Optimization of Business Processes thanks to Machine Learning and Virtual Reality

Use-Case : SpeakInVR

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Who am I ?

- Education
  - Master in Mathematics :
    - Educational training Master Degree (AESS)
    - Statistics and Actuarial Sciences (Uliège & University of Southampton)
  - Bachelor in Mathematics (Uliège)

- Job
  - PhD candidate in Management Science
  - Teaching Assistant in Mathematics and in Statistics

Research question

How Machine Learning and Virtual Reality can improve Business processes ?

- In Marketing: presenting a product
- In Tourism : guided tour
- In HRM : job interview
- In Management: meeting of a manager

Use-case

SpeakInVR : a solution to public speaking

State of the art

- 2D virtual environment
- Reaction of the audience managed by an experimenter in front of the computer interface
- Drawn models

Proposed methods

- 3D virtual environment
- Interactive and autonomous audience
- Use of photorealistic models

Research sub-questions

- Can we automatically identify some behaviours like anxiety thanks to **business analytics** ?
- Can we improve the manager/speaker performances with training in a **virtual reality digital twin** ?
- How to create a useful digital twin for management purposes and when to use ?

Interdisciplinary approach

- Business analytics: Statistics, Machine Learning, NLP, Deep Learning
- New digital technologies: AR/VR, IoT, simulation and training in digital twins...
- Applications in behavioural analysis: HRM, Marketing, Psychology, Speech therapy...

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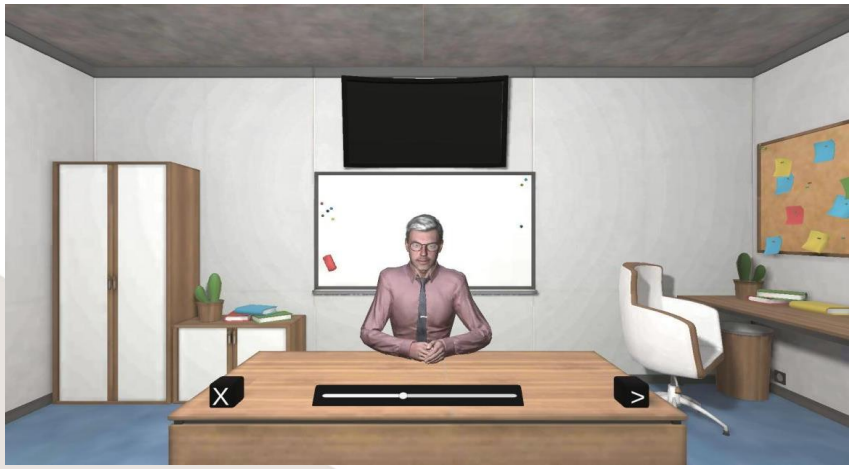
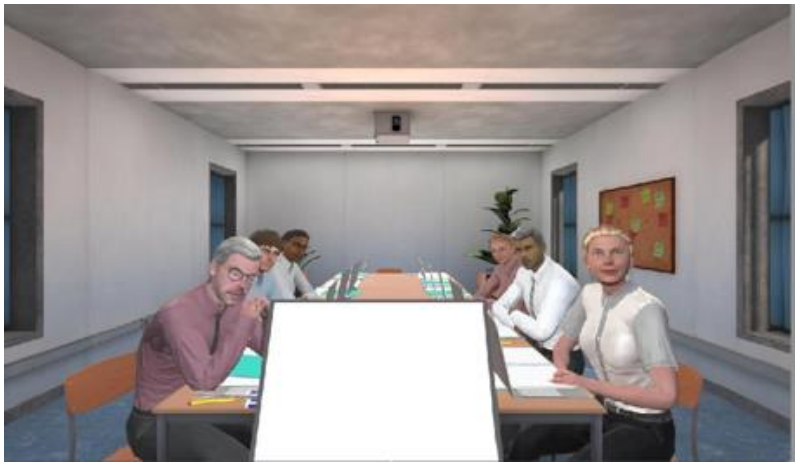
3D-environment





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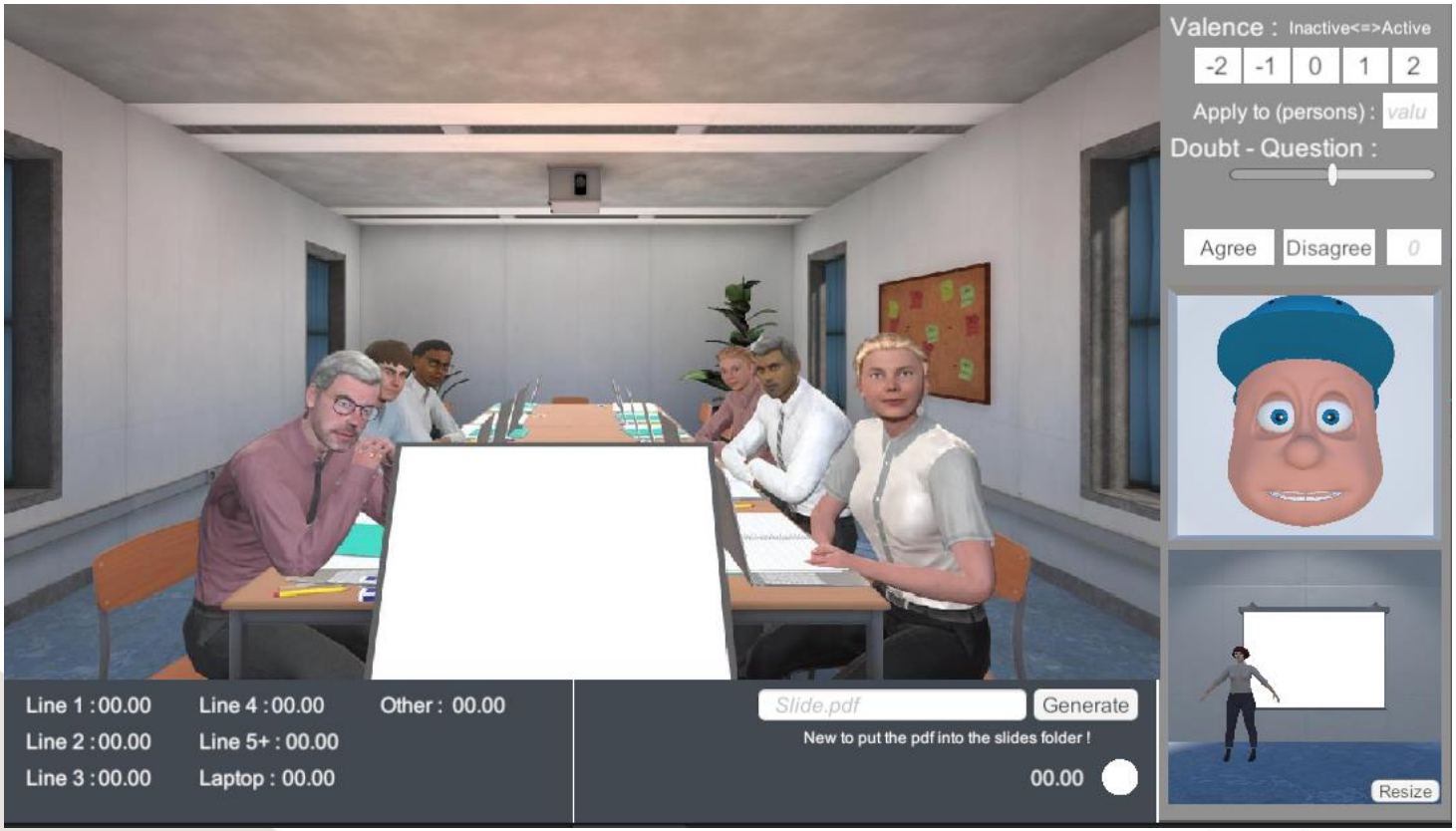
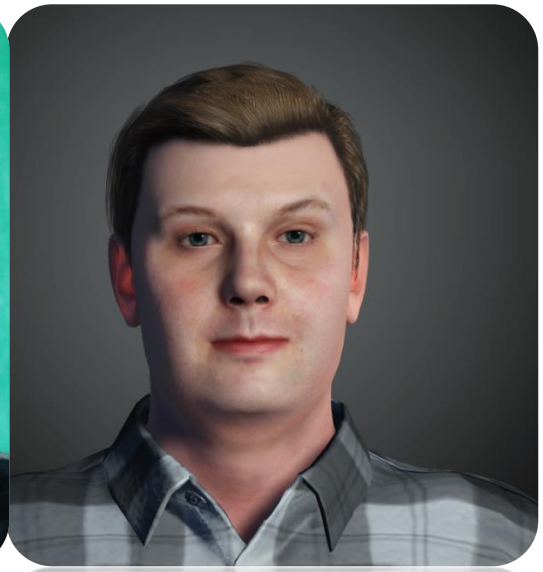
SpeakInVR : Digital twin for training

Autonomous and interactive audience

- Highly customizable
- Recorded parameters during the speech (voice, eye tracking, body tracking, …) for real-time feedbacks



Photorealistic models compared with drawn models



Approach : 3-step process

- Creation of an interactive audience

  Validate the attitudes that an interactive audience should show through a statistical study of about 100 participants *(International AR VR Conference 2020-2021)*

- Voice and Speech analysis with Statistics, NLP, ML and DL approaches
  - Voice indexes
  - Feelings, jokes, …
  - Word detection
  - …
- Public speaking training in virtual reality

  Training in front of an interactive audience reacting in an autonomous way (machine learning, deep learning, ...) to the speaker's presentation.

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First step : Validation of a virtual audience

- Which attitudes the characters must display and how people perceive the individual members of the audience in terms of their states of arousal and valence.
- Can the use of a 3D photorealistic model significantly improve the *user's presence*?
- Can the virtual person's gender or nationality influence the way the public feels about the person in terms of their states of arousal and valence ?

Statistical study
About 100 participants

Vidéo 2	Faible	1	2	3	4	5	6	7	Elevé
Valence		○	○	○	○	○	○	○	
Confiance		○	○	○	○	○	○	○	
Eveil		○	○	○	○	○	○	○	
Confiance		○	○	○	○	○	○	○	
Commentaire facultatif:									

Challenges/issues of interdisciplinarity

- **New technologies :** the struggle for virtual reality to be taken seriously in the world of Research (not just as hobbies or games)
- **Collaboration :** compulsory in an interdisciplinary setting
- **Communication :** different backgrounds of the researchers
- **Presentation and publication :** difference in standards between disciplines and results that can have multiple applications (ML, NLP, Marketing, Speech therapy, Psychology ...)

Thanks for your attention !

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