Augmented Reality as a Tool for Large-Scale Environmental Learning

Shaina B. Martis¹, Aaron L. Gardony¹,², & Tad T. Brunyé¹,²

¹ Center for Applied Brain and Cognitive Sciences, Tufts University
² Cognitive Science & Applications Team, Natick Soldier RDEC

Introduction

• Augmented Reality (AR) refers to the addition of virtual assets into the real world¹.
• AR may enhance spatial cognition, including navigation, wayfinding, and spatial memory.
• Consider: Individuals’ spatial preferences and abilities vary
  - Some prefer overhead map-like spatial perspectives,
  - others, ground-level route perspectives².
• Interactive AR permitting manipulation of 3-D environmental models may promote environmental learning by matching learning experience to spatial preferences and abilities³.

Here, we used the MS HoloLens and virtual navigation to examine how interaction strategies and individual differences in an AR-based urban route learning task predict route memory and spatial memory.

Methods

Participants
• n = 65: 43 TU undergraduates (23 male); 22 male Soldiers

Materials/Design/Procedure
1. Surveys & cognitive tasks assessing individual differences⁴
2. Manipulated a 3-D city model to learn a prescribed route
3. Virtual navigation, following learned route from memory
4. Unexpected navigation back to the origin

Results

Interactions With Model Over Time

Early Pitchers (n = 26) … Followed the route better on both Route task and Return task

but did not differ in path efficiency on Return task

Results (cont.)

Model Pitching Behavior Mediates Relationship b/w Perspective Taking & Route Following

Discussion

• Our results suggest variability in how individuals interacted with the virtual city when learning a prescribed route.
• Pitching early emerged as an effective strategy, yielding improved route following in both navigation tasks.
• Overall, these findings suggest that preference-flexible learning media, such as AR, may improve spatial learning outcomes compared to existing approaches by permitting self-selection of learning experiences tailored to individual differences.
• Our current research aims to identify the advantages, limitations, and cognitively-informed design principles of AR-based user interfaces for spatial cognition.

References


Correspondence
Shaina B. Martis – Shaina.Martis@tufts.edu