



Internship Student Showcase

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Summer 2021



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VANDERBILT UNIVERSITY

PIRE Program

- **PIRE:** Partnerships for International Research and Education
- **German Aerospace Center** at the **Institute for Transportation Systems**
- **Topic:** *Participatory Design in Virtual Reality* – with a focus on *Cyber-Physical Systems* and *human-centered approaches*
- *Encouraging involvement* from the research participants in order to **accelerate the design process** and improve the product's **usability** and **user experience**
 - Elaborate and assess user state & needs
 - Integrate the user into the design & evaluation process

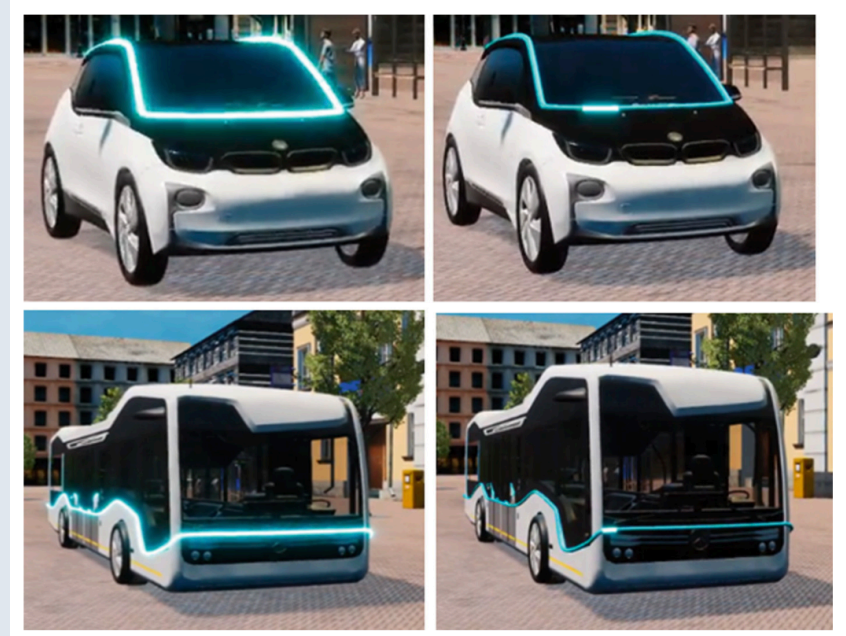


DLR

Deutsches Zentrum
für Luft- und Raumfahrt
German Aerospace Center

My Tasks

- **Literature search** regarding *current VR methods* used for *Human-Machine Interface (HMI) design evaluation*
- Workshops to brainstorm **Participatory Design** practices and encourage user participation
- Design a User Interface in **Unreal Engine**, a gaming software, to encourage **participant customization of the eHMI design**
 - *Maximum usability: what makes the most intuitive sense to the user?*



Unreal Engine Demo



Assurance Testing of CPS

- Model various **transportation scenarios** to evaluate AV effectiveness under different *environmental and traffic conditions*
- **CARLA + Scenic** Integration:
 - **CARLA**: open-source simulator for AV research
 - Includes an API that allows users to control **traffic, pedestrian behaviors, weathers, sensors, and more**
 - **Scenic**: probabilistic programming language for modeling Cyber-Physical Systems
 - Program different configurations to **yield concrete scenes** and **gather data** on the parameters that lead to *substantial performance degradation*
 - Supports a **large # of simulation runs** and **parameter values**

CARLA Demo



Conclusion

- **Lesson learned:**
 - Time Management: Balancing two separate research groups
 - Asking for help: Don't try to fix everything yourself
- **Challenges:**
 - Learning curve for Unreal Engine & UI design
 - Technical difficulties on the Vanderbilt project
 - Frustration when things don't go smoothly
- **What went well:**
 - Familiarity with a new platforms and programs
 - Gained skills in design and communication
 - Learned a ton about AVs and the current research being done