

Perspective Aware Projected User Interfaces

Lilian de Greef

Current Pack Stations

- Instructions off to side



Concept

- Project directly onto the table
- RGB-D camera
 - Detect errors
 - Correct projection



Future Pack Stations?

- Project directly onto the table
- RGB-D camera
 - Detect errors
 - Correct projection



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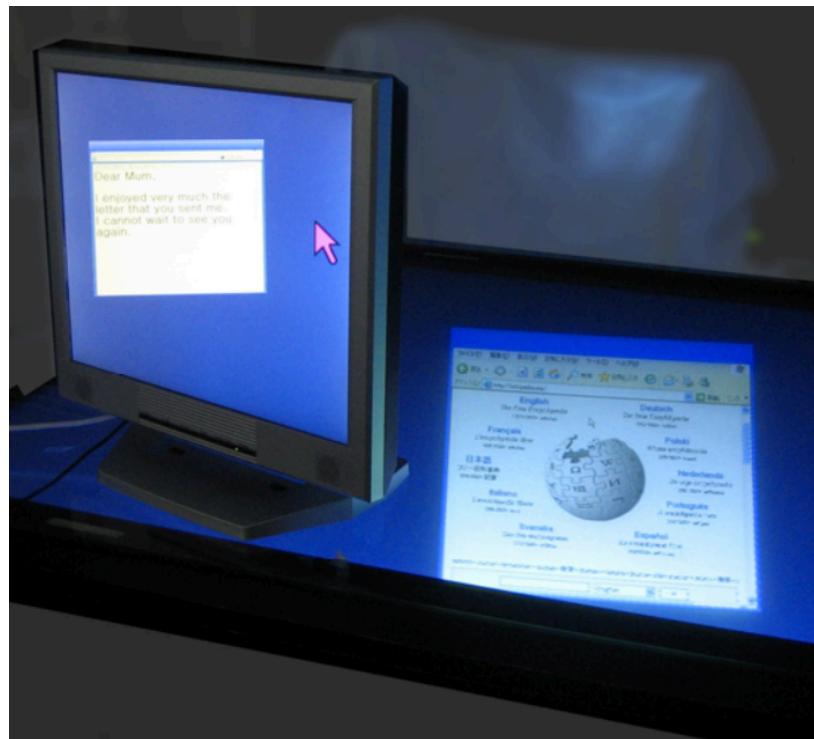
Future Pack Stations?

- Project directly onto the table
- RGB-D camera
 - Detect errors
 - Correct projection
- Track eyes / head?



Related Work

Perspective-corrected 2D displays improve readability [Nacenta *et al.*, UIST 2007]



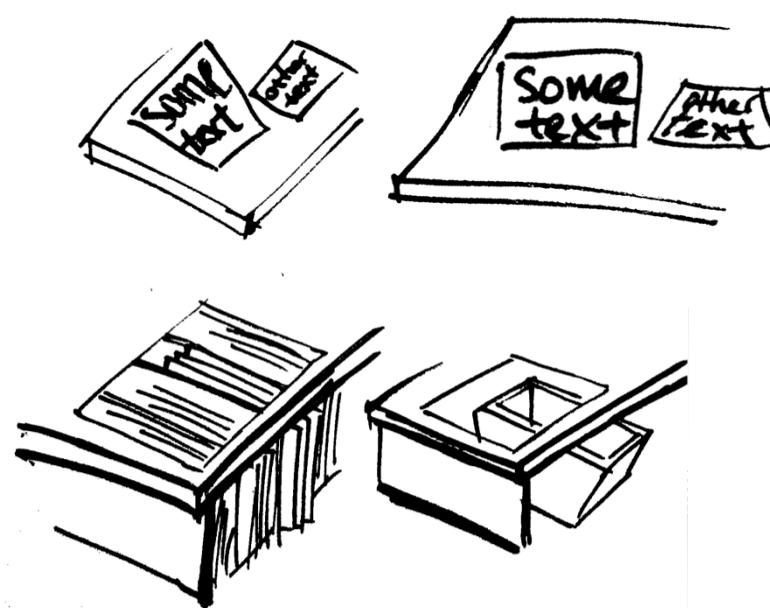
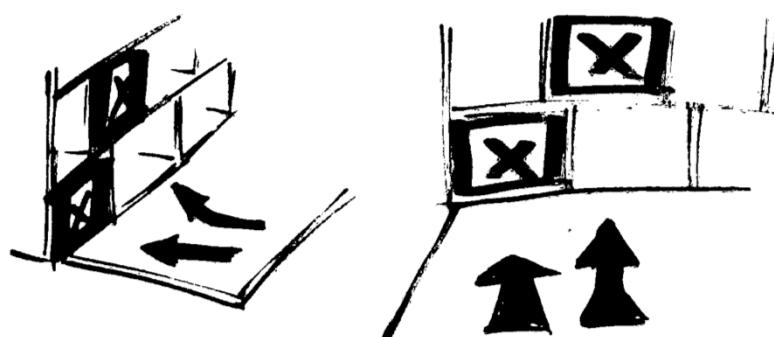
3D Illusions



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Perspective-Enabled UI Tools

- Arrows pointing in 3D space
- Displays based on viewing angles
- Perspective-corrected text
- “Popped up” buttons, etc.
- The “right” combinations



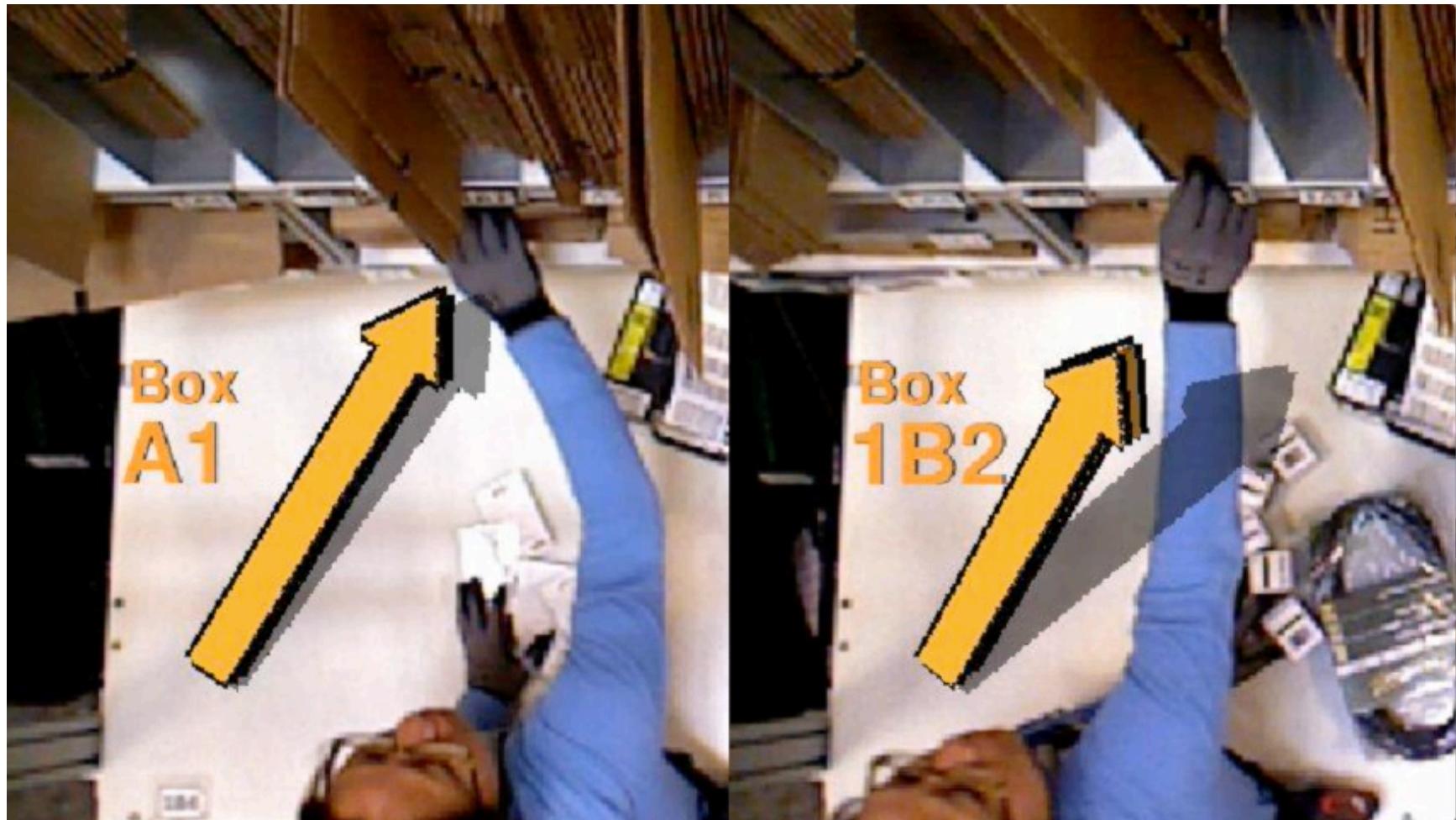
The Box Search



Vision: Arrows in 3D Space



Boxes at Different Heights



First Prototype

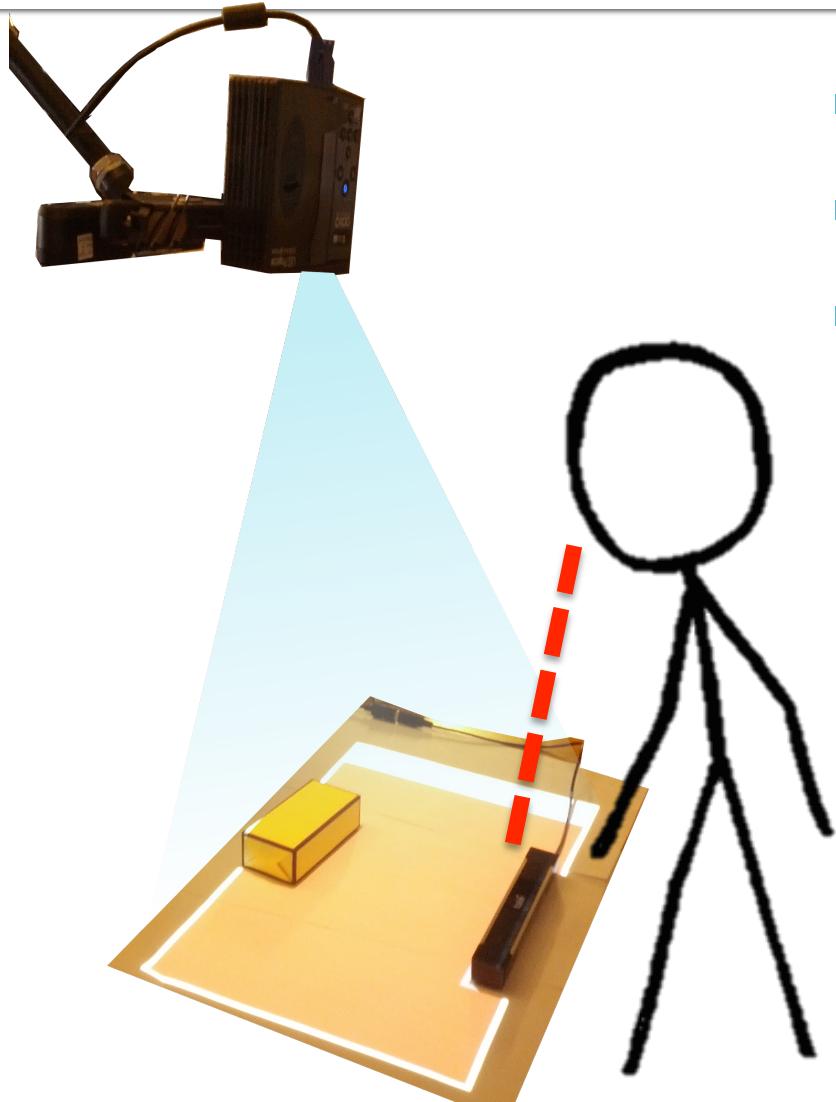


- Gaze & head tracking w/ Tobii



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First Prototype

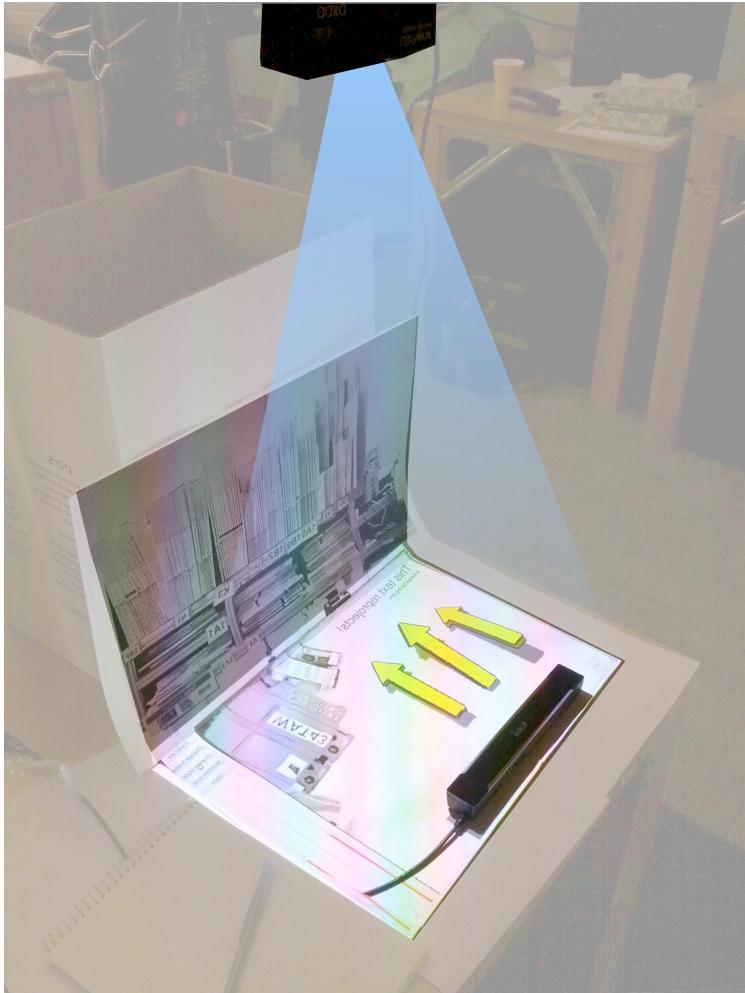


- Gaze & head tracking w/ Tobii
- Real-time POV on 3D model
- Perspective correction



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First Prototype

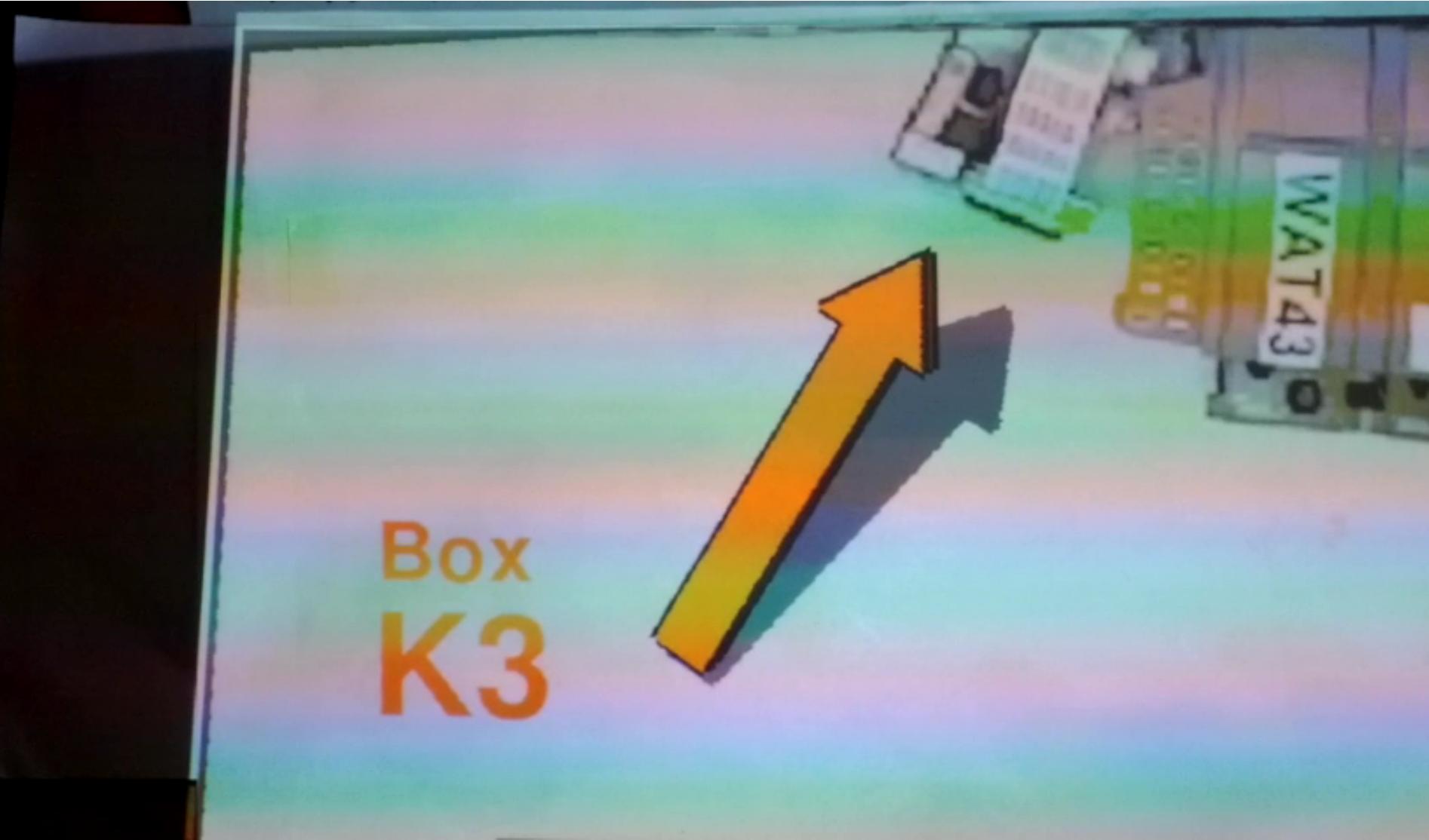


- Gaze & head tracking w/ Tobii
- Real-time POV on 3D model
- Perspective correction
- Simulated “pack station”



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Perspective Aware Arrows and Text



Perspective Aware Arrows and Text

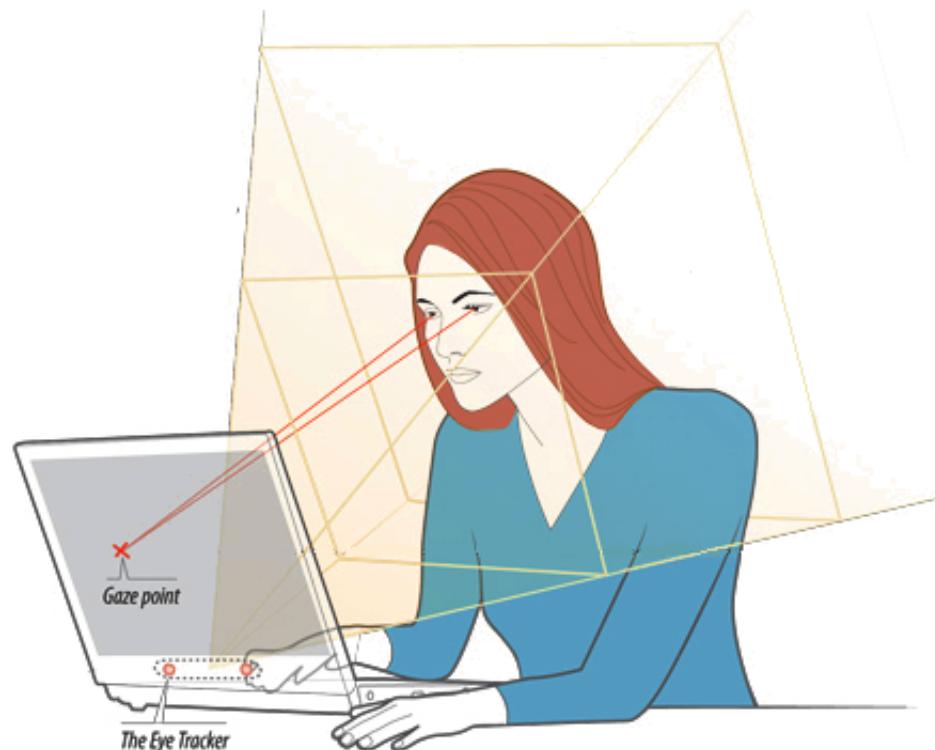


Challenges with Tobii

Works for traditional monitors,
but not pack stations

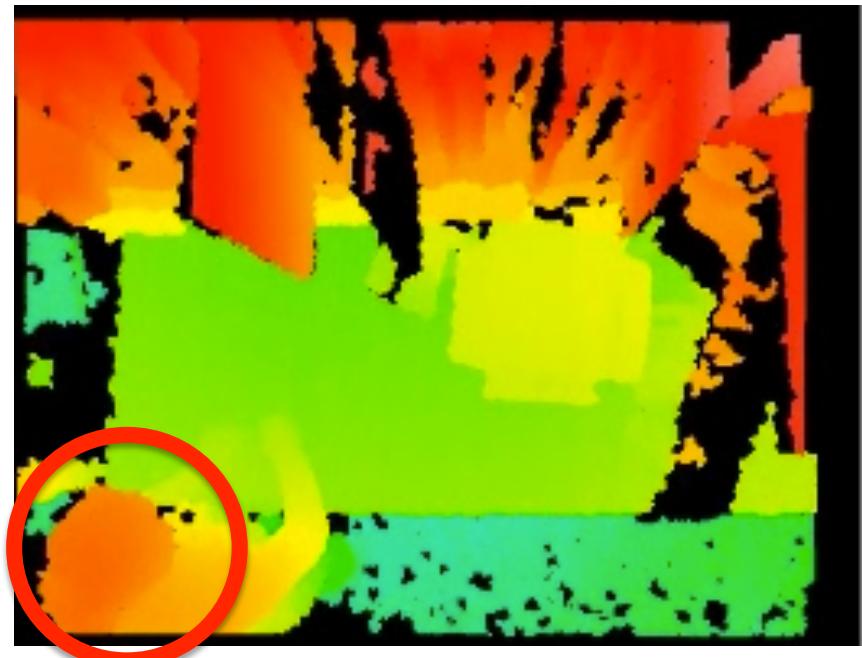
Eyes must be visible

- within view
- open
- not occluded

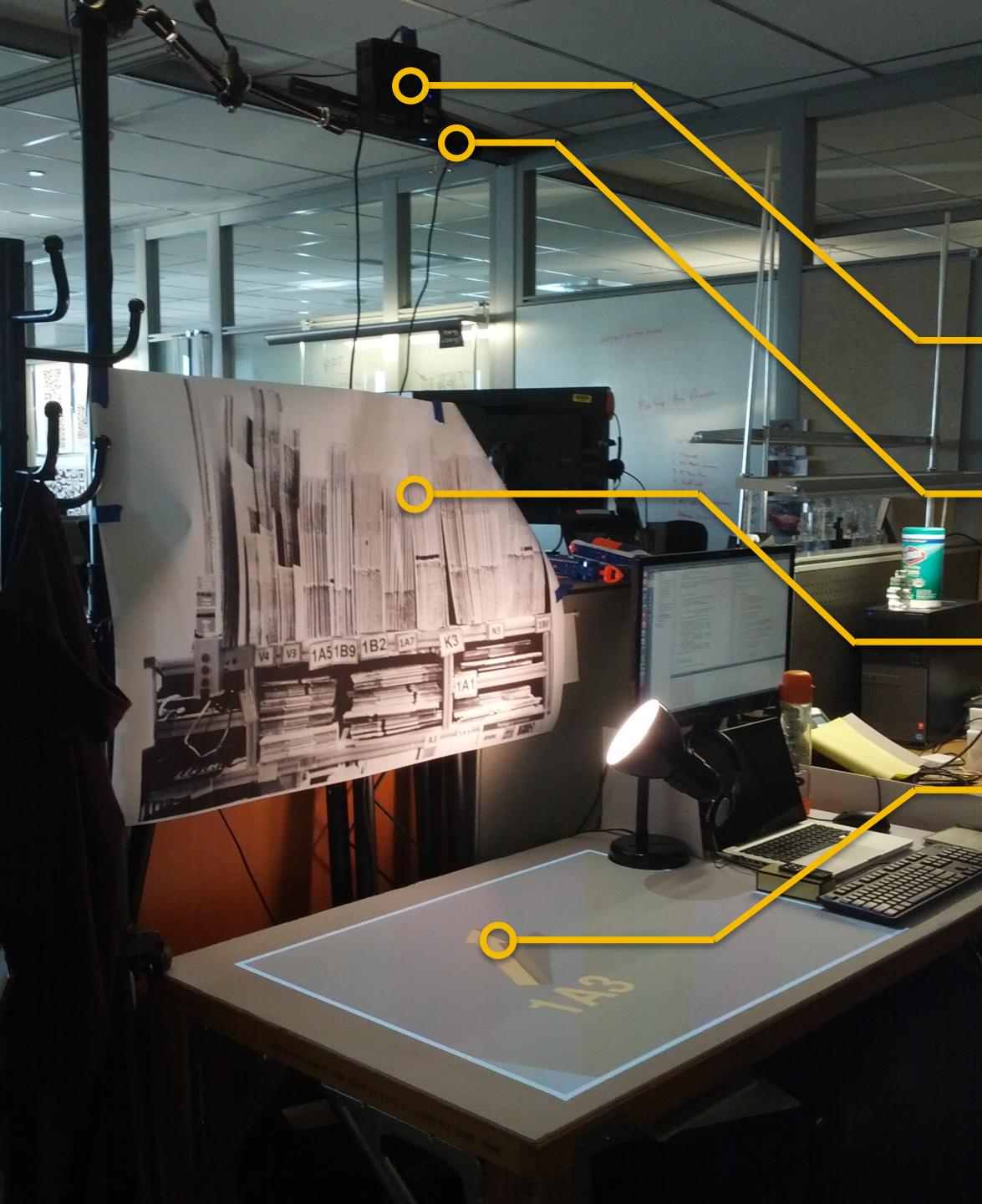


Second Prototype

Head-track with RGB-Depth camera



Setup



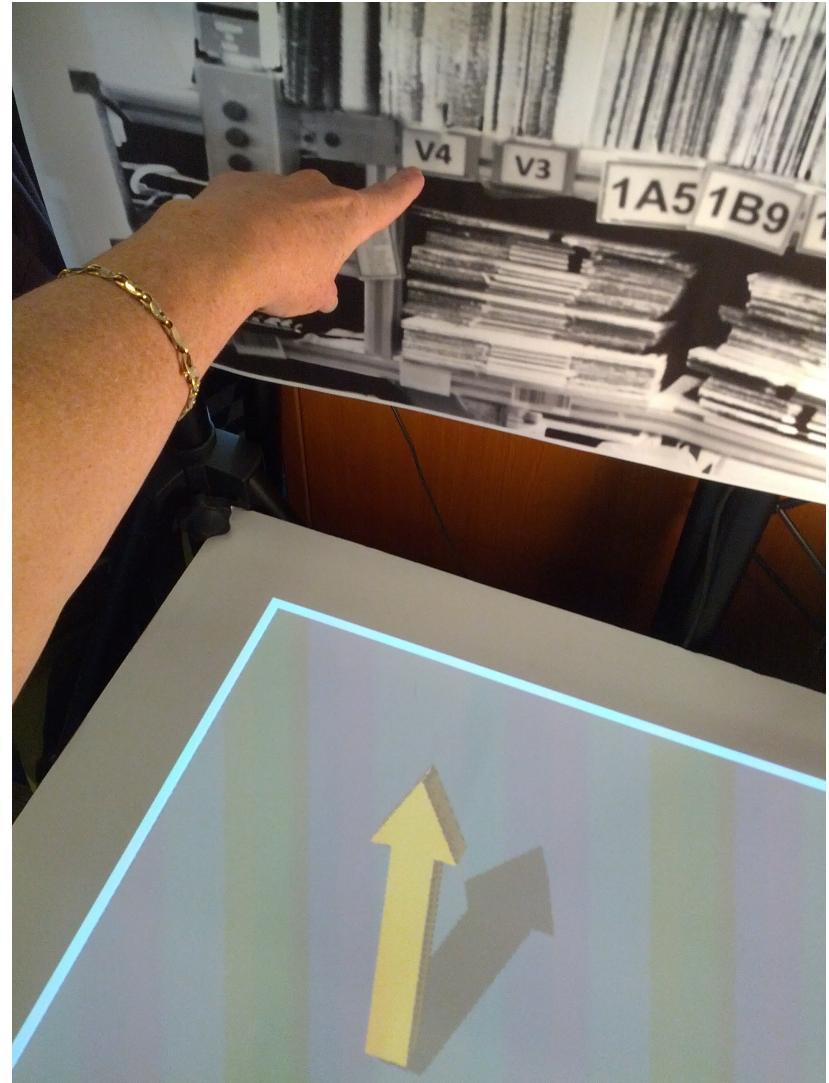
Projector

RGB-Depth Camera

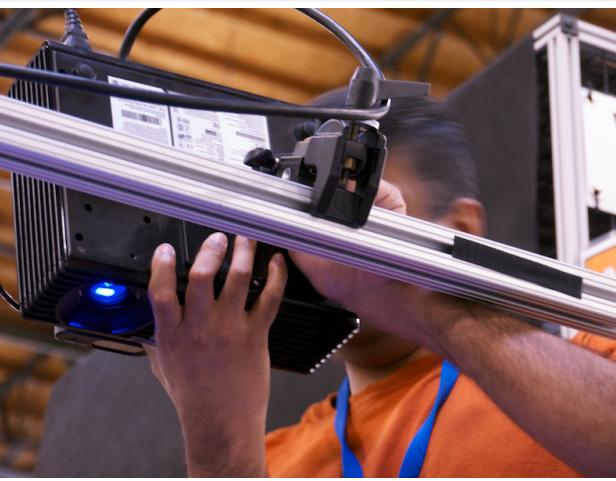
Pack station “shelves”

Work-surface

Casual Usage



Test on Real Pack Station



V4 V3 1A5 1B9 1B2

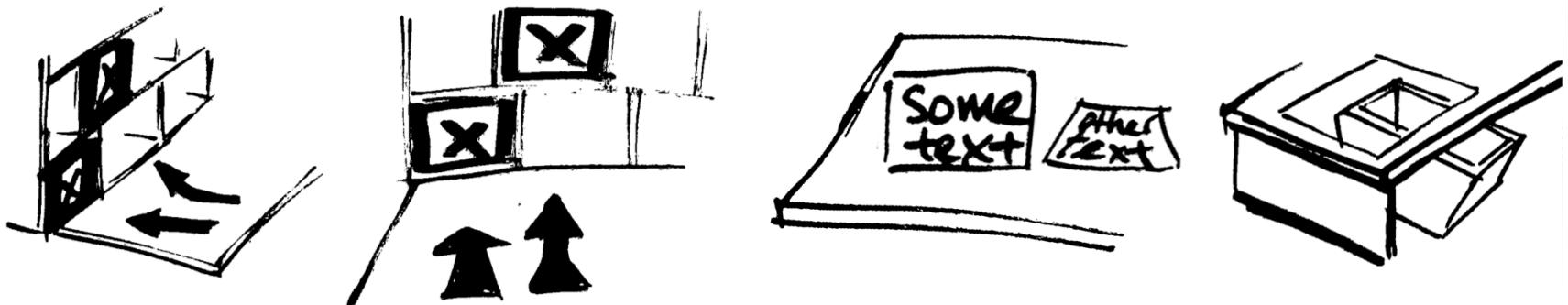
1AD

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K3

Future Work

- Evaluate Efficacy: rigorous user studies
 - Speed
 - Ease of use
- Develop & evaluate other perspective-aware UI



Contributions

- Built perspective-aware system
 - On a desktop simulation (proof-of-concept)
 - At a real fulfillment center
- Evaluation of Tobii EyeTracker for pack stations
- Concepts for
 - Perspective-aware UI elements other than arrows
 - Visual attributes (parallax, shadow, texture, *etc.*)

Questions?

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