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Impact of task complexity on driving a gaze-controlled telerobot

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Robotic telepresence systems promote social interaction between geographically dispersed people. Gaze interaction is regarded as a common control mode for severely paralyzed people (Minakata et al., 2018). Gaze interaction with telerobots provides a new opportunity for people with limited mobility. The possibility of gaze-controlled, floor-driving robots has been shown in a prior study (Tall et al., 2009). The quality of eye tracking has been shown to be sufficient for gaze interaction in a bed scenario (Hansen et al., 2011). Situation awareness (SA) plays an important part in telepresence and a high level of understanding of the environment the telerobot is navigating through must be provided (Endsley, 2000). SA is also a primary basis for performance (Endsley, 1995). However, for this kind of gaze-controlled telepresence, it is still unclear how task complexity impacts users' performance and their SA. Thus, the main research question of this study is: what is the impact of task complexity when driving a gaze-controlled telerobot with a virtual reality head-mounted display (VR HMD)?

A total of 10 participants took part in our experiment (five with a low-complexity task vs. five with a high-complexity task). The dependent variables of interest were, eye movements, position of telerobot, and correctness of answers about information collected during the test. A subjective measure was also collected on experience of comfort and fun. A VR HMD with gaze tracking was provided for each test person to control a robot that carries a 360-degree video camera. The two groups of participants were asked to drive the gaze-controlled robot along two pre-set paths with different complexities. Following the driving test, each participant was interviewed.

With log data and screen recordings captured during the experiments, our analysis results include users' eye movement behaviours, telerobots' deviation from pre-set paths, number of collisions, and accuracy of answers about information collected during the test. We present out findings in terms of differences between the two groups.

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