Pedestrian collision avoidance on narrow sidewalk: a meeting between psychology and virtual reality
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PEDESTRIAN COLLISION AVOIDANCE ON NARROW SIDEWALK: A MEETING BETWEEN PSYCHOLOGY AND VIRTUAL REALITY

Context: NARROW SIDEWALKS

Problem: why do we choose to step down or stay on the narrow sidewalk when we encounter a pedestrian walking in the opposite way?

Goal: to simulate a social virtual pedestrian (non player character) in order to study this kind of situation in virtual environment

We avoid the collision by modifying our trajectory

To keep a safety zone

To anticipate the collision

Impact of 3 personal factors were studied

- Speed (fast – slow)
- Sex (Male – Female)
- Distraction (texting – non texting)

First Experiment – Questionnaire

- 64 videos of pre-jousting, before any modification of trajectory
- 8x8 counterbalanced videos
- Participants told who was to step down: pedestrian at left or at right in the jousting
- Participants said why the virtual pedestrian stepped down (speed, sex, distraction) with Likert scales
- 64 videos of complete jousting with a Likert scale

Social Perception Model

- Speed and attention influence the decision to step down
- Participants said why the virtual pedestrian stepped down if his detection time is greater than the other pedestrian involving in the jousting

Collision avoidance behaviors simulation (Orca model)

Social Perception Model

- Speed and attention influence the decision to step down
- Pedestrian is expected to step down when:
  - he walks fast,
  - he is attentive
- For the participants, no gender effects

Impact of 3 personal factors were studied

- Detection time is then a score
- Overall ranking of the model-based videos, Median = 4

Discussion

- To use Social Pedestrian Non Player Characters in VR environment is feasible
- Needs to take into account the empowerment/authority

Conclusion

- First Experiment – Results
- 64 videos of pre-jousting, before any modification of trajectory
- 8x8 counterbalanced videos
- Participants told who was to step down: pedestrian at left or at right in the jousting
- Participants said why the virtual pedestrian stepped down (speed, sex, distraction) with Likert scales
- 64 videos of complete jousting with a Likert scale

2nd Experiment – Results

- 64 videos of complete jousting with the new model
- 8x8 counterbalanced videos
- One of 8 videos is a fake video (opposite of the model result)
- Participants said if the jousting is credible
- 64 videos of complete jousting with a Likert scale

Overall ranking of the model-based videos, Median = 4

To keep a safety zone

To anticipate the collision

We avoid the collision by modifying our trajectory

Personal characteristics (psychological and physical)

Direction

Speed

Collaborative effort (Y/N)

First Experiment – Results

- Influence of speed and attention
- Pedestrian is expected to step down when:
  - he walks fast,
  - he is attentive
- For the participants, no gender effects

Social Perception Model

- Speed and attention influence the decision to step down
- Pedestrian is expected to step down if his detection time is greater than the other pedestrian involving in the jousting

N.B.: the virtual pedestrian sees pedestrian in the public space, and detects him in the social space

Discussion

- To use Social Pedestrian Non Player Characters in VR environment is feasible
- Needs to take into account the empowerment/authority