

A New Representation Framework for View-Out Research

Yunni Cho | PhD Advisors: Prof. Marilyne Andersen (EPFL), Prof. Caroline Karmann (KIT)
 Laboratory of Integrated Performance in Design | École Polytechnique Fédérale de Lausanne

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Abstract

To address the current gap in view-out research, this study aims to develop a workflow able to accurately capture dynamic views in an experimental setting. In testing the suitability of the proposed methodology, we conducted two comparative studies on the participants' perceptual impressions using VR.

In the first experiment, participants (N=34) were asked to observe window views in two different conditions - one from a real office and the other projected in VR, which was recorded from the same office space using the proposed scene collection method at the start of the experiment. Participants' responses from this experiment were compared between the real and virtual environments to evaluate the perceptual accuracy of using VR for view-out studies. In the second study, the same participants were shown two variations of the pre-recorded view scenes with and without the use of a scale model during the scene collection process. The results of this study were used to determine whether framing the views might enhance perceived presence and realism in representing view-out in an immersive virtual environment (IVE).

This study is the first to test the suitability of using VR in maintaining immersion and dynamism when studying the perception of daylight views-out, using original data based on human-subjects. Findings show how VR can be an appropriate experimental tool for representing window views from office environments. By conducting these experiments, the authors were also able to evaluate the effectiveness of a novel workflow of representing views in physically-based IVE, using a dual fisheye lens combined with a scale model. This work opens up new experimental paths in reliably representing dynamic movements and temporal changes in views-out when conducting studies about them.

SUMMARY OF THE RESEARCH FINDINGS:

“VR can be an appropriate tool for view-out studies.”

Perceptual Impressions	Real vs. VR view	No statistical significance ($p > 0.05$), Negligible effect size ($d < 0.2$)
Sense of Presence	Virtual window view	Participants reported experiencing high sense of presence and realism
Physical Symptoms	Response after viewing the first vs. last VR scene	No statistical significance ($p > 0.05$), Negligible effect size ($d < 0.2$)

“Use of a scale model enhances perceived presence and realism in representing view-out in an IVE.”

Impression of window	Virtual view with vs. without a scale model	Statistical significance ($p < 0.05$), Large effect size ($d > 0.8$)
Realism of view-out		

SUITABILITY OF VR AS A RESEARCH TOOL FOR VIEW-OUT STUDIES

EFFECTIVENESS OF USING A SCALE MODEL FOR COLLECTING VIEW SCENES

METHODOLOGY

1

Canon RF 5.2m F2.8L Dual Fisheye lens
 +
 Canon EOS R5
 +
 EOS VR Utility
 Adobe Premiere Pro

Equirectangular Projection
 +
 Pico Neo 3 Pro Eye VR HMD
 +
 LMT Lux Meter

Real Window View → Virtual Window View

2

Horizontal Aperture: Aspect Ratio (H : W): 0.40
 WWR (Window-to-Wall Ratio): 48%

Camera Attachment Detail

Wall Materials Assembly
 - White wallpaper
 - Polycarbonate panel
 - Light-blocking tape

Selected View on EPFL Campus
 Recognizable central passageway

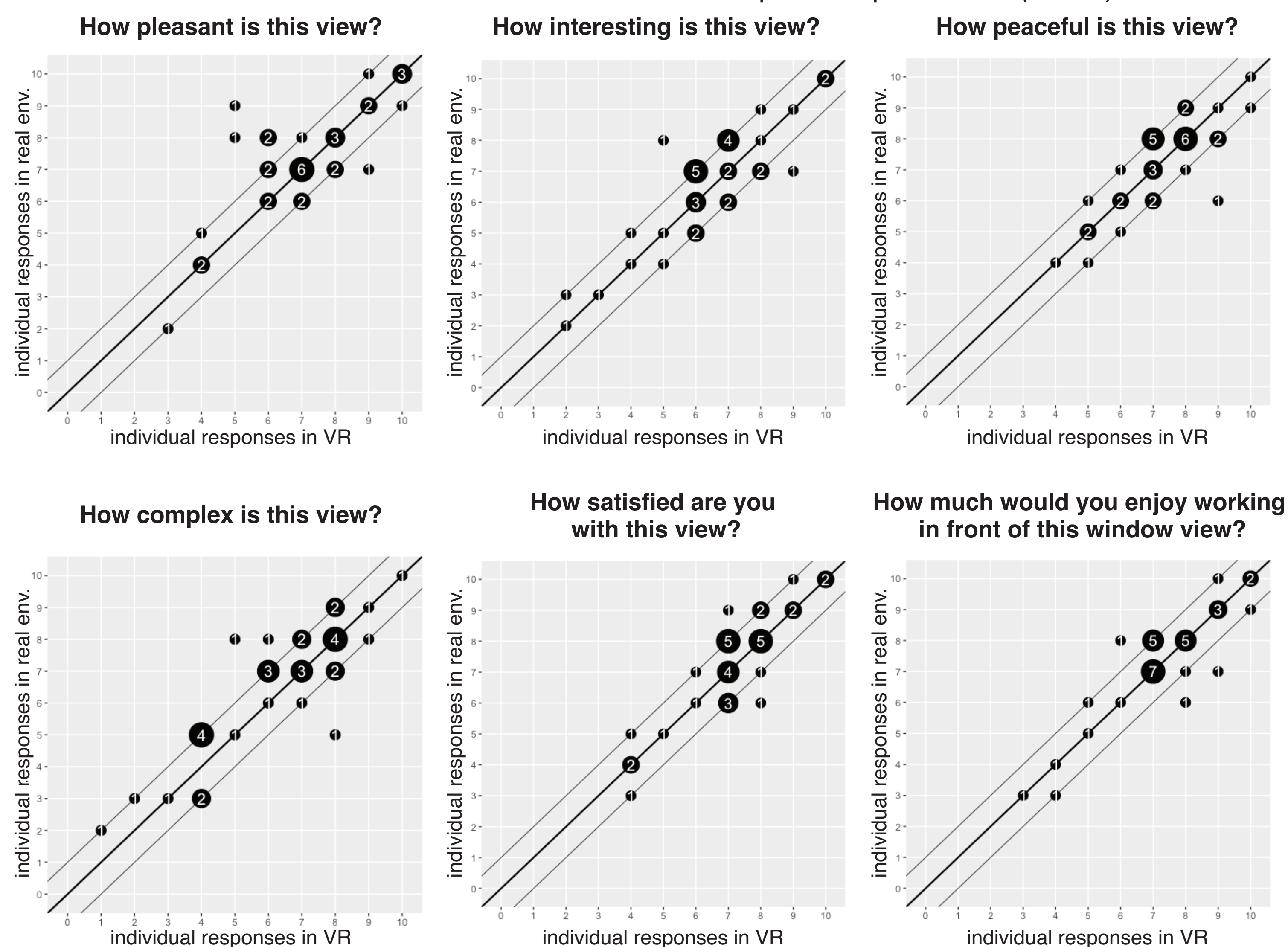
With a scale model

Without a scale model

RESULTS

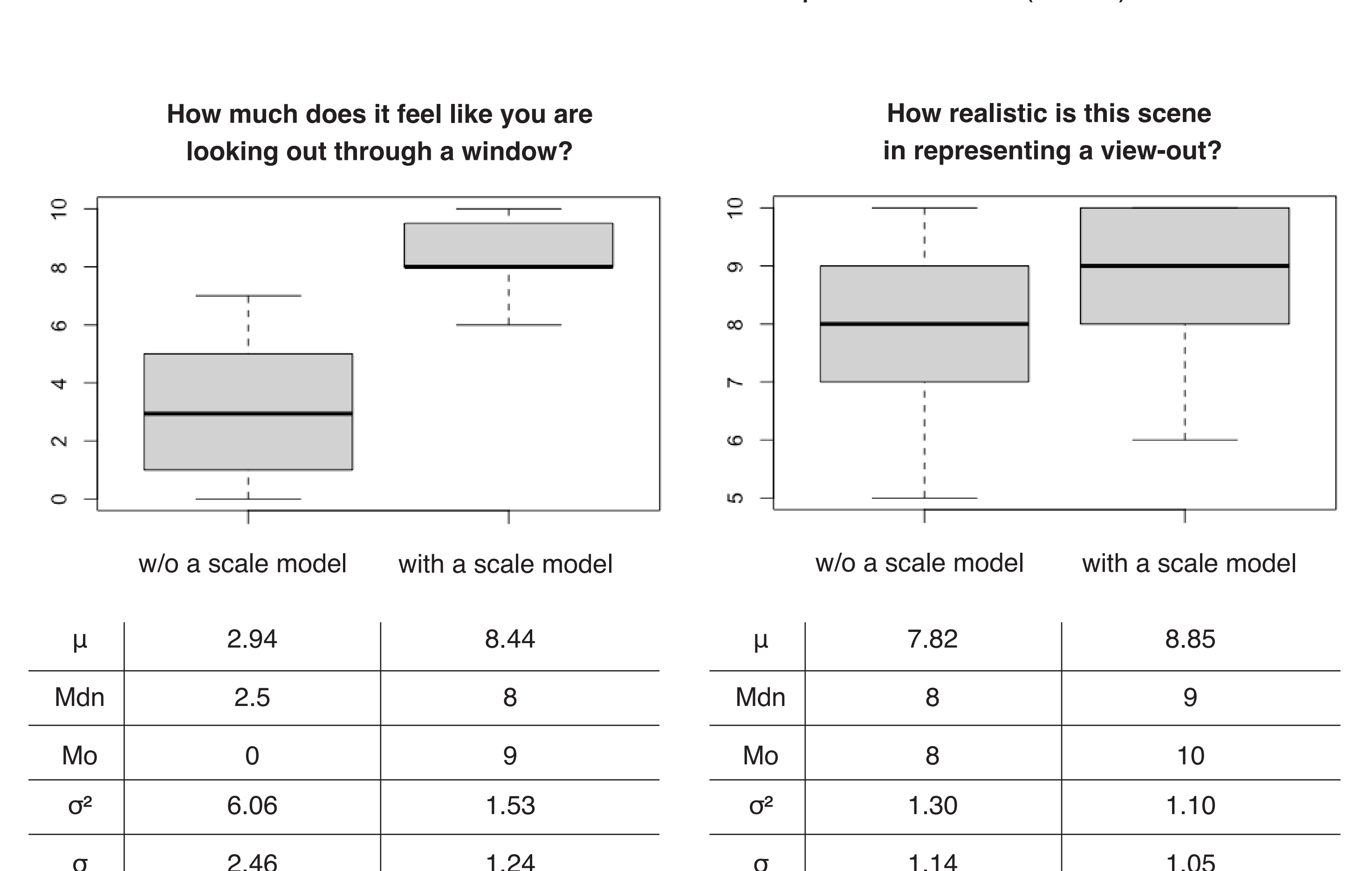
PERCEPTUAL ACCURACY OF VIRTUAL WINDOW VIEWS

Real Window View vs. Virtual Window View: Perceptual Impressions (N=34)



EFFECT OF USING A SCALE MODEL FOR COLLECTING VIEW SCENES

Virtual View With vs. Without a Scale Model: Perceptual Realism (N=34)



Yunni Cho | yunni.cho@epfl.ch

Yunni joined LIPID as a PhD candidate in the Doctoral Program of Civil and Environmental Engineering (EDCE) in September 2021. Yunni has previously pursued B.F.A in Interior Architecture at Rhode Island School of Design (RISD) and B.A in urban studies and cognitive neuroscience at Brown University. She also worked as a lighting designer and a consultant for an architectural firm in Germany and participated in design exhibitions in Italy, Morocco, Portugal, France, and the United States.

