

PoVRPoint: Authoring Presentations in Mobile Virtual Reality - Additional Results

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1 Introduction

This appendix contains some additional information on the analysis of the results in the paper "PoVRPoint: Authoring Presentations in Mobile Virtual Reality" [2].

In the original paper, aligned rank transform (ART) [3] was used to transform non-parametric data before using ANOVA. Post-hoc tests were then conducted by using Wilcoxon signed-rank test and Bonferroni-adjustments for multiple comparisons. As shown by [1] post-hoc tests can also be conducted using the ART data. In addition to the results reported in the main paper, using Wilcoxon signed-rank test, we will here report the results using the ART-C method [1].

2 Search Study

As mentioned in [2] repeated measures analysis of variance with ART [3] was used for subjective data and errors. This indicated a significant main effect of INTERFACE on the number of errors. Post-hoc tests using ART-C [1] with Bonferroni-adjustments showed a significant difference between TABLET ($M = 0.8$, $SD = 1.11$) and VR-FULL ($M = 5.08$, $SD = 4.65$) ($p < 0.001$) and between TABLET and VR-LIMITED ($M = 3.58$, $SD = 3.64$) ($p < 0.001$). However, no significant differences were found between VR-LIMITED and VR-FULL.

The repeated measures analysis of variance also indicated a significant main effect of INTERFACE on the total severity dimension of the simulator sickness questionnaire. However, post-hoc tests did not show significant differences between any of the three interfaces.

These findings for the search study are consistent with the findings obtained through Wilcoxon signed-rank test, as presented in [2].

3 Reordering Study

Again, repeated measures analysis of variance with ART [3] was used for subjective data. This indicated a significant main effect of INTERFACE on the overall task load. Post-hoc tests using ART-C [1] with Bonferroni-adjustments showed that VR ($M = 20.1$, $SD = 11.46$) induced a significantly lower task load than

both DYNAMIC REORDERING ($M = 49.29$, $SD = 22.15$) ($p < 0.001$) and POWERPOINT ($M = 34.23$, $SD = 21.56$) ($p = 0.01$). Also, a significant difference between POWERPOINT and DYNAMIC REORDERING was detected ($p = 0.02$). The differences between POWERPOINT and DYNAMIC REORDERING and between VR and POWERPOINT have not been found to be significant when using the Wilcoxon signed-rank test, as presented in [2].

The repeated measures analysis of variance also indicated a significant main effect of INTERFACE on the usability and post-hoc tests using ART-C showed that it was significantly higher in VR ($M = 89.11$, $SD = 7.76$) as compared to both DYNAMIC REORDERING ($M = 53.39$, $SD = 21.63$) ($p < 0.001$) and POWERPOINT ($M = 69.64$, $SD = 18.76$) ($p = 0.001$). Also, POWERPOINT was found to result in a significantly higher usability than DYNAMIC REORDERING ($p = 0.04$). This was not previously detected by Wilcoxon signed-rank test.

References

- [1] Elkin, L. A., Kay, M., Higgins, J. J., & Wobbrock, J. O. *An aligned rank transform procedure for multifactor contrast tests*. In The 34th annual ACM symposium on user interface software and technology (pp. 754-768), 2021.
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- [3] J. O. Wobbrock, L. Findlater, D. Gergle, and J. J. Higgins. *The aligned rank transform for nonparametric factorial analyses using only anova procedures*. In Proc. of the SIGCHI Conf. on human factors in computing systems, pp. 143-146, 2011.