Tabletop Territoriality and Social Context: Examining Medical Simulation

Ulrich von Zadow
Interactive Media Lab
Technische Universität Dresden
Dresden, Germany
uzadow@acm.org

Raimund Dachselt
Interactive Media Lab
Technische Universität Dresden
Dresden, Germany
dachselt@acm.org

Roberto Martinez-Maldonado
Faculty of Education and
Social Work
The University of Sydney,
Australia, 2006
roberto@it.usyd.edu.au

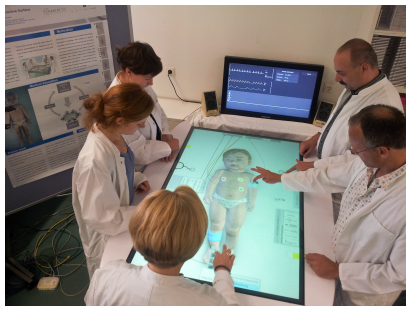

Figure 1: SimMed in use [9].

Abstract
We are interested in the influence that specific social contexts have on tabletop territorial behaviour. To study this, we observed use of the collaborative educational simulation application SimMed by students and experienced doctors. In this particular setting, we found very little evidence of territorial behaviour. We report on the results of the study, examine possible causes for the absence of territories and discuss potential implications for application design.

Author Keywords
Territoriality; simulation; tabletop; education; medicine

ACM Classification Keywords
H.5.2. [Information Interfaces and Presentation (e.g. HCI)]: User Interfaces

Introduction
Tabletop terrioritality has been studied numerous times (e.g., [5, 7]). We would like to look at this subject from a perspective of social context: How does the context determine what territorial rules are in place? How can we influence the territorial setup using application design?

In this position paper, we report on initial results in the context of SimMed, an application that enables situ-

ated, procedural learning for medical students on a touch-sensitive tabletop (see Figure 1). SimMed presents a simulated patient to a group of students, tasking them with collaboratively diagnosing and treating the patient. A qualitative study showed a high degree of engagement and immersion as well as a significant learning effect [9].

We examine two cases of SimMed usage – one by students and another by experienced medical practitioners – with regards to territorial aspects and discuss possible implications for application design.

Related Work

Territoriality on interactive tabletops has been studied a number of times, with the seminal work on the matter being Scott et al.'s "Territoriality in Collaborative Tabletop Workspaces" [5]. They found distinct areas on the table being used as personal, group and storage territories. Among others, her work builds on early work by Tang [7], who analyzed work in an analog tabletop environment with regard to tabletop partitioning and orientation of elements. Tang found that tabletops support teamwork through observal of collaborator's actions very well.

In his work on proxemics, Hall [2] layed much of the groundwork of our understanding of territorial behaviour from an anthropological standpoint. He distinguishes intimate, personal, social and public space, stressing that culture is a large factor in the perception of territories.

Furthermore, Ryall et al. [4] examined how interactions change with group size, among others suggesting that additional vertical displays can be beneficial. Scott et al. give design guidelines for collaborative tabletop applications [6]. In "Avoiding Interference", Tse et al. [8] suggest that social protocols are enough to coordinate users and allow flexible spatial partitioning, while Morris et al. [3] argue that system support is beneficial in a number of situations. In particular, Morris et al. give a number of cases where mediation of disruptive changes in global state is helpful. More recently, Xambó et al. conducted a study of musicians collaborating during use of the reactable musical interface [10] and found regular transfer of ownership of tabletop objects and a shared storage space along the complete table border – including the area directly in front of other musicians.

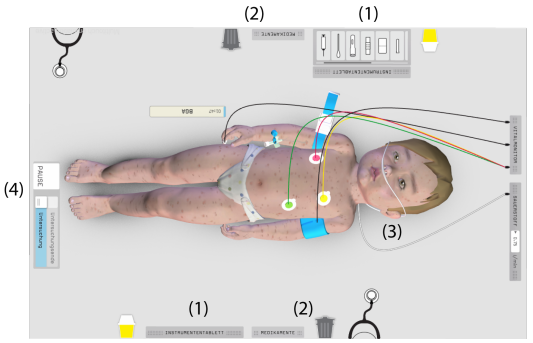

Figure 2: SimMed screen layout showing (1) Instrument tray, (2) other tools, (3) child and (4) instructor's controls.

SimMed Physical Setup

Physically, SimMed consists of the tabletop itself and an additional vertical display at the head of the table. 3-5 students stand at the longer sides of the table, and an instructor stands at the foot of the table (see Figure 1). Besides the life-sized child placed in the middle, each long side of the table has access to a shared instrument tray and other controls (see Figure 2). Additional controls are available at the head of the table. All border elements are movable along the sides of the table and can thus be moved from one student to the next. The vertical display can show, e.g., vital signs on a medical monitor.

In addition, there are a number of instructor-only UI elements at the foot of the table that allow her to change global state (e.g., pause the simulation). Since the tabletop is not able to detect a user's identity, we rely soley on social protocols to resolve any conflicts.

Figure 3: Participant (Student) leaning over within private zone of second participant [9].

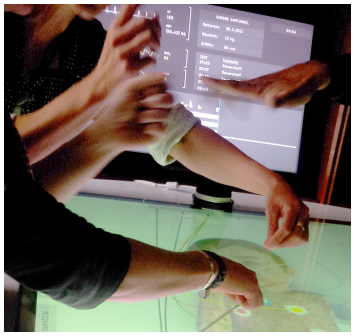

Figure 4: Discussion among experienced doctors involving interaction on and above the table in close proximity.

Study

We studied SimMed usage in two setups, each involving a different category of users: Medical students in the sixth semester and experienced emergency doctors in an advanced training course. In both setups, the subjects were presented with an emergency scenario, and needed to quickly initiate correct action as a team to avoid permanent disabilities or loss of life. The study was performed in a laboratory setting. We videotaped the sessions, took notes and analyzed the videos.

For the first setup, we recruited 18 students in five equal-sized groups. Each group went through the scenario twice, taking a total time of 45 minutes. Participants were sixth-semester students, generally in their early twenties, knew each other well before the study and had extensive experience with university group work. We published a thorough report on the results of the study in [9]. The second setup consisted of two groups of three participants each, with an age span of around 30-50 years. Each group did the scenario once, taking around 20 minutes. Furthermore, participants in this setup generally did not know each other before the study.

In analyzing the videos, we found that personal territories were generally ignored by the participants. Participants regularly picked up items within the intimate distance of others and furthermore, the social protocol seemed to allow this (see Figure 3 and 4). This was the case for both user groups, and we did not observe any verbal apologies or apologetic gestures, nor did any participant ask for permission. However, we observed several cases of careful gesturing (e.g., keeping the upper body at a distance while cautiously entering another's private zone with the hand) in the second setup (doctors). This behaviour was mostly centered around instrument trays directly in front of other participants. At the same time, the instructor's UI elements were not touched by any participants.

In the first user category (students), we generally observed very fluent cooperation as well as fast and seamless handovers between different people. Constant running commentary on insights and actions was common. In the second setup, cooperation was less fluent, with several near-collisions when multiple people simultaneously tried to place the same instrument.

Discussion

When discussing the results of the study, it is important to note that the participants were acting in a simulation – this includes simulating the social setup of the real situation [1]. In a real-world emergency, medical personnel have clearly defined roles and communication. This allows close collaboration in an urgent, time-critical situation – and in close proximity to colleagues. It appears that whatever needs to be done, is done without regard for the personal space of others. This gives us one possible reason that territories were ignored: The participants may have mimiked real-world behaviour in the simulated situation. Furthermore, we note that the way the instrument tray was used is similar to the use of Reactable tangibles at table border in [10]: Xambó et al. also observed taking of items in storage inside of other's personal territories. With regards to the observed differences between the user categories, there are several possible explanations. The fluent interaction in the younger students' case may have

been a function of them knowing each other well, of their experience in group work, or simply of their familiarity with touch screen technology in general.

A more general hypothesis, and one that provides interesting avenues for further research, is that knowledge of the social protocols in place in the specific situation can be used to inform user interface design. A free-form design allows users to find territorial setups that fit their needs. On the other hand, user interfaces can also be designed with specific social setups in mind (e.g., SimMed's tutor area), possibly significantly improving the user experience. Researching the social protocols beforehand has the potential to allow appropriate arrangement of users and advance planning of territories.

Conclusion

Our results confirm that territoriality on interactive tabletops depends strongly on the social situation at hand. Workplace culture and interpersonal relationships as well as the user's tasks change the territorial behaviour of users. Therefore, we believe that it is important to understand the social protocols that are in place and adapt the interfaces accordingly. Hall [2] goes at length into the implications of territoriality and proxemics for architecture, and it seems probable that the implications for user interface design are similarily complex.

Acknowledgements

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