

Tabletops Beyond the Wow Factor: Understanding User Engagement and Experiences

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ABSTRACT

In this study we are using the Mitsubishi DiamondTouch table to evaluate user engagement with multiple gestures across different contexts of use. We have designed several touch gestures to be used in multiple applications in a collaborative setting, with both exploratory and task-based activities. We have built an exploratory activity for the purposes of our preliminary research and to introduce users to the range of gestures. We report the results of a month of preliminary research with informal and impromptu groups of 1-4 participants interacting with the free play application.

Author Keywords

Tabletops, user engagement, experience, affect, engagement triggers

ACM Classification Keywords

H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION

A major challenge to the evaluation of new tabletop interactions is the bias created by the wow factor, in which users are thrilled to play with the device for the first part of a session and then start to lose interest. An improved understanding of ways to make tabletop interaction more engaging in a sustained way is needed. In our research, we identify a range of gestures common to tabletop interaction. Using a mixed method approach, we evaluate how engaging these types of gestures are in different interaction contexts [1, 6]. This work contributes to an understanding of how to design engaging tabletop user experiences.

We define user engagement as a multi-dimensional concept that includes both behavior and affect. Behavior is what the user does including observable phenomena such as attentiveness, frequency of use, and group dynamics. Affect is what the user feels, including subjective phenomena such as expression, interpretation, and sense-making.

We are working with the Mitsubishi Diamond Touch Table [2], which can handle certain types of multi-finger gestures as well as distinguish between four different users at once. We have based our research on collaborative work, to which the Diamond Touch Table is well-suited.

Our research plan consists of three phases: the design of the gestures and the applications, running of the formal engagement evaluation sessions using a mixed methods approach, and synthesis of the data. In the following we will discuss our design, preliminary research findings, and our future work.

DESIGN

Using bodystorming, participatory design, paper prototyping, and exemplar research [3, 4] we designed forty different gestures for the Diamond Touch Table. We are currently working with twelve gestures spanning a broad range of gestural types, from direct to indirect touch manipulation.

With these gestures as a starting point, we designed and developed a free-play activity for the purposes of our preliminary research and to introduce users to the gesture palette. In this activity users can individually choose any of the twelve gestures and interact with several colored balls on the table

PRELIMINARY RESEARCH

We have conducted a month of preliminary research with informal and impromptu groups of 1-4 user interacting with the free play application. In these studies we were looking for preliminary insights about engagement as well as feedback for how to construct our future evaluation session. For these studies we used various methods of observation, including video recording, note taking, and the speak-aloud protocol. Our initial insights can be divided into the categories of personal space, physical orientation, and engagement triggers.

Personal Space and Physical Orientation

The table that we are working with requires that users maintain contact with a conductive pad beneath their seat. Since users can't easily move around the table and still be able to interact with it, they tend to focus on a perceived personal space in the surface area directly in front of them. We must be conscious of how this might affect engagement with both the table and the group, and look for ways to address this with the capabilities of the table.

We have observed users interacting with the table in both sitting and standing positions, each with its own engagement concerns. The DiamondTouch table uses an overhead projector to display the visuals on the surface.

This can lead to occlusion when the visuals are projected on the user's hand, and sometimes people who preferred to stand instead chose to sit. Occlusion may or may not cause problems depending on the activity being carried out and the size and shape of the object being interacted with.

Each position has a different effect on users' engagement with the group and with the table. Standing participants seemed to talk to each other more, as well as make eye contact when speaking to another. This may be related to the focusing on the "perceived personal space" discussed earlier. Standing participants also were able to easily move around, away from the table or to stand next to someone else to see their point of view. This sometimes led to amusement in the group as someone attempted to maintain contact with the conductive pad with their foot as they moved about the table.

Additionally, standing and sitting have an effect on how finger movement is interpreted by the table. Depending on how the user naturally applies pressure and angles their fingertips on the surface, some gestures were more usable than others. Taking this into consideration, we will need to look at both how we are using the software to interpret touch, as well as how we might design applications for both sitting and standing users.

Engagement Triggers

We observed several engagement triggers when using the various gestures. These include the discovery of unintended or novel uses of a gesture, prompting to try new gestures by more experienced users, and the idea generation that takes place when mapping the new interactions with familiar or anticipated interactions.

Discovery of unintended or novel uses of a gesture occurred when user would attempt to "hack" or find a new use for a gesture. Study participants could be seen both smiling and focusing intently while experimenting with how to appropriate the gesture for something other than what they thought it was intended for. Some participants seemed delighted when they stated that they "broke it," or "figured out another way to do it."

Sometimes a user with previous experience with the gestures would suggest that the participants try something that he or she had already found to be engaging. This would often happen at times when the participants were interacting with the table separately. The suggestion would cause the group to take more notice of each other, especially when the more experienced user suggested gestures that allowed the group to interact with each other both in the physical space and with the objects on the table.

One example was with the "flick" gesture, which sends a colored ball flying rapidly across the table and bouncing off the edges of the screen. Users would scramble to keep the colored balls in motion, often colliding with other user's fingers and sometimes grabbing each other's hands. It is also important to note that sometimes this caused other

users to remove themselves from the activity completely and choose instead to watch the "battle."

The last engagement trigger that we will discuss is how often the tabletop activity would lead to idea generation. Throughout the activity participants would, at random and unprompted times, express an idea that suddenly came to them about how the gestures could be used in another applications. Oftentimes this application didn't exist, and the user would start designing it on the spot, using the tabletop and his or her hands to explain what it would look like.

Nearly all users did this to some extent, and upon questioning we discovered that it would come about from one of two types of sense-making. The first was when users attempted to interpret the use and make sense of a gesture by applying it something they had previously seen, most of the time from a WIMP style of interaction. The second was when users tried to anticipate the intended use of the gesture, and then constructed a situation where it might be used. This type of sense-making could be expected considering the open-to-interpretation nature of our tabletop application.

FUTURE WORK

We are currently in the process of designing the next two collaborative applications for our study [5]. The first will be focused on collaborative creation where a group of 3-4 people can create a piece of art using the gestures of their choosing. The second will be focused on accomplishing a task, where groups of 3-4 must choose interactions that work together to accomplish a goal.

After the applications have been designed and developed, we will run 2-day research sessions. The first day will be to introduce the user to the library of interactions and give us baseline data to compare to the second day. We will be using a mixed-methods approach to understand engagement via physiological, behavioral and self-reporting metrics. We will use a bioharness to record physiological responses [1], Camtasia to record behavioral responses on the table, video cameras to record group behavior and facial responses, as well as interviews, card sorting, the Geneva Emotion Wheel, and Microsoft's product reaction cards for self-reporting.

CONCLUSION

From our preliminary research we have discovered several insights that can help shape and inform the future of our study. We have seen how the DiamondTouch technology elicits delight and creative engagement not only with the technology itself, but also with other people sitting at the table. Also, this technology helps to give people satisfaction, as they can be able to teach others how to use and "hack" the interactions to make them more recognizable to other users. With these insights, we hope that our study will help discover certain types of gestures that might be more engaging in certain contexts, as well as

provide insights about accessible tabletop design for collaboration.

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REFERENCES

1. Bardzell, S., Bardzell, J., Pace, T. 2009. Understanding Affective Interaction: Emotion, Engagement, and Internet Videos. *Proc. of 2009 IEEE International Conference on Affective Computing and Intelligent Interaction*
2. Dietz, P., Leigh D. 2003. DiamondTouch: A Multi-User Touch Technology. *Proc. of UIST 2001*
3. Gaver, W., Bowers, J., Boucher, A. 2004. The Drift Table: Designing for Ludic Engagement. *CHI 2004 / Design Case Study*
4. Hornecker, E., Marshall, P., Dalton, N. S., and Rogers, Y. 2008. Collaboration and interference: awareness with mice or touch input. *Proc. of the ACM 2008 Conference on Computer Supported Cooperative Work*
5. Rogers, Y., Lim, Y., Hazlewood, W. 2006. Extending Tabletops to Support Flexible Collaborative Interactions. *Proc. Of the First IEEE International Workshops on Horizontal Interactive Human-Computer Systems*
6. Shami, S., Muller, M., Hancock, J., Mandryk, R., Peter, C. 2008. Measuring Affect in HCI: Going Beyond the Individual. *Proc. of CHI 2008*

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