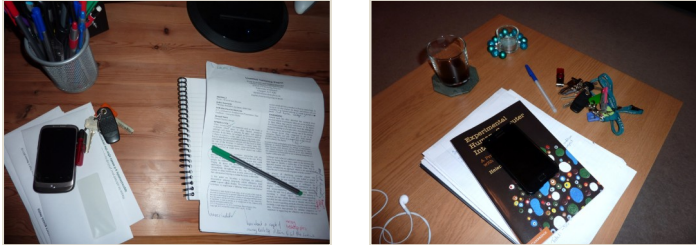


Messy Tabletops: Clearing Up the Occlusion Problem

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1. Tabletops in the home



When introducing interactive tabletops into the home, lack of space will often mean that they play two roles: interactive display and a place for putting things. Clutter on the table surface may hide things on the display, preventing the user from noticing or interacting with important information. Our work looks at how we can use the cameras inside tabletops to find a visible part of the display for content.

2. Design issues

These are some of the design questions which arose during the development and initial evaluation of our system.

Where should content be placed?

Where is the best place to display content? The largest free space? Closest to the user? Somewhere else?

Moving content—is it new or old?

When moving content from under items to free space, some users thought it was new information. We animated moving content along a path to show it was just changing position.

What about occlusion from hands?

Ignore hands and fingers—do not move content away from hands trying to touch it.

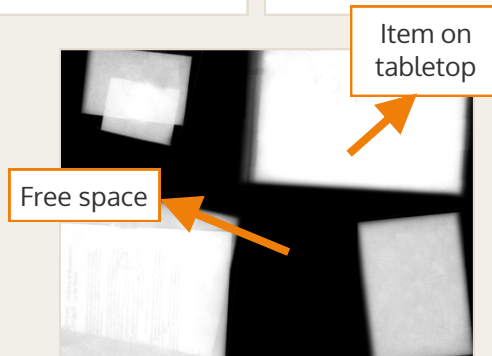
What if the table is *very* messy?

If table is completely covered then use other modalities to alert the user that content is occluded.

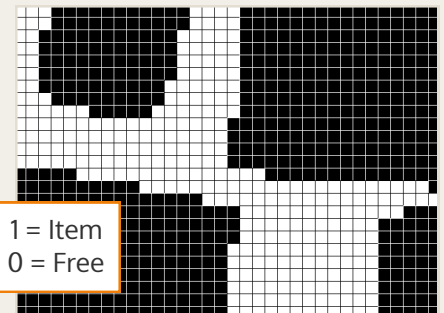
3. Our algorithm

An *access-supporting* occlusion management technique.

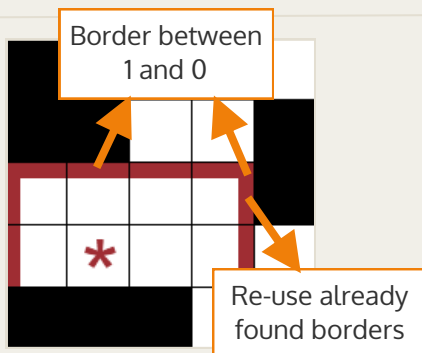
- + Efficient dynamic programming approach.
- + Scales well to larger displays.
- Limited to rectangular areas.
- Only considers 2D occlusion (but can be easily extended - add item shadows to matrix).



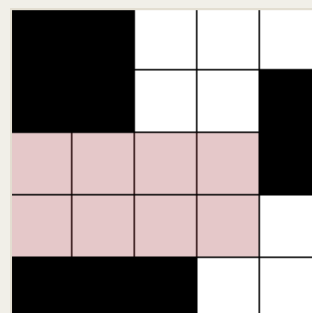
1) Use IR cameras in diffused illumination table to find the footprint of items on the surface.



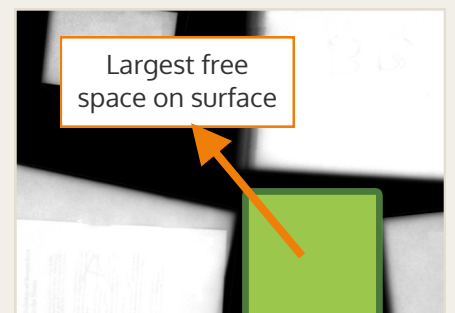
2) Build a matrix which shows item footprints and free space.



3) For each cell, see how far a border can be extended to the top, left and right.



4) This gives largest rectangular free space containing that cell.



5) Search these *maximal rectangles* for a suitable space to place content.



Algorithm source code and more information online.



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