Pedestrian collision avoidance on narrow sidewalk: a meeting between psychology and virtual reality
Cléo Deroo, Angélique Montuwy, Béatrice Degraeve, Jean-Michel Auberlet, Anne-Hélène Olivier, Marie-Axelle Granie

To cite this version:
Cléo Deroo, Angélique Montuwy, Béatrice Degraeve, Jean-Michel Auberlet, Anne-Hélène Olivier, et al.. Pedestrian collision avoidance on narrow sidewalk: a meeting between psychology and virtual reality. TRB 2019 - Annual Meeting on Transportation Research Board, Jan 2019, Washington, United States. hal-02396553

HAL Id: hal-02396553
https://univ-rennes.hal.science/hal-02396553
Submitted on 31 Jan 2020

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L’archive ouverte pluridisciplinaire HAL, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d’enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.
PEDESTRIAN COLLISION AVOIDANCE ON NARROW SIDEWALK: A MEETING BETWEEN PSYCHOLOGY AND VIRTUAL REALITY

**First Experiment – Questionnaire**
- 64 videos of pre-jousting, before any modification of trajectory
- Both counterbalanced videos
- Participants told who was to step down: pedestrian at left or at right in the jousting with a Likert scale.
- Participants said why the virtual pedestrian stepped down (speed, sex, distraction) with Likert scales.
- 64 videos of complete jousting with 8x8 counterbalanced videos
- One of 8 videos is a fake video (opposite of the model result)
- Participants told who was to step down: pedestrian at left or at right in the jousting
- Participants said if the jousting is credible and attention

**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

**Perception model for the virtual pedestrian**
- ORCA Model used
- Different types of collision avoidance (anticipative, reactive)
- Collision avoidance behaviors are a function of the walking speed, the detection time

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

**Experiment – Results**
- Overall ranking of the model-based videos, Median = 4
- Credibility of model-based videos and fake videos according to the subjects’ answers
- Detection time is then a score according to the subjects’ answers

**Experiment – Questionnaire**
- 64 videos of pre-jousting, before any modification of trajectory
- Both counterbalanced videos
- Participants told who was to step down: pedestrian at left or at right in the jousting with a Likert scale.
- Participants said why the virtual pedestrian stepped down (speed, sex, distraction) with Likert scales.
- 64 videos of complete jousting with 8x8 counterbalanced videos
- One of 8 videos is a fake video (opposite of the model result)
- Participants said if the jousting is credible and attention

**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

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

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

**Context: NARROW SIDEWALKS**
- Pedestrians manage social interpersonal distances
- 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 testing)

**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

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

**Experiment – Results**
- Overall ranking of the model-based videos, Median = 4
- Credibility of model-based videos and fake videos according to the subjects’ answers
- Detection time is then a score according to the subjects’ answers

**First Experiment – Questionnaire**
- 64 videos of pre-jousting, before any modification of trajectory
- Both counterbalanced videos
- Participants told who was to step down: pedestrian at left or at right in the jousting with a Likert scale.
- Participants said why the virtual pedestrian stepped down (speed, sex, distraction) with Likert scales.
- 64 videos of complete jousting with 8x8 counterbalanced videos
- One of 8 videos is a fake video (opposite of the model result)
- Participants said if the jousting is credible and attention

**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

**Perception model for the virtual pedestrian**
- ORCA Model used
- Different types of collision avoidance (anticipative, reactive)
- Collision avoidance behaviors are a function of the walking speed, the detection time

**Experiment – Questionnaire**
- 64 videos of pre-jousting, before any modification of trajectory
- Both counterbalanced videos
- Participants told who was to step down: pedestrian at left or at right in the jousting with a Likert scale.
- Participants said why the virtual pedestrian stepped down (speed, sex, distraction) with Likert scales.
- 64 videos of complete jousting with 8x8 counterbalanced videos
- One of 8 videos is a fake video (opposite of the model result)
- Participants said if the jousting is credible and attention

**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

**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

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