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Jamilah Foucher and Benoît Bardy
EuroMov Digital Health in Motion
University of Montpellier
700 Av. Pic Saint Loup
34090 Montpellier, France

To the Editor,

The authors would like to thank the editor and review staff for considering this Regular Manuscript submission for publication at IEEE Access. Our manuscript titled "Simulation and Classification of Spatial Disorientation in a Flight use-case using Vestibular Stimulation" concerns a two-part study measuring behavior during a Spatial Disorientation (SD) event and exploring machine learning (ML) modeling metrics for predicting the occurrence of SD.

SD is the erroneous sense of position and motion with respect to a reference, airplane and helicopter pilots often experience SD. Erroneous perception increases the likelihood of successive errors, and accidents and/or death can occur if errors caused by poor motion perception are left unmonitored.

Currently, SD is studied and categorized by the type of erroneous sensorial effects experienced by pilots (e.g.: somatogravic illusion). Due to the fact that SD is defined in terms of many categories (+15 use-cases), predicting SD and administering effective solutions in real-time can be complicated. In this work we simplified the identification of SD in terms of task errors and human behavioral measures such as motion, instead of using the existing SD categories.

Our intention was to demonstrate how to simulate and collect task specific human behavioral data during a flight use-case, and to create a predictive model to detect the occurrence of SD. Our use-case was a motion detection response but in a flight-context it could be a flight maneuver. Our results show that:

1. Motion simulation experimentation can recreate SD situations such that human response during SD can be collected, thus assisting with human response dataset collection during SD.
2. The SD dataset was used to successfully predict the occurrence of SD. ML modeling comparison analysis demonstrated that SD can be accurately predicted regardless of the feature quantity used, however model type, specialized dataset models, feature type, and label type significantly influence prediction accuracy.
3. No significant relationship between physical disorientation and motion detection was found, indicating that two-sample before and after simulator sickness questionnaire-based methods are insufficient to uncover correlations with perceptual disorientation; a more frequent physical disorientation measure or questionnaire method is needed.

We believe these results are important for the readers of IEEE Access as they demonstrate that SD can be detected and thus treated in a naturalistic setting; the SD detection model depends on human behavioral measures (e.g.: joystick manipulation) with respect to task performance. Concerning future application of these ideas to real-world flying scenarios, the important aspect of this work is

the framework of data collection and labeling data as correct (non-SD state) or not-correct (SD state) with respect to task performance for ML modeling.

Sincerely,

Jamilah Foucher & Benoît Bardy