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# SociaBowl: A Dynamic Table Centerpiece to Mediate Group Conversations



**Figure 1: Prototype of SociaBowl, a table with an actuated bowl as a centerpiece to help mediate group conversations.**

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## ABSTRACT

In this paper, we introduce SociaBowl, a dynamic table centerpiece to promote positive social dynamics in 2-way cooperative conversations. A centerpiece such as a bowl of food, a decorative flower arrangement, or a container of writing tools, is commonly placed on a table around which people have conversations. We explore the design space for an augmented table and centerpiece to influence

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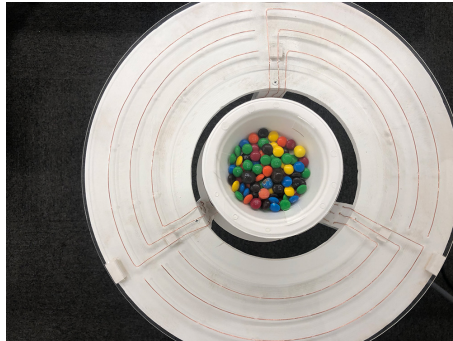
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**Figure 2: Top View of the SociaBowl Prototype, comprising a sensing table surface and an actuated bowl as a centerpiece.**



**Figure 3: Group conversation around the SociaBowl.**

how people may interact with one another. We present an initial functional prototype to explore different choices in materiality of feedback, interaction styles, and animation and motion patterns. These aspects are discussed with respect to how it may impact people’s awareness of their turn taking dynamics as well as provide an additional channel for expression. Potential enhancements for future iterations in its design are then outlined based on these findings.

## KEYWORDS

Tangible User Interfaces; Conversations; Social Dynamics; Turn-Taking.

## INTRODUCTION

Conversations take on many forms. In dialogues where participants are meant to exchange their points of view and engage in both listening and talking [1], one common issue is that there is an imbalance amongst conversation participants. Oftentimes, due to the mixture of personalities and conversational styles, some people dominate the conversation while others may feel uncomfortable or unable to express their point of view.

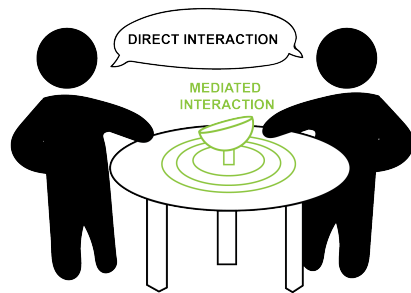
The aim of this project is to develop a versatile tangible platform to encourage more inclusive and constructive social exchanges. Inspired by the common practice to place a centerpiece on the table, we developed SociaBowl, an augmented tangible table-and-centerpiece setup (as seen in Figures 1 and 2) to enhance social dynamics, by raising people’s awareness of conversational balance and serving as an additional channel for expressing the willingness to speak up, or for providing feedback to others. Furthermore, we outline the design space for tangible user interfaces (TUIs) for conversation mediation.

## RELATED WORK

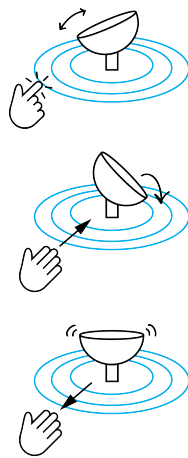
Conversation dynamics are complex and can take on many forms. In this paper, we focus on *dialogues*, which are classified as *2-way, cooperative conversations* with the purpose to exchange information and build relationships [1]. Categorizing our work using the CSCW Matrix [2, 5] we focus on *face to face, same time/same place* interactions, which are *collocated* and *synchronous*.

Several prior works have aimed to help mediate conversations by promoting turn-taking behaviours. These works can be categorized using either passive or active intervention methods. Passive methods are centered on only providing information about the conversation dynamics, for instance by displaying metrics as bar charts on shared displays [3, 8], or as custom spatial visualizations on private mobile displays [6].

Active intervention methods aim to foster equal participant contribution by prompting people to take action. For example, Flower-Pop [7] was a combined mobile-device and tabletop experience where a bee would be visualized at the position of the participant with the lowest participation levels.



**Figure 4: SociaBowl provides a mediated interaction layer in addition to the direct interaction between conversing people.**



**Figure 5: Interaction gestures for SociaBowl. From top to bottom: a tap gesture triggers the bowl to nod in your direction, a swipe-up gesture triggers the bowl to deposit a token to the person across from you, and a swipe-down gesture triggers the bowl to shake.**

A more tangible approach for conversation mediation is introduced by TurnTable [4]. It involves the use of inflatable airbags embedded under a table's surface to drive the motion of a ball on its surface in the direction of people who have been talking less than the others.

These attempts limit themselves to point out the person with the least contribution. In our work, we explore alternative ways of active feedback to introduce new possible interaction patterns. To do so, we more deeply explore the materiality of feedback, and investigate the incorporation of an additional explicit input channel for expression to provide a more versatile platform. We outline this design space for a tangible interface for conversation mediation and explore it in a number of interaction scenarios.

### SOCIABOWL PROTOTYPE

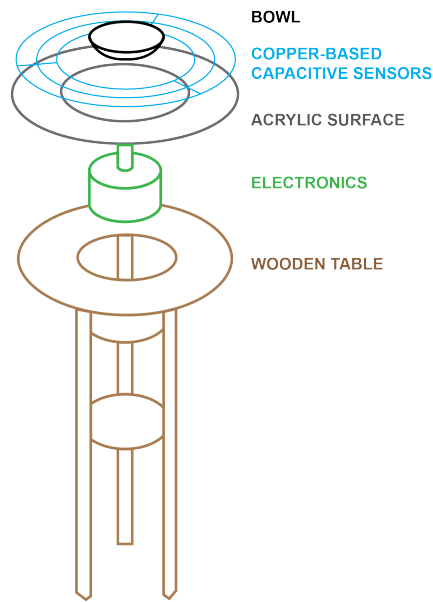
Our main prototype uses a candy bowl as a centerpiece, alternative scenarios are discussed later. Below we explain the concept, interaction design, as well as implementation details.

#### Concept

Using a bowl filled with edible treats as the actuated centerpiece, people can trigger it to move by tapping on sensors embedded in a radial fashion along the table's surface. This adds a mediated interaction layer to their conversation (see Figure 4). Each person has a set of three capacitive sensors positioned at different distances from the bowl. These sensors are built to accommodate a direct interaction style. This means users must intentionally touch a sensor on the table's surface for the bowl to react. Users can either tap or swipe over the wires to trigger movements of SociaBowl, as seen in Figure 5. When a user taps on a sensor, the bowl acknowledges the tap by nodding in his/her direction for everyone to see. This empowers users to express their desire to talk via a physical gesture, giving them an alternative to verbally interjecting while another participant is speaking. By swiping upwards, participants are able to make the bowl deposit candy at the position of another participant. However, they cannot make the bowl provide candy to him or herself. Attempting to do so with a swipe-down gesture will result in the bowl wobbling or shaking in refusal. This encourages people to compliment one another's ideas by gifting an edible token. The choice of material, being candy, gives the bowl a nurturing nature. Although different users may have different interpretations of the bowl's movement, the simple interaction vocabulary helps to provide users with basic feedback principles.

#### Implementation

SociaBowl comprises two fundamental components: a sensing table structure and a dynamic actuated centerpiece as seen in Figure 6. The table is a circular standing table (55 cm in diameter, 112 cm in height). Through experiential prototyping, we decided on a standing table since we felt it better encouraged focused conversational exchanges over individualistic working styles. The base structure is milled from plywood, and topped with a 3 mm layer of acrylic which was laser-cut and engraved to



**Figure 6: SociaBowl Prototype Composition, including a sensing table surface and electronics for the actuation of the bowl-based centerpiece.**

enable the inlay of copper wire. The copper wire serves as capacitive sensors to facilitate tapping and swiping gestures on the table's surface. A circular cutout was made in the center of the table's surface to allow for the placement of the electronics. The electronics consist of an Arduino UNO which reads in sensing data from the copper wires via a 12x Capacitive Touch Shield (MPR121) and controls the movement of the bowl centerpiece via two stacked servomotors (HITECH HS-8775MG) to control the tilting direction and angle of the bowl.

### DESIGN SPACE

There are many aspects of the design of the table and the centerpiece that can alter people's perception of the tangible interface and their corresponding social behaviours. We explore different facets including the materiality of feedback, the motion patterns of the centerpiece, and the types of interactions that are enabled by the use of different sensors.

#### Materiality of Feedback: Nurturing or Threatening

The centerpiece can contain different content, ranging from solid objects, such as food and writing utensils, to fluids such as water. The choice of material can have a large impact on people's expectations and sense of anticipation. Here, we acknowledge that this choice can also set a tone for using the object - it can either be nurturing, or threatening. Choosing to fill the bowl with liquid can enable the bowl to generate a sense of threat or anxiety if the bowl can tilt towards a person and possibly spill its contents. However, by using a treat such as candies, the tilting and spilling of the bowl takes on a positive connotation. Interestingly, placing different objects on the table can also re-frame the nature of the centerpiece's behaviour. For instance, if the centerpiece is a bowl that can spill water, but a circular flower pot is placed around the bowl, the spilling of the bowl transitions from being a negative consequence to to a positive one in which the flowers are watered.

#### Interaction Styles: Implicit or Explicit

There are many ways in which the actions of the participants can be sensed and responded to by the system. On a high-level, one can observe that the interactions of participants around the table can either be passive or active. For instance, passive interaction can be facilitated with the use of microphones that listen to the conversation. Algorithms may be used to determine the tone or balance of a conversational exchange, for which the centerpiece can respond. As this method is covered by many other works [3, 4, 7], we choose to explore capacitive sensors embedded into the table's surface. In this way, we empower users to interact with the bowl through direct and intentional interactions.



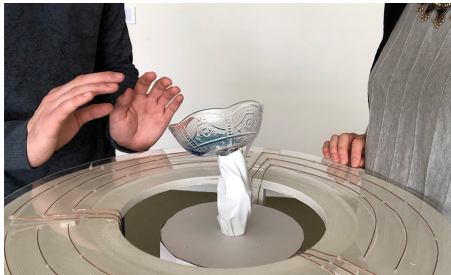


Figure 7: Speak 'n Spill threatens to spill water on a dominant speaker.



Figure 8: Garden-Talk enables people to water another's plant as a token for positive feedback.

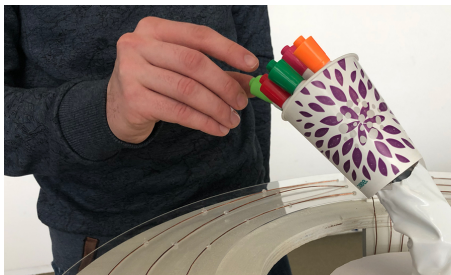


Figure 9: Pen-ny for Your Thoughts encourages a person to participate.

### Animation & Motion Patterns: Playful or Formal

The way in which the centerpiece moves can convey different meanings. Similar to the works of animators, who can illustrate inanimate objects to seemingly have emotion, the way in which the mechanism is programmed imbues the centerpiece to have a personality and preferences. In this prototype, we explore different degrees of tilting, swirling, and wobbling. In preliminary experiments, the tilting comes across as a greeting in the form of a bow, swirling and stopping can be used to give the sense of pointing towards a participant, and wobbling can be perceived as a way of refusing an action, or playfully responding to an action in a way that resembles being tickled.

### ALTERNATIVE INTERACTION SCENARIOS

We present a number of variations to the prototype, by manipulating the aforementioned design parameters in order to demonstrate the versatility of the concept in supporting group-meetings. As a commentary on conversation dynamics, SociaBowl filled with water can actively impact the dialogue between people. The primary aspect of water as a material is that it can either be nurturing or threatening to the participants. To demonstrate the threatening context, consider **Speak 'n Spill**, pictured in Figure 7, where the bowl monitors speech-time (input = implicit), and gradually tilts more and more towards the speaker the longer he or she speaks, until the water inside threatens to spill over. Only when the speaker pauses and gives others the chance to converse does the bowl shift back towards the neutral state. In contrast, if flower-pots are situated around the water bowl, the nature of the water can become nurturing. Consider an application called **Garden-Talk**, pictured in Figure 8, where participants can perform a swipe-up gesture (input = explicit) to water another participant's plant. In this case, a spill is re-contextualized into a positive event that waters the plants placed in front of another participant. In **Pen-ny for Your Thoughts**, as seen in Figure 9, a collection of writing utensils is used as a centerpiece. Monitoring the speech-time of participants (input = implicit), the bowl then tilts and offers a person with low participation levels a tool to write with, thereby encouraging participation. Finally, an application such as **Friend-Leaf**, as seen in Figure 10, demonstrates the power of animation. In this case, the centerpiece resembles a flower pot that dances when the conversation-energy is high, or that begins to droop when the conversation is silent. This gives the centerpiece a personality that may encourage more lively back-and-forth conversation.

### CONCLUSION & FUTURE WORK

In this paper, we presented SociaBowl, a tangible approach for promoting positive social dynamics in group-meetings comprising a sensing table and actuated centrepiece. The system aims to serve as a platform to raise awareness of conversational balance amongst participants, as well as provide an additional channel for expression and feedback. Inspired by traditional table centerpieces, we



**Figure 10: The Friend-Leaf droops when there is little conversation around it.**

created a dynamic, motor-controlled bowl in the center of a round table, that is capable of holding different content and moving in different directions in response to people's gestures on the table's surface. We outlined our design considerations comprising *Materiality of Feedback*, *Interaction Styles* and *Animation and Motion Patterns*, and demonstrated the versatility of SociaBowl to help mediate conversations in a variety of ways by manipulating these design parameters.

In the future, we would like to develop the prototype further. The current implementation is limited to explicit input via capacitive sensors. We would also like to integrate implicit sensors, such as microphones to enable a larger variety of interactions. Furthermore, we would like to perform a user study to evaluate the impact of SociaBowl on the behavioural dynamics of conversations, and the impact it may have on overall team-performance as well as participant satisfaction.

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