

# Evaluation of an Off-Screen Visualization for Magic Lens and Dynamic Peephole Interfaces

# Static paper maps



[http://www.zombiezodiac.com/rob/ped/archives/tokyo/maps\\_of\\_neighborhoods.html](http://www.zombiezodiac.com/rob/ped/archives/tokyo/maps_of_neighborhoods.html)

zombiezodiac

# Magic lens vs. dynamic peephole



[Rohs et al. 2007]

# Visualizing the off-screen for digital maps



[Henze et al. 2010]

# Off-screen objects for magic lens and dynamic peephole

Informal tests of different visualizations

Decided for a simple arrow-based approach

Arrows' orientation show the direction

Arrows' length show the distance



# Implementaion

## Phone's position in relation to "physical" map

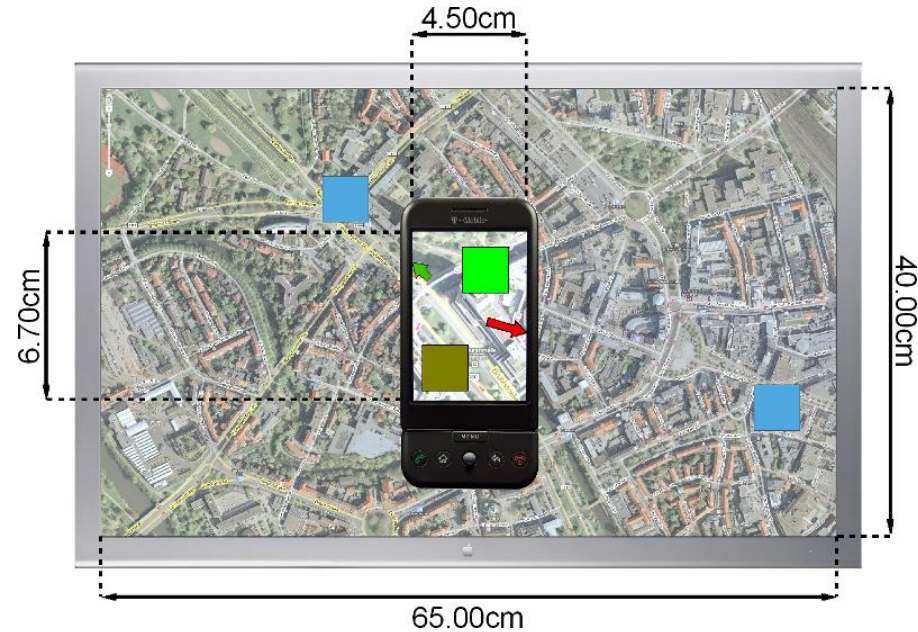
- Large screen as physical map
- Phone's camera image transmitted to server
- Localization with ~10 fps

## Visualization on physical map

- Plain map (dynamic peephole)
- Map and objects location (magic lens)

## Augmentation

- Embedded coloured rectangles
- Arrows pointing at off-screen objects



# User study

## Independent variables

- Off-screen arrows vs. no visualization
- Dynamic peephole vs. magic lens

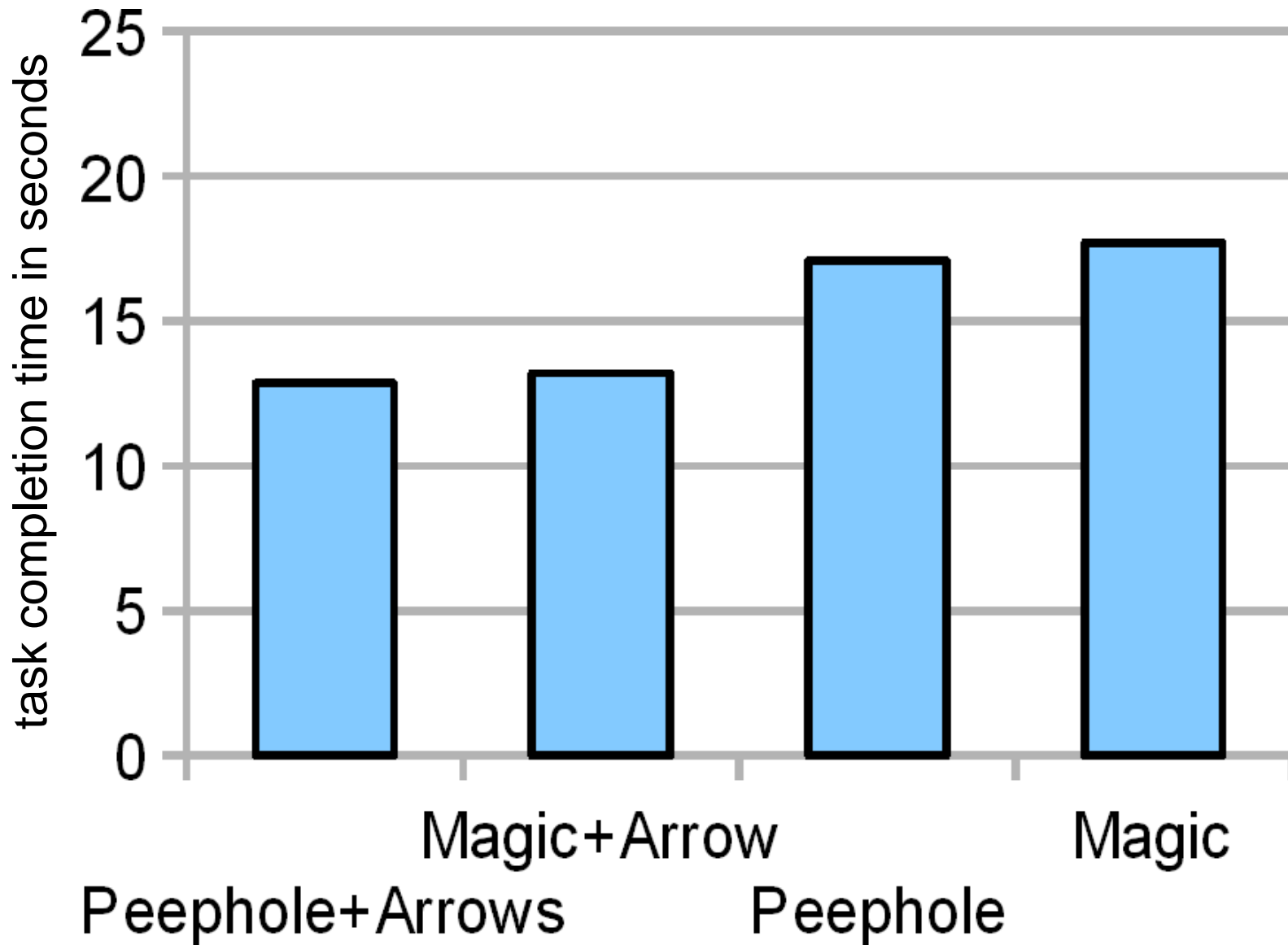
## Tasks

1. Find and select the “greenest” object among 2-12 objects
2. Select all objects from green to red for 2,4, and 6 objects

## Design & participants

- 12 Participants
- Four conditions
- Repeated measurement
- NASA TLX, completion time and error rate

# Task completion time for task 1





# More results

No significant effect on the error rate

## Off-screen visualization

- Reduces task completion time ( $p < 0.01$ )
- Reduces perceived task load ( $p < .01$  &  $p < 0.05$ )
- Significant effects on individual NASA TLX scores are consistent with overall results

## Dynamic peephole vs. magic lens

- No relevant differences found
- Small advantage for the magic lens

# Conclusion & future work

## Negligible difference between dynamic peephole and magic lens

- Compared to the improvement by an off-screen visualization
- At least for this concrete task

## Investigation of more complex tasks needed

- If visual context is important
- Beyond 2D surfaces

# Questions?