

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



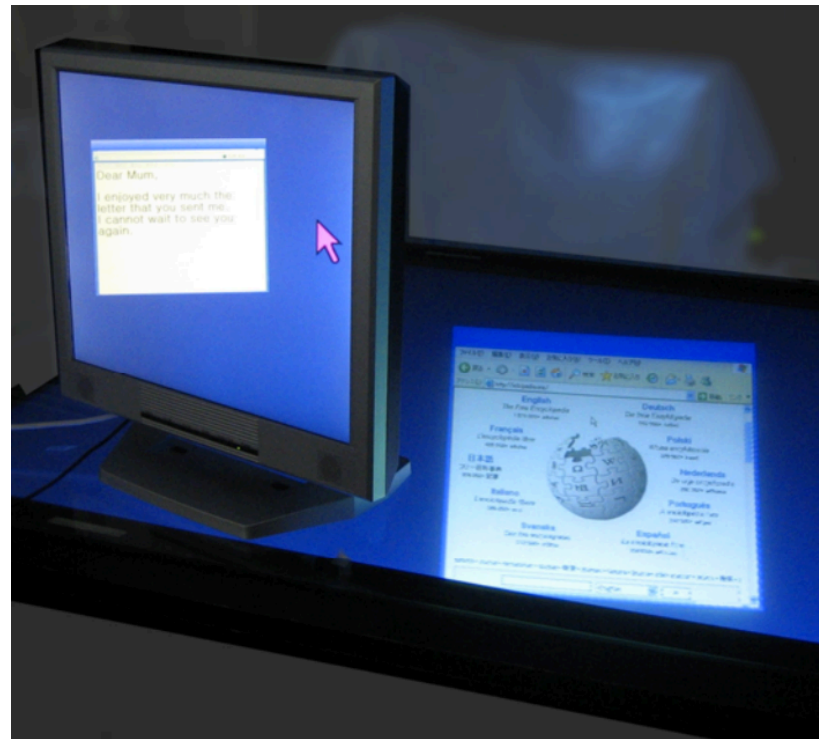
Future Pack Stations?

- 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]

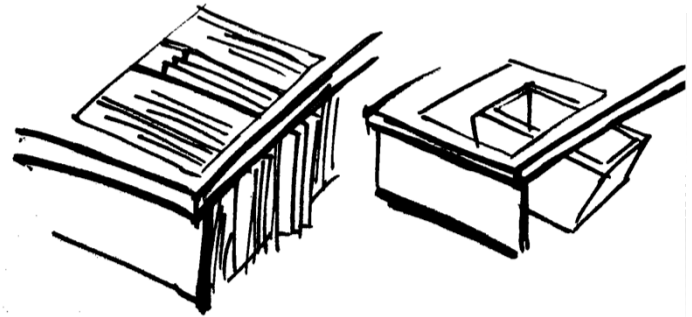
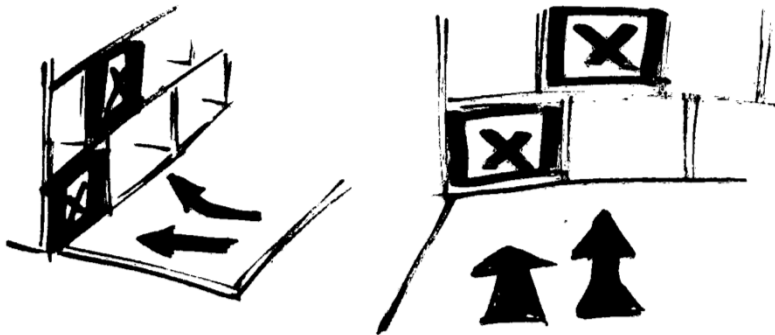
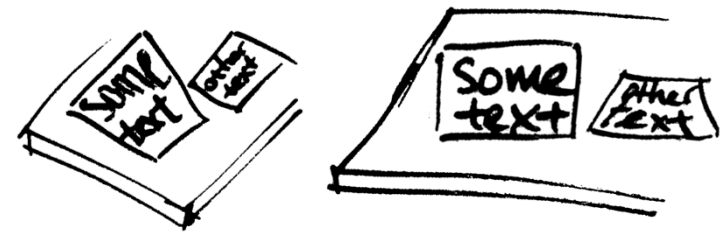


3D Illusions



Perspective-Enabled UI Tools

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



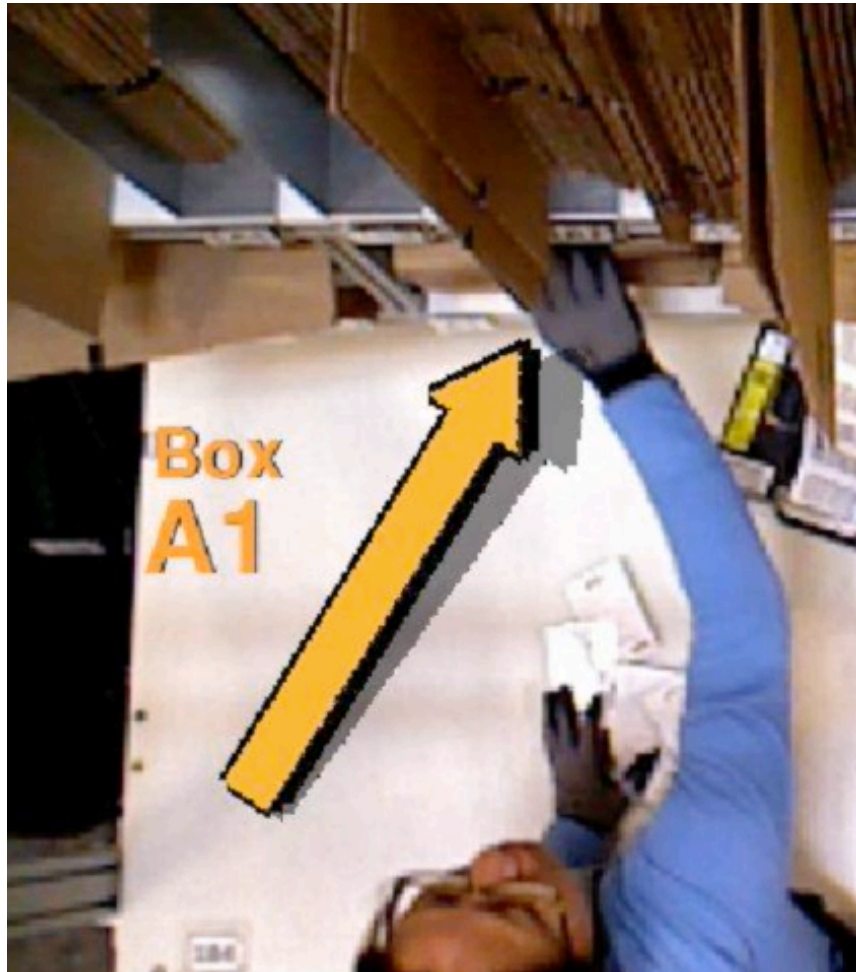
The Box Search



Vision: Arrows in 3D Space

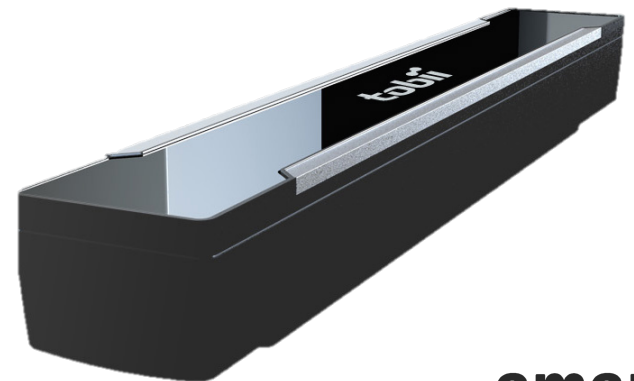


Boxes at Different Heights

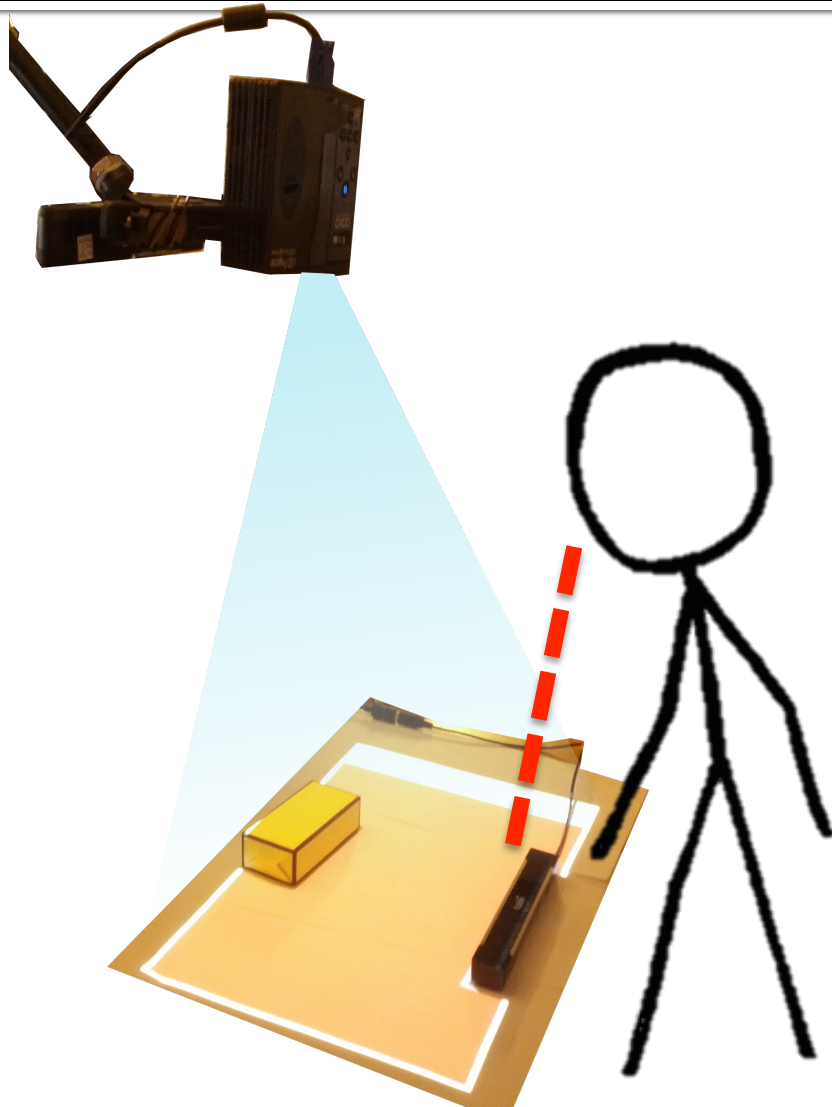


First Prototype

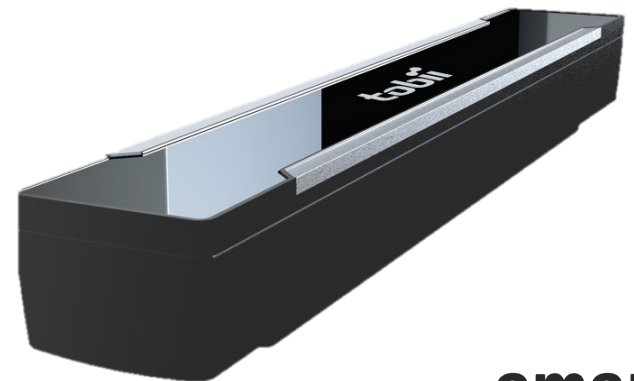
- Gaze & head tracking w/ Tobii



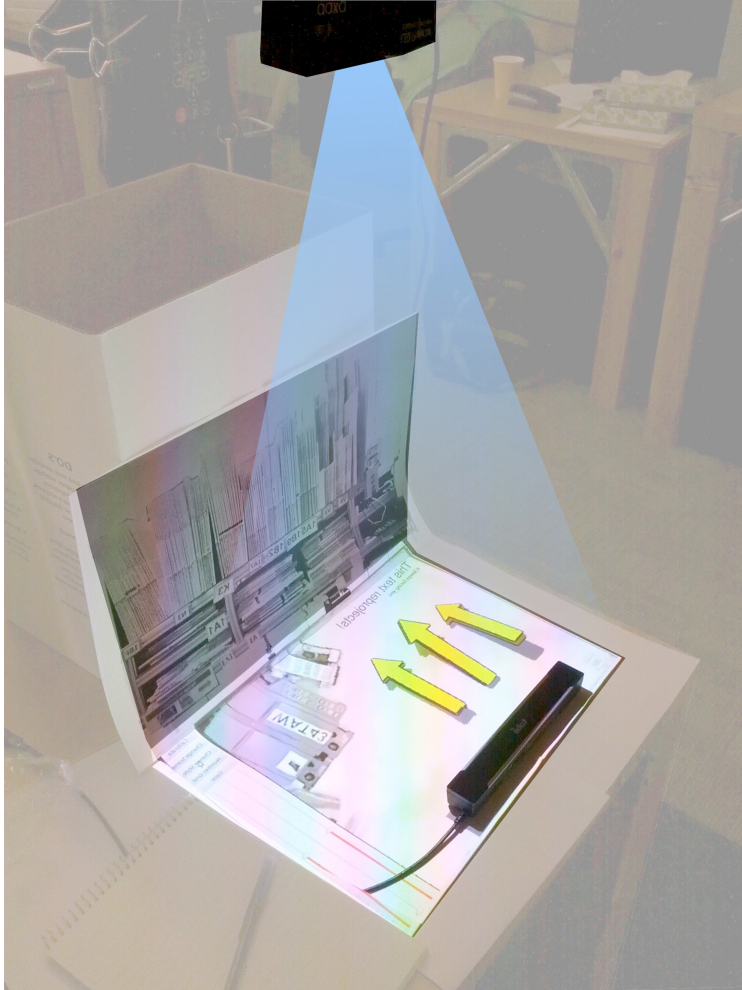
First Prototype



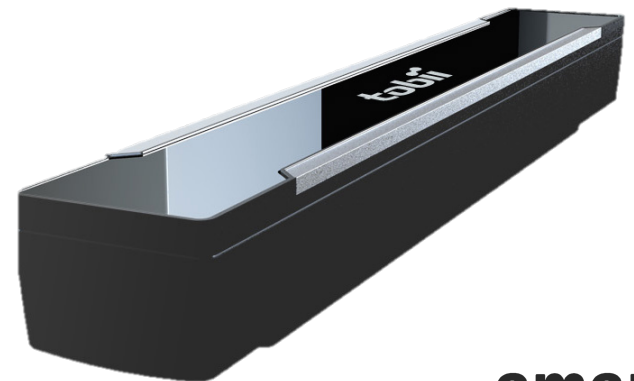
- Gaze & head tracking w/ Tobii
- Real-time POV on 3D model
- Perspective correction



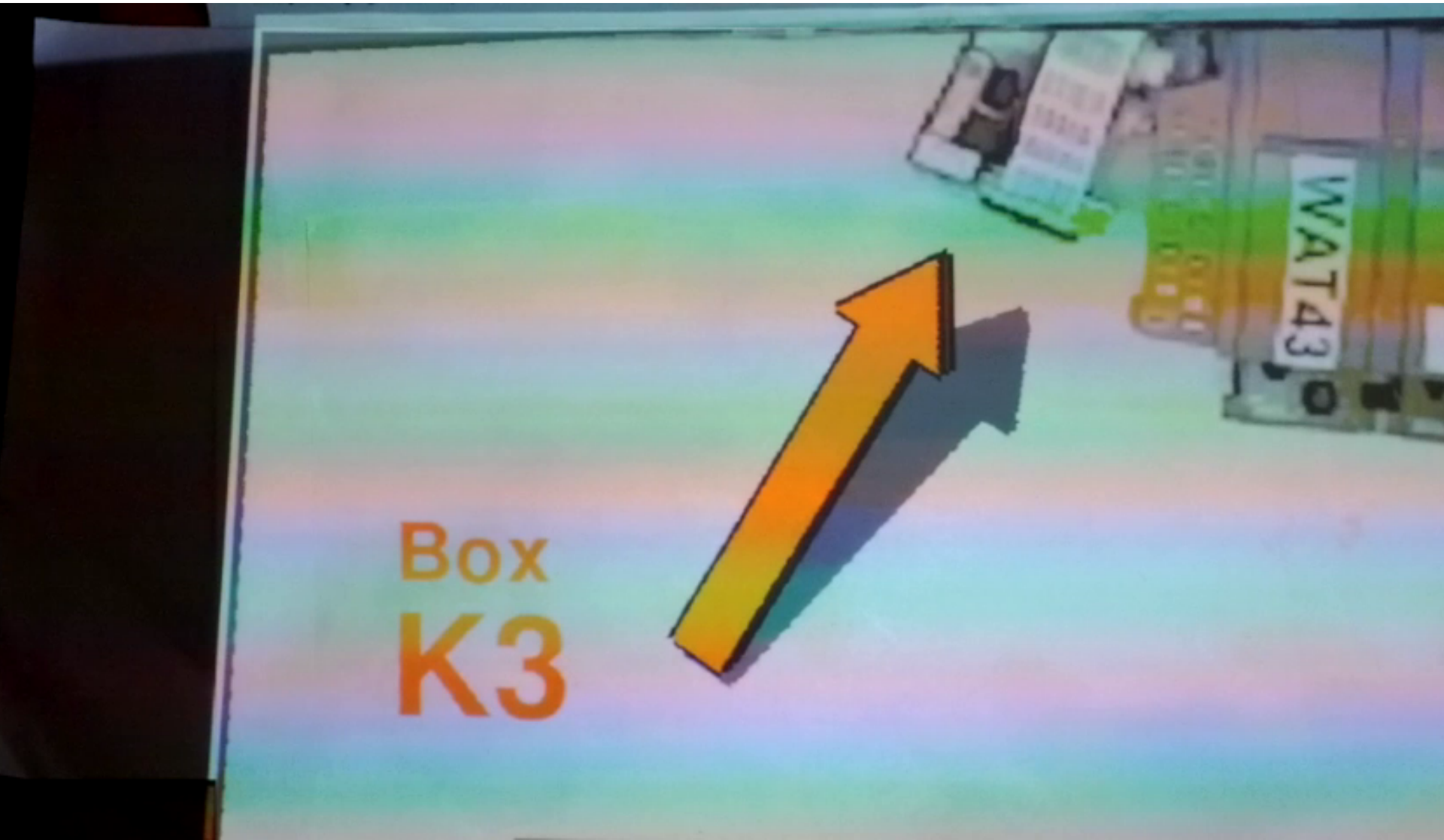
First Prototype



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



Perspective Aware Arrows and Text



Perspective Aware Arrows and Text

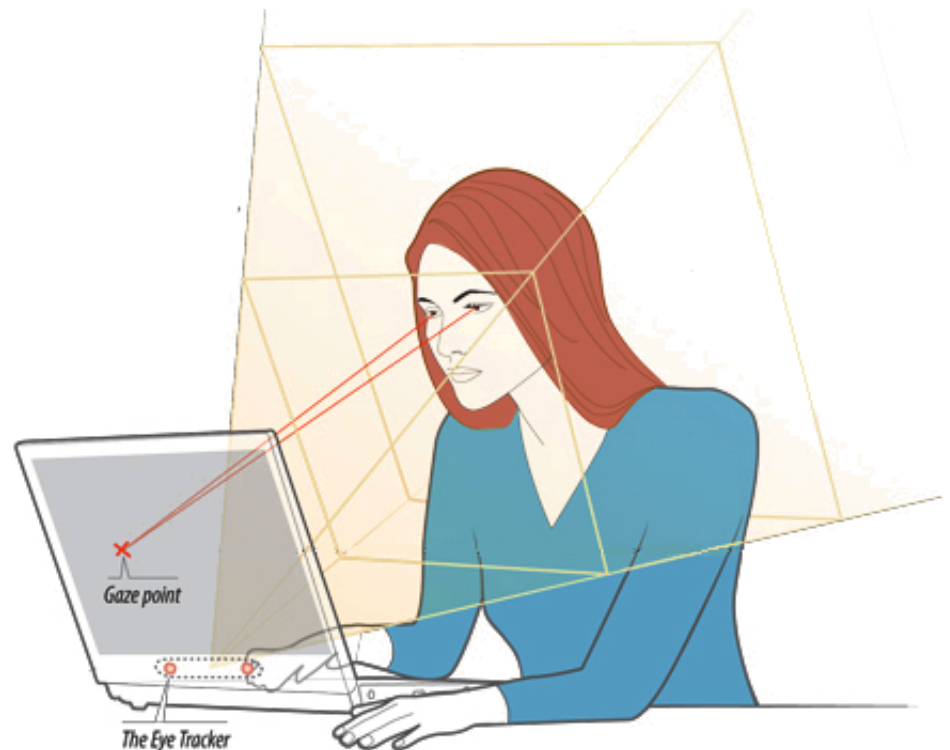


Challenges with Tobii

Works for traditional monitors,
but not pack stations

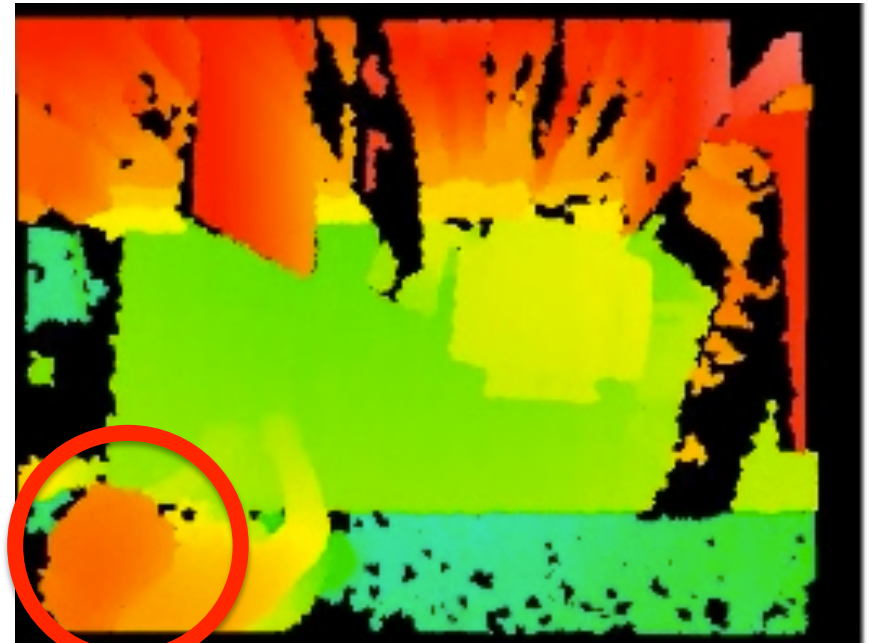
Eyes must be visible

- within view
- open
- not occluded



Second Prototype

Head-track with RGB-Depth camera



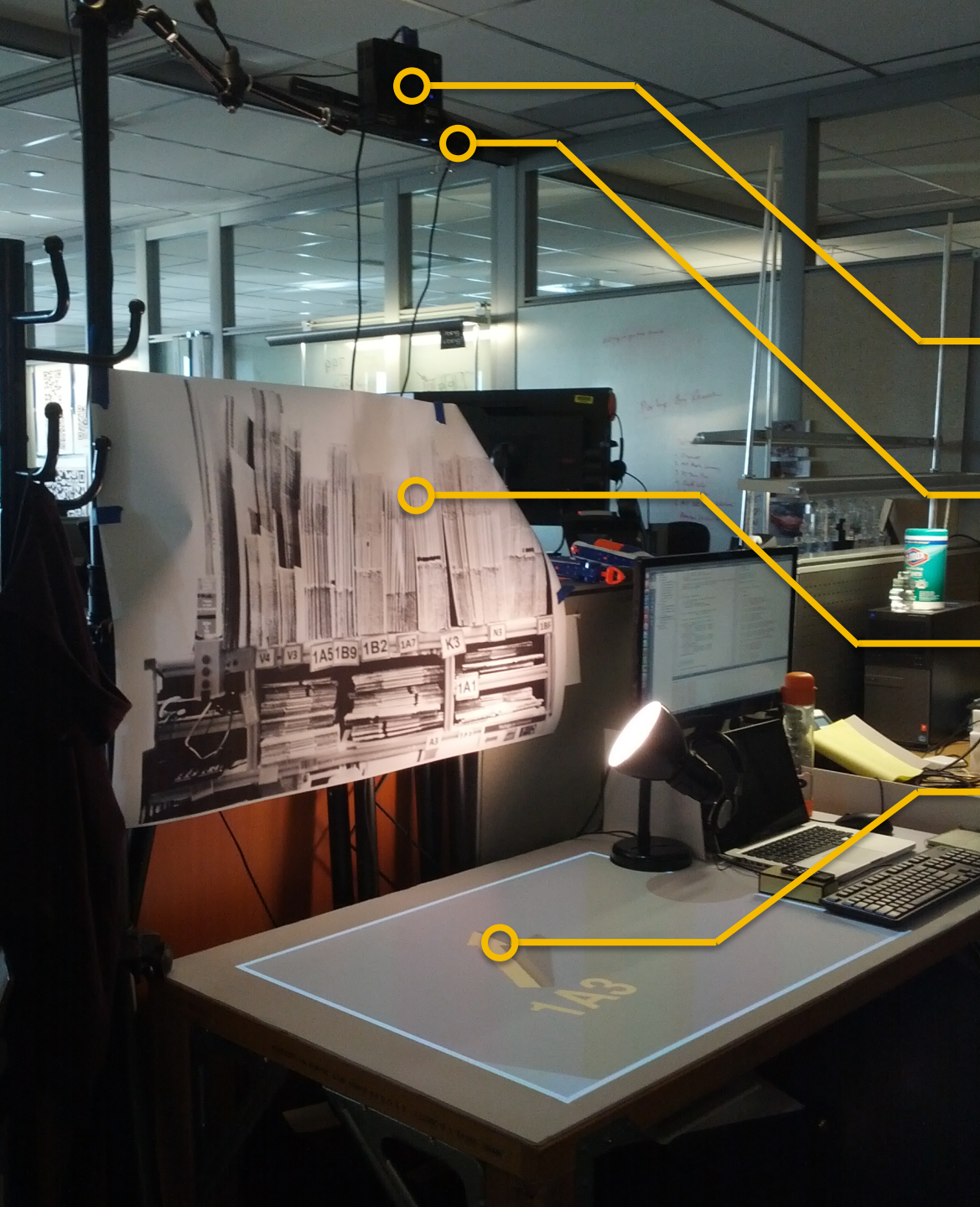
Setup

Projector

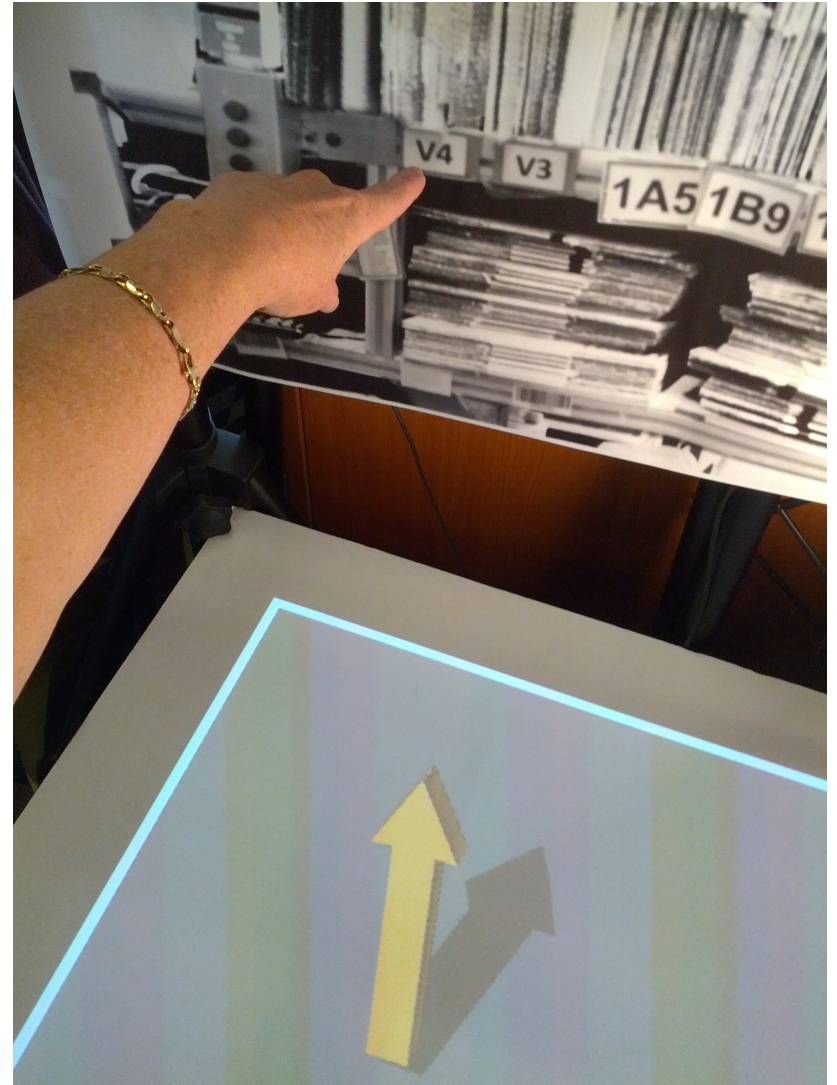
RGB-Depth Camera

Pack station "shelves"

Work-surface



Casual Usage



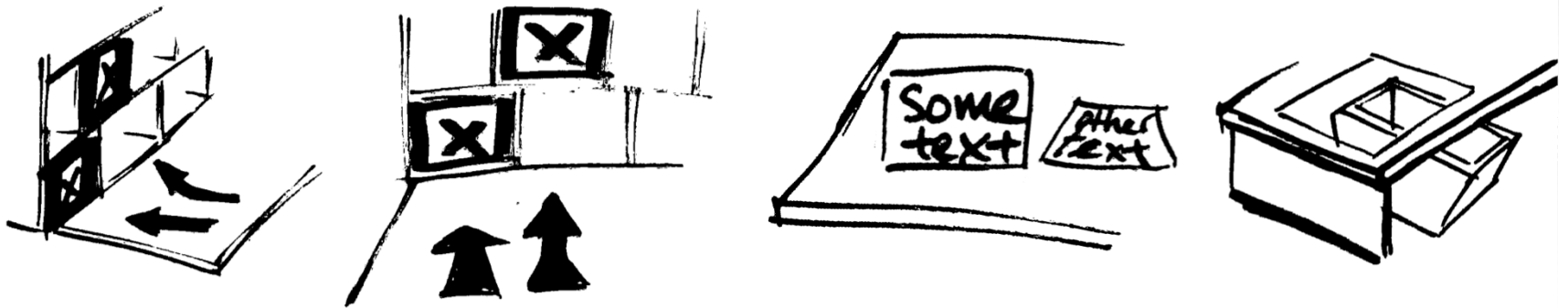
Test on Real Pack Station





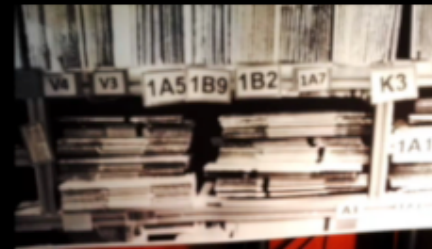
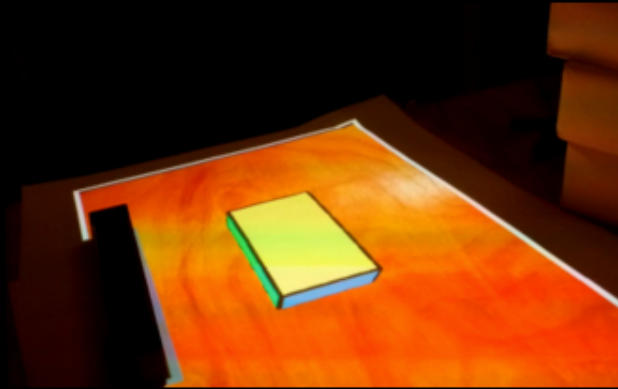
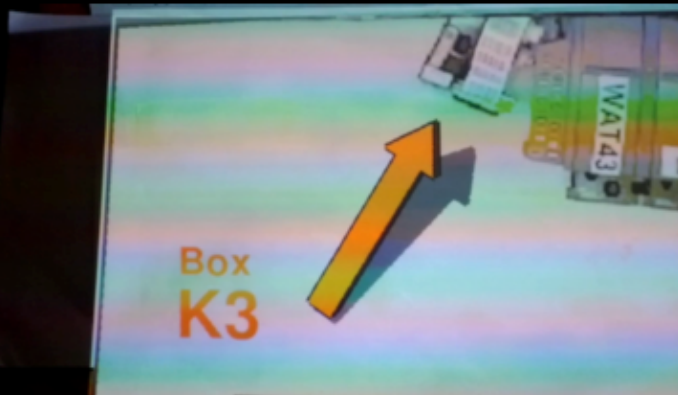
Future Work

- 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?

Lilian de Greef <ldegreef@uw.edu>

