

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.

³ Telecom ParisTech, Paris, France

¹ Université Paris-Est, COSYS, LEPSIS, IFSTTAR, Paris, France

2nd Experiment – Results



credibility of model-based videos and fake

videos according to the subjects' answers

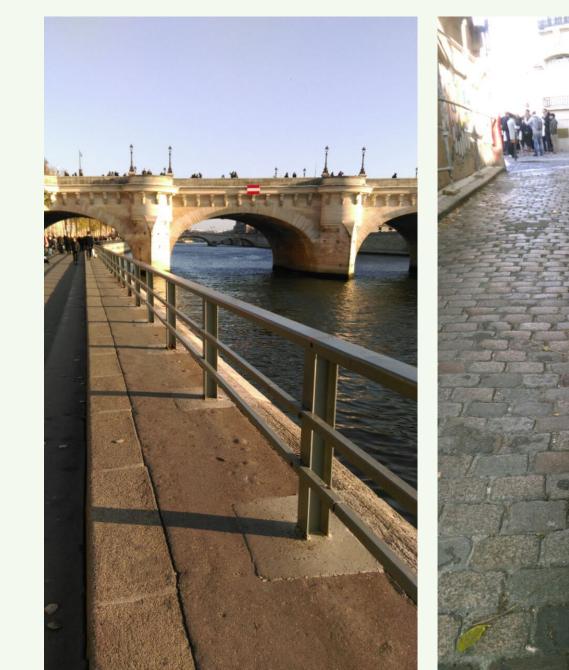
Model_based

Fake

Session: 1635, Pedestrian Planning and Analysis – Paper # 19-05480

PEDESTRIAN COLLISION AVOIDANCE ON NARROW SIDEWALK: A MEETING BETWEEN PSYCHOLOGY AND VIRTUAL REALITY

Context: NARROW SIDEWALKS





Paris ©AH Olivier 2018

Encounter of two pedestrians is impossible one has to step down and he is

exposed to the road traffic

→ It can be seen as an URBAN JOUSTING





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?

Pedestrians manage social interpersonal distances Proxemics (Hall, 66) @JL Grall, Wiki-commons To keep a safety zone To anticipate the collision We avoid the collision by modifying our trajectory Speed Direction Collaborative effort (Y/N)

⁵ M2S lab, University Rennes 2 - ENS Rennes – UEB, Rennes, France

Impact of 3 personal factors were studied Distraction (texting – non texting)

First Experiment – Results

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 with a Likert scale.
- Participants said why the virtual pedestrian stepped down (speed, sex, distraction) with Likert scales
- >80 participants

Influence of speed

and attention

Pedestrian is expected

For the participants,

to step down when

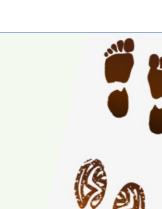
* he walks fast,

* he is attentive

no gender effects

2nd Experiment – Questionnaire

- → 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 >80 participants



² Centrale Nantes, Nantes, France

⁴ Lille Catholic University, OCeS, Lille, France

⁶ Univ Lyon, IFSTTAR, TS2, LESCOT, Lyon, France

Social Perception Model

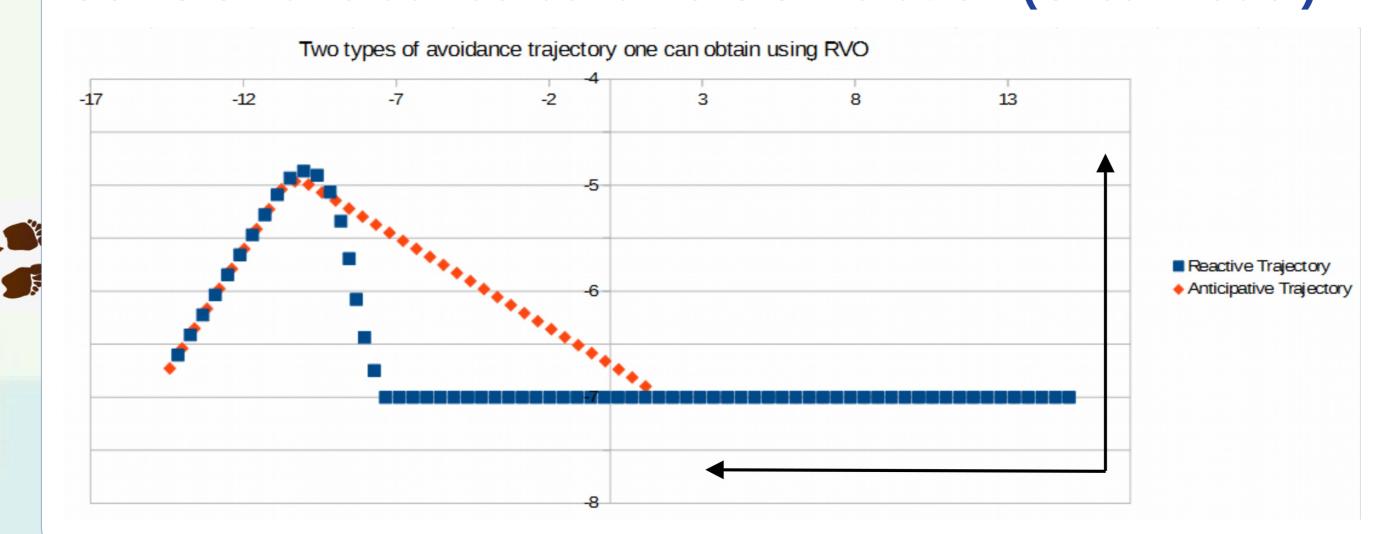
Speed and attention influence the decision to step down from the narrow sidewalk

Assumption: speed and attention increase the detection time in the ORCA model. Detection time is then a score.

Virtual pedestrian decides 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

Collision avoidance behaviors simulation (Orca model)



Nb of answer Overall ranking of the model-based videos. Median = 4

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