CPSC 601.47 Fall 2009

Week 8 Papers

Notes on Paper #1 for week 8 of CPSC601.47 - Tabletop and Interactive Surfaces.

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Discussed Paper: Mark Hancock, Sheelagh Carpendale and Andy Cockburn. Shallow-Depth 3D Interaction: Design and Evaluation of One-, Two- and Three-Touch Techniques. In CHI '07: Proceedings of the SIGCHI conference on Human factors in computing systems. (New York, NY, USA), ACM Press, pp 1147-1156, 2007.

Three Main Points

- 3D shallow depth provides an interesting way of dealing with the virtual environment
- There are several potential gestures for approaching 3D rotation
- There may exist the need for further exploration on stickiness (and to a lesser degree, a need to explore the relevance of finger identification)

Detailed Discussion

Main Point as the Author Sees It

Nicole Sultanum:

Overall, the author's main point was the proposal of 3 ways to interact within a visualization environment and derive conclusions from a user study.

The proposed 3 ways to interact with the 3D objects (obtaining 6DOF) were:

- 1 touch: If object is picked in a central area, then a translation will be performed. Within another circular area surrounding the previously cited one, there will be 2D rotation. For the corners, 3D rotation is performed. This is comparable to RNT, as previously discussed. It appeared as though the object was being dragged around with weight and bounce, but resulted in imprecise control.

- 2 touch: While maintaining 1-contact translation and 2D rotation from above, 3D rotation is obtained through the second contact.
- 3 touch; One point of contact resulted in translation, 2 points for 2D rotation, and 3 points (with 2 stationary points defining an axis of rotation) for 3D rotation.

An experiment was conducted, in order to determine which technique was preferred. It consisted of 3 tasks involving the manipulation of objects: passing, docking and completing a puzzle. They reached several conclusions, which included:

- More points of contact made tasks faster. Tests performed with the 3-touch technique were consistently faster than 2-touch/1-touch.
- From the participant's perspective, one-touch was rated as difficult, with the preference given to 3-touch interaction. They concluded that the users liked having increased control.

Lastly, alternative techniques were briefly discussed for both one-touch and multi-touch interaction styles, but not explored. These are listed in the paper.

Main Point as the Reader Sees It

Darren Andreychuk:

From the reader's perspective this presented a starting point into shallow depth on the table top. While there was lots of background information on shallow depth and the presented design guidelines nice, it appeared too early to call these a concrete set.

Especially for those whose primary field was not computer graphics, there was a nice collection of terminology within 3D interaction, especially before going into the paper's specific techniques.

From the study, the techniques that used more touches were prefered, 1 touch was disliked and resulted in the worst performance. However, given these findings, they go on to discuss the exploration of 1 touch interaction. Given that the study found multi touch was preferred, it was not disclosed as to why they discuss revamping 1 touch?

Further, the paper, does not disclosed suggested usefulness. There exists a broad statement of these techniques being relevant for multi-user interaction, however no concrete examples are presented.

General Class Discussion:

According to Sheelagh, in 2007, for Mark Hancock to perform this experiment, he had to fake 3D input by modifying the diamond touch and revamping it in order to pick up on 3 touch. If multi-touch hadn't happened, there would have been more exploration into 1 touch as it was the only readily available technology. (Ready availability of multi touch occurred shortly after this paper was published). Once multitouch came into play, we obtained the flexibility to explore many touches.

The discussion evolved to point out that in Mark's current sandtray research, there is order of contact difference. However, overall, the added inputs allows for a form of modality. 2 touch doing one thing, 3 doing another, 4th, yet again something else. This is different than explicit gestures.

In regards to the ordering of contact points, there was a query as to whether order should be relevant for general development. Previously on the Diamond Touch, one had to explicitly identify which of the 5 fingers would cause the table to recognize a touch, and then provide identification for that specific contact.

After the discussion was wrapped up, Sheelagh presented a video on the paper, exploring the shallow depth 3D techniques. The aim was to emulate real interactions on digital tables.

How Does this Impact Our Research

Lawrence Fyfe:

Several points were found that could impact further research:

- The idea of having shallow-depth 3D interaction helps to focus research by simplifying interactions. It results in a finite z, and makes development interaction more managable and flexible.
- Providing independent translation and rotation might be good for certain types of interactions. The paper acknowledges that providing both simultaneously can cause challenges in establishing precise control on the object.
- Connecting manipulation/preventing cognitive disconnect seem like good guidelines for developing interactions since the mappings between input and action are obvious. For example, the 2 point rotation provided the ability to still control the object while not being in physical contact with it. This cognitive disconnect, and instead motion connected manipulation may deserve more exploration.
- Three touch input offers 6DOF, which leads to a greater range of possible gestures.
- Mappings between 2D surface contact and 3D manipulation may make gesture development easier

- The study data about where touches on 3D objects occur based on the number of touches is interesting and can be used to create interaction zones on 3D objects

General Class Discussion:

A question was posed by Sheelagh: There is the concept of a finger being sticky. In such a case, the finger stays in contact with the object where it first touched. How does this relate to the discussion from our new found understanding of 3D interaction on the table?

- From this, we can know where the object is going. Such motions are reliable
- With sticky tools, it can lead to how the software is performing their 3d rotation with their 3d touches
- What about rotating about the axis defined by finger axis, rather than center of object?
- With sticky fingers, how does one determine rotation about center? Perhaps its not a big deal, if we assume the center as being the object's center of gravity, or geometric center.
- Notice, though, that in many 3D modelling applications rotations are often based on the center of the object.
- Recognize that when holding objects in the real world, we rotate the object about our wrist angle. However this can be awkward in the virtual world, and may not seem intuitive - some things still seek awkward.
- What are other points of center for rotation? If a designer wants to rotate around another angle, point of center, then what to do? eg. a fan that rotates about one end?
- What about moving the center of rotation within an object?
- How does this relate back to the sticky concept?
- We have avoided intuition behind the idea of rotating objects: if touching with one finger, we obtain very wobbly control. As you add more fingers, than you stablize. No one has picked up on this concept well

Notice that while not explictly stated, this system relies on the id of the touch. In a collaborative setting, without having an id, it is challenging to determine who's third finger is whose (especially with rotating or stabalizing of the object).

There was further disappointment at the lack of discussion in the paper on scaling.

From more recent research, scaling is mapped to the distance between the touches. Why not, and how, can one allow for more touches for this process? How to allow for many fingers

to perform these rotations/translations/scaling? There are lots of opportunities that allow for interactions yet none of these 3 papers are definitive. It is likely that the community is undecided about how this is going to work.

CRITICAL THINKING (CRTH 601) SYLLABUS UMASS, Boston -Fall 2009 BOB SCHOENBERG, INSTRUCTOR Bobsch3@gmail.com. This is a 3 credit graduate course offered online via the University of Massachusetts at Boston, accredited by the New England Council of Schools and Colleges. OBJECTIVES: To develop further the critical thinking skills and dispositions of the course participants. Information Visualization CPSC 533C, Fall 2009. Tamara Munzner. UBC Computer Science. Wed, 28 October 2009. 1 / 49. Readings Covered.Â Jerey Heer, Nicholas Kong, and Maneesh Agrawala. ACM CHI 2009, pages 1303 - 1312. Turning Pictures into Numbers: Extracting and Generating Information from Complex Visualizations. J. Gregory Trafton, Susan S. Kirschenbaum, Ted L. Tsui, Robert T. Miyamoto, James A. Ballas, and Paula D. Raymond. The US Consumer Product Safety Commis-sion (CPSC) should increase efforts to ensure that toys that are sold in retail store bins, vending machines, or on the Internet have appropriate choking-hazard warnings; work with manufacturers to improve the effec-tiveness of recalls of products that pose a choking risk to children; and increase efforts to prevent the resale of these recalled products. via online auction sites. Current gaps in choking-prevention standards for childrenâ€™s toys should be reevaluated and addressed, as appropriate, via revisions to the standards established under the Child Sa...