Proxemic Conversational UI: Moving beyond simple conversation

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Abstract

Conversational user interfaces (CUIs) have long been a dream of computer scientists and futurists alike [13, 5]. In 2016, a number of large technology companies, including IBM, Microsoft and Facebook, have announced their intentions to expand and improve bot and conversation interaction. What remains to be seen, is how bots and conversational UIs will be integrated into existing and new services. This poster explores the design of CUI systems, specifically identifying opportunities for combining CUI systems with proxemic interaction concepts, and examining issues that may arise from this kind of CUI/bot interaction. To do so, we present scenarios for potential CUI and bot interactions, leveraging real world client concerns from our industry work to explore use cases that can inform future CUIs, proxemic interaction, and design work.

Index Terms: K.6.1 [Management of Computing and Information Systems]: Interacation Techniques—Conversation User Interface;

1 Introduction

2016 has been declared the year of the bot [1, 12, 3], with companies such as Microsoft [11], Facebook [10] and Slack [14] investing in bot development and platforms. Bots will allow interaction over text and voice, hand-off to or pick up from human operators, and allow access to large amounts of data, opening up potentially powerful and more seamless computer interaction methods.

2 Conversation User Interaction and Interfaces

While users once communicated conversationally strictly with another person behind their respective desktop computer displays, these days the "person" a user is interacting with may not be a person at all, but rather a bot. According to Slack [2], "Bot users have many of the same qualities as their human counterparts: they have profile photos, names and bios . . . they can post messages and upload files, and they can be invited to and kicked out of channels and private groups." To the human user on the other end of the conversation, the biggest noticeable difference may be the ability of a bot to access a multitude of data sources and APIs to rapidly perform computational tasks. For conversational bots that leverage proxemic interaction, there exists an even greater opportunity to provide unencumbered human-computer interaction.

Conversational user interaction is not new; rather, it seems that the upswing in adoption of CUI and bot-based systems has been made possible by the greater mass adoption of smart phones, high-speed Internet connections, and improved voice and artificial intelligence technologies. One of the first and most important publications on the topic is the work of Nickerson, who, in 1976, a) identified key characteristics of conversation interaction related to computers, b) noted rules for conversation interaction with computers, and importantly, c) took "exception to the notion, however, that person-computer interactions should, ideally, resemble person-person conversations in all respects." One can look even further back to 1950 and Alan Turings ideas on the Imitation Game [16] and the Turing Test [15], to see examples of conversation interaction. More recent work includes that of Allen, which discusses the significant technological problems that still exist with developing CUIs [4], as well of the work of Benyon and Webb who address issues related to evaluating a conversation companion [17, 7].

3 Proxemic Interaction

We are particularly interested to better understand how the physical arrangement of people in space impacts information flow among people and bots. To frame our understanding of spatial arrangements of people engaged in conversational computer interactions, we referred to Hall's proxemic reaction bubbles (see Fig. 1) for observing the spatial distances between people [9]. These zones were defined as follows: intimate space (1.5 ft radius), personal space (4 ft radius), social space (12 ft radius) and public space (25 ft radius). Previous research on human-computer interaction [8, 6] has used proxemic relationships to design and augment computer-based interactions, but the integration of proxemic and conversation interaction is less thoroughly explored in the literature.

4 Moving mobile CUI beyond the keyboard and microphone

Robots and Pencils is an app development company that helps organizations develop leading-edge, world-class digital experiences, and, recently, this work led to our team exploring conversation interaction in the medical and banking sectors. Here, we review our ongoing CUI research and work in both sectors and expand this to imagine CUI interaction augmented by proxemic sensing technology.

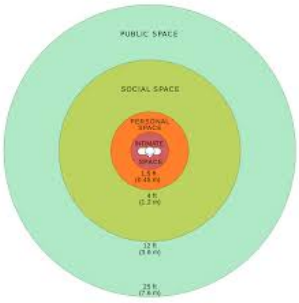

Figure 1: Diagram of Halls personal reaction bubbles (1966), radius in feet [9]

4.1 Case Study 1: Personal Retail Banking

Retail banking apps have matured greatly in the past several years, and, in the past year alone, three major Canadian banks have released new mobile banking applications. User interactions can now go far beyond basic keyboard and touch interactions, thanks to advances in voice detection, as well as features like NFC and fingerprint readers available in modern smart phones. For our project, we were tasked to explore how retail banking customers might interact with a text or voice-based bot built to facilitate easier financial transactions.

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Early on, we identified the bots potential to use client data to support banking actions. For example, the chat bot can access bank account balance information and inform a user if a transfer would lower the balance below a preset minimum. More complex conversation queries are also possible with user-bot interaction, such as, "If I buy this item now, will I have enough money left in my account after my expenses are automatically deducted next week?"

Our client, a major Canadian bank, told us that the most common issue they encounter, besides forgotten passwords, is with setting up money transfers. Our client told us that the bank tellers and customer service providers could easily guide customers through the process on the phone or in person, and we began to imagine a bot that could facilitate this process. When the user experiences issues with setting up bank transfers, the bot can leverage knowledge about where the client is in space and relative to other people, and then select a contextually sensitive conversational interaction method.

Situations for Exploration:

Client at home:

If the client is at home, the system asks the client if they would like a call from customer service as they appear to be struggling with the app. This conversation prompt might be different if the system detected the client was currently at work and not able to initiate or receive a voice-based call.

Client within 25 feet of a bank teller:

If the client is physically approaching a bank branch, it is unnecessary to call the client as they are already near a person who can help. Thus, the conversation UI suggests that the client take their phone to a bank teller for help. In addition, the conversation system can provide the names of employees currently on shift with the required support skills.

Client within 4 feet of the teller:

When the user is within four feet of the bank teller, the system knows that the client is currently in the personal space of the bank teller. The tellers computer is then given access to the users online banking account. The teller can then turn the computer display to the customer and is able to visually walk them through the process of setting up a transfer.

4.2 Case Study 2: CUI in Medical Settings

Interactions in hospitals can be very complex and involve a large number of stakeholders, from hospital staff (e.g. doctors, pharmacists, nurses, medical students) to patients and their families. Modern hospitals that utilize electronic medical records (EMR), additionally face security challenges related to the technology and information access and retrieval.

For example, physicians may require off site/hospital access to patient records, so that they can update EMRs when they are not physically present with the patient. However, we were informed by our clients that, nurses access to records was meant to be contained to when they were physically working in specific hospital wards for security reasons. We considered how we can use proxemic conversational interaction in these types of settings to extend the system interaction beyond more simplistic and obvious interactions, such as defining medical acronyms and retrieving patient test results.

In this situation, we could extend CUI interaction by further refining access to patient records. Using a mobile tablet, nurses could access, but not edit patient records within 25 feet of the ward. If a nurse takes a tablet computer within 12 feet of the patients room, the nurse may gain editing rights to the patients EMR. When family members or visitors are in the patients room or within 12 feet of the patient, the system enables additional security settings to ensure confidential patient information remains confidential, limiting the potential for an unwanted person to pick up an unattended device. We can further secure the device by restricting access to when a nurse or other medical professional is within 1.5 feet, or in the intimate zone, of the device. Such proxemic interaction would allow for a voice based computer system in the patients room to respond to verbal commands or questions from the patient, a useful feature for patients with mobility issues or who are bed ridden, while allowing secure and more powerful interaction for medical staff who are within the personal zone of the voice based conversational computing system.

Interestingly, we can also expand access to patient records for nurses not on the ward when they use a tablet computer within the personal space of a patient's specific doctor, such as when a doctor and nurse meet in a doctor's office located outside the ward to review a patient's records. In this example, a nurse standing next to a doctor could be allowed communication access with a bot and ask for specific patient records from six months ago, facilitating the otherwise difficult information-seeking task of manually scrubbing through large amounts of text records looking for relevant information.

5 Conclusion

We present this early work, in progress, to build upon the discussions currently surrounding bot and conversational interaction. We invite those in the HCI community also interested in CUI, proxemic interaction, and/or extending mobile interaction methods to come talk to us, collaborate with us, and explore these issue with our clients in real world situations.

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