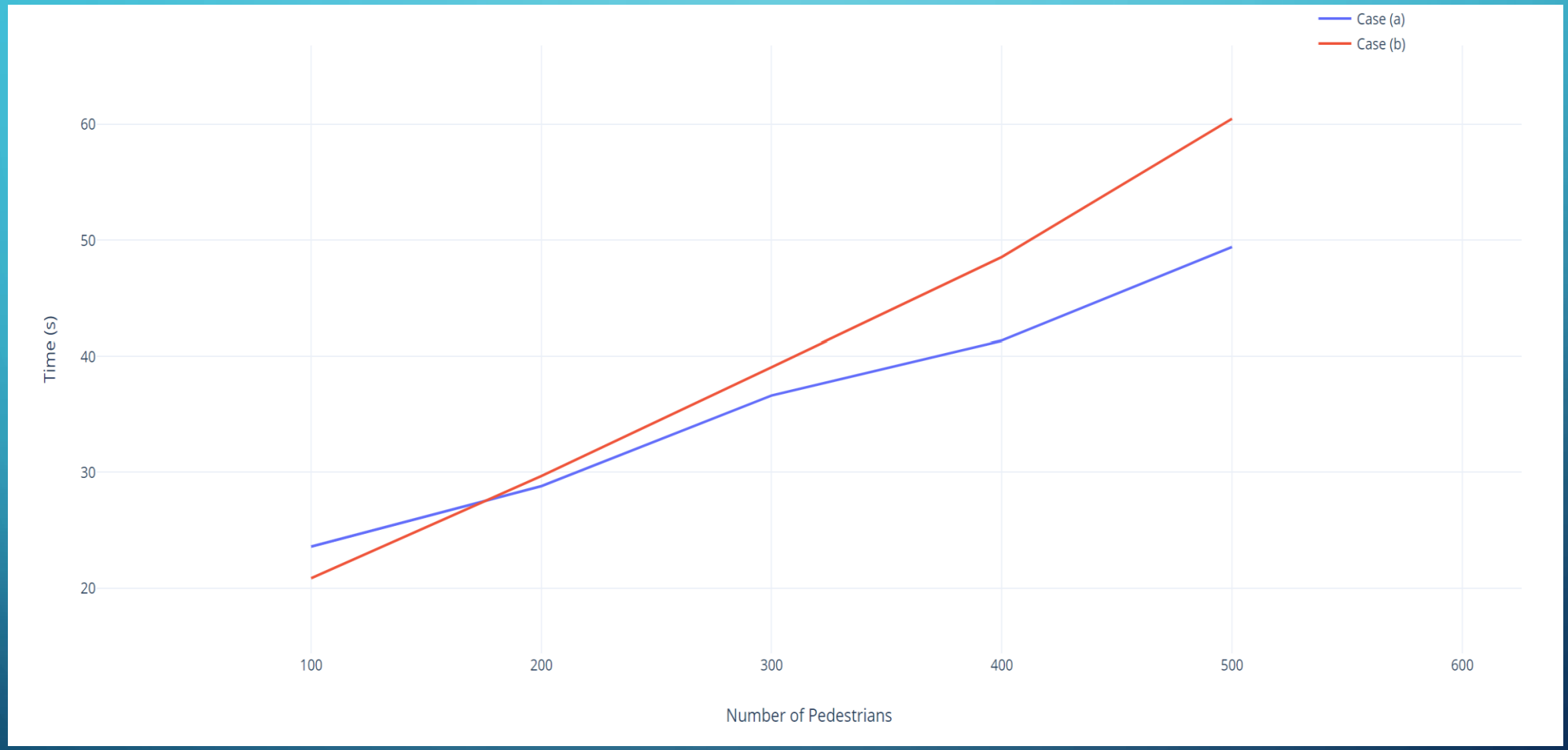
U0 mu= 1.43 & sigma = 0.16

RESULTS & ANALYSIS

Number of pedestrians	Condition 1		Condition 2	
	Without Back pack (s)	With Back pack (s)	Without Back pack (s)	With Back pack (s)
500	60.83	82.72	49.40	60.48
400	52.94	68.55	41.34	48.54
300	41.27	52.82	36.63	39.07
200	30.75	37.67	28.80	29.68
100	24.72	23.87	23.58	20.85



Comparing case a) and b) with condition 1



Comparing case a) and b) with condition 2

CONCLUSION

- From the analysis of “Back pack scenario”, it is advisable and recommended for the pedestrians to leave their belongings while evacuating in an emergency situation.