Cloud Assisted IOT Based Social Door to Boost Student-Professor Interaction

Ali Asghar Nazari Shirehjini[1(✉)], Abulsalam Yassine[2], Shervin Shirmohammadi[2], Ramtin Rasooli[1], and Mohammad Salar Arbabi[1]

[1] Ambient Intelligence Laboratory, Department of Computer Engineering, Sharif University of Technology, Tehran, Iran
shirehjini@sharif.edu
[2] DISCOVER LAB, University of Ottawa, Ottawa, Ontario, Canada

Abstract. Face to face meetings and physical presence are important concepts in student-professor relations. Many students require flexibility in arranging meetings or the possibility of ad-hoc meeting with their professors. However, ad-hoc meetings could be difficult to arrange due to busy schedule of professors. It is not unusual for students to attempt several times in a day to catch a professor, or wait an hour behind his door. To overcome this challenge, some professors have teaching assistants (TAs) or office assistant who manage their schedule or provide students with helpful information on how to reach them or handover their documents, projects, etc. Many other professors do not have any secretary or TA.

When students look for a professor at his office and he is not there, it is common to leave a message on a whiteboard or some paper outside the office. However, by this approach professors will not be able to update their schedule dynamically or some might not will to share their schedule with public because of their privacy concerns. Some students also intend to contact with the professor by email. Professors usually get a lot of emails every day and they will not be able to read and answer to all of them, besides it will be frustrating for students too when they don't receive feedbacks from their professors.

To overcome this problem, recent technological advances could be used. We have been motivated by the problems addressed above to propose a cloud assisted IoT based cyber-physical door to boost student-professor interaction in the absence of the professor at his office. This door can be thought as a virtual secretary and an interface between students and professors to help the students to get in touch with their professors.

Keywords: Cyber-physical door · Internet of things · Student-professor interaction

1 Introduction

Normally, university professors are elusive. They are not easily found even in their offices during work hours. Students and other visitors cannot readily get hold of them. The use of computer-mediated communication (CMC) technology has dramatically

C. Stephanidis (Ed.): HCII 2016 Posters, Part II, CCIS 618, pp. 426–432, 2016.
DOI: 10.1007/978-3-319-40542-1_69

changed the ways for students to interact with their professors, especially for communications occurring outside the classroom.

A recent study investigated the impact of offering virtual office hours by using instant messaging (IM) software for student-faculty interaction. The study found that participants in classes that offered virtual office hours reported higher levels of satisfaction with office hours than students in classes that offered only traditional face-to-face office hours. Also revealed, however, was that students' use of virtual office hours is not significantly different from their use of traditional office hours. The study further reported that students prefer asynchronous tools such as email to communicate with the professor.

A question that comes up is why student do not use email to improve their faculty communication. Danielewicz-Betz conducted a research to examine student–faculty communication by email and the lack of clear guidelines that leads to misuse of email in student–faculty interaction. The way students communicate with faculty in higher-education, despite common usage nowadays, has not been analyzed sufficiently (Biesenbach-Lucas 2006a). Moreover, most academic syllabi lack explicit instruction in email writing. Consequently, students, growing up in the instant messaging culture, are unsure how to (or not aware that they should) modify the content of their messages when addressing professors. They often seem unaware of the fact that their emails influence professors' impressions of themselves and their academic achievements (c.f., Jessmer and Anderson 2001).

On the other hand university professor get numerous emails daily and they will not be able to answer to all of them. Besides, different students with different positions try to contact the professor by email. They may vary from undergraduate students to research assistants and PhD students. To address this challenge, we propose a collaborative system to boost the student-professor relation in academic environments. The system integrates office doors using internet of things (IoT) technology, Near Field Communication (NFC) and mobile applications. This creates a cyber-physical system that facilitates IoT enabled doors to allow asynchronous communication between students and faculty, which improves students' perceived satisfaction of student-professor-interaction experience. The system architecture and the way to interact with the system is described in detail in Sect. 3.

The reminder of this paper is as follows. Section 2 discusses related work. In Sect. 3 we describe the proposed cloud assisted IoT based cyber physical system. Section 4 concludes the paper.

2 Related Works

Many researchers studied factors affecting student satisfaction, attention and retention in academic environments, revealing that "student engagement in college activities outside the classroom and interactions with other students and faculty tends to have a substantial impact in terms of student retention, academic performance, and overall satisfaction (Astin 1999)". In his study of the effects of out of classroom experiences, Kuh (1995) found that participation in college activities, living on campus, and conversing frequently with other students and faculty positively influenced students' learning and personal development. Also different students prefer different means of communication (Kelly et al. 2004). Quite

simply, reticent students tend toward the use of CMCs and it is therefore less probable that a face-to-face visit take place (Kelly et al. 2004).

Research on the effects of student-faculty interaction outside the classroom have consistently found that informal contact between professors and their students was positively associated with personal, social, and intellectual outcomes as well as students' overall satisfaction with their college experience (Pascarella 1980; Endo and Harpel 1982; Fusani 1994; Myers et al. 2005; Halawah 2006). In their meta-analysis of student faculty interaction, Kuh and Hu (2001) explored the frequency and nature of out-of-class interactions between students and faculty over a period of time and found a positive correlation between the interactions and positive student outcomes despite the myriad of changes that have taken place in higher education over time. The richness of media choice bears mention. While effective in many ways, albeit less rich, the CMC media outlet entails less feedback potential which, in some cases, may impede message transfer (Huett 2004).

Recent technological advances such as the Internet of Things, Augmented Objects, and Cyber Physical Systems bring new potentials in terms of systems that could positively influence the student-professor interaction. A research on augmenting everyday objects was made by Kawsar et al. (2005). They call the objects "sentient artifacts." These objects are everyday life objects augmented with sensors to provide added value services.

Kuniavsky defined object augmentation specifying that instead of designing new ubiquitous devices, non-digital objects could be used to gather and process information. The new object will keep all its original functionalities but will be improved with new ones. The main reasons why intentional augmentation of everyday objects works as a Ubicomp user experience design strategy are as follows: Users have familiarity with the objects, interaction patterns are already defined, when augmentation breaks the object just returns to its pre-augmented stage, and marketing of such objects can be done traditionally (Kuniavsky 2010).

While most research focused on studying different facets of student-professor interaction, to the best of our knowledge, no research contributed tools or technology-mediated tools to improve or influence the interaction quality. Considering the fact that most students use mobile phones, it seems feasible idea to use mobile interaction to improve the interaction. In addition, recent advances in IoT can be used to create a virtual representative for each faculty. Internet of things and related technologies can be used to augment office doors to represent professors during their absence and provide a tangible proxy in the student-professor interaction.

While many aspects of IoT have been well explored, the application of IoT and cyber physical systems to the above described specific problem domain has not been studied yet. In contrast, we have developed an augmented door supporting interaction between students and professors. The system has been deployed to real education settings and intensively tested.

3 The Proposed System

The concept of this work is to create a solution to support professors and students concurrently by creating an interactive smart virtual secretary on the academics office

door. By definition, "A door in the physical world is a means of access, admission, or exit, it can also provide a means of access to virtual areas. By creating virtual interactivity with commonplace physical objects, the hope is to optimize the current system, and improve students' interaction with their professors."

The solution would act as an add-on service in order to encourage access to online information on demand. These micro interactions ideally would be used to leave a small notes/reminders for students to have a quick access to retrieve the professor's availability.

This system demonstrates methods of solving the communication problems using a set of low cost NFC tags that can be scanned by students' android based mobile applications which will then update them with the comings and goings of the professor whose tag is scanned. In addition we have added a series of QR codes, providing an alternative method to two access the same service for those students who will not have NFC-enabled smart phones. Figure 1 represents Smart Door's system architecture.

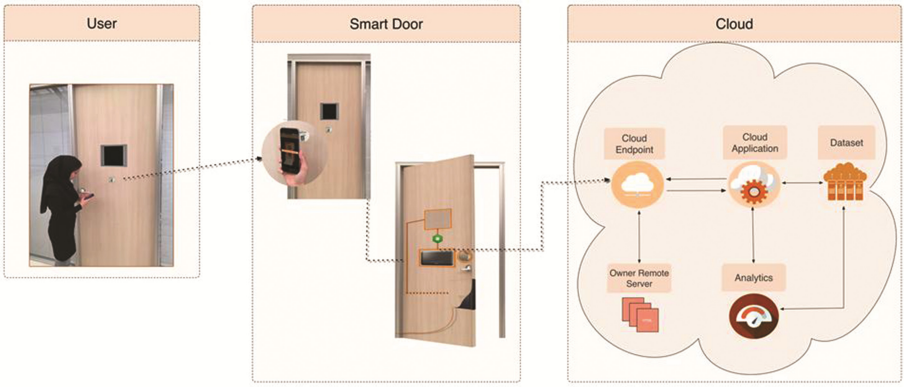

Fig. 1. Smart Door's system architecture

Using this system professors can leave specific messages for custom group of students. Students will only have access to the messages that are defined for their access level which will be granted to them on the server by the door owner himself.

Students can scan the NFC tag/QR code installed on the door that contains its virtual identity and to get connected to system's cloud server. Despite of the technology being used by the students, information will be fetched from server and will be shown on their android smart phones. Students then will be able to reply to professor's messages or to submit their presence to inform the professor of their intent to have a meeting. The system can also provide updates of all the interaction that take place at professor's door step to him by email.

The system was installed in two rooms of the CE department offering access to members of the Ambient Intelligence lab as well as all undergraduate students taking courses with the author or conducting undergraduate projects with him. An overall of 26 students subscribed, downloaded and used the system. Figure 2 illustrates two students using their mobile application to use the system.

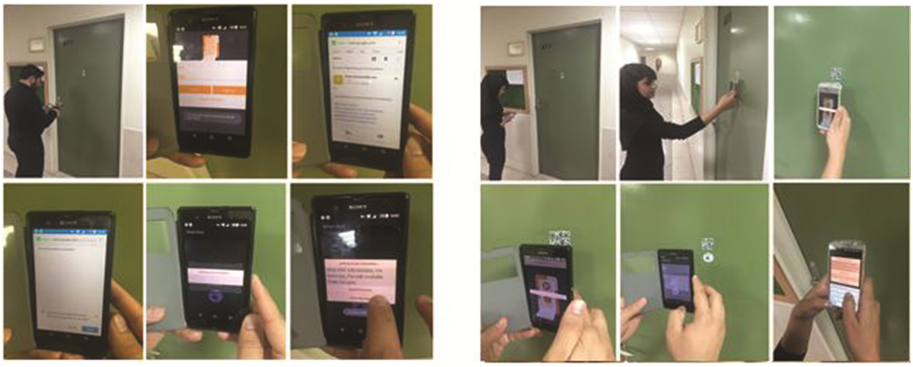

Fig. 2. Students interacting with the smart door

Fig. 3. Student's phone display after connecting to the serve

After the application is launched it read the door's identity with a single touch to the NFC tag or scanning the QR code. Figure 3 shows an example of students' phone display scanning being connected to the server.

4 Conclusion

We propose a system that enables a new way to interact and communicate with professors using mobile phone generating a virtual system where professors do not have to be physically present or respond. The students have the opportunity to get updates from the professor without the need to meet in person with the professors. Unlike previous attempts, the system is current and can be deployed now without expensive and time consuming installations. Students are able to deliver and retrieve information in context and the service enhances their experience within the higher education environment. The system supports student's organization of learning by utilizing pervasive mobile technologies and by disseminating information from the central information systems to the user's android based mobile devices. Door owners have full control of the system, being able to manage public and private conversations without.

Having to worry to plan their days and meetings with students in advance, solving current common issues in academic environments. The innovative approach using an actual door to enable interactions with the specific professor, the mobility and speed of the process all differ in how students are currently able to engage with their supervisors. Future work requires the evaluation from both students and faculty into the engagement of the users with the system, although fully operational; the system will be extended across differing departments in preparation for a long term study.

The goal of the system is to allow users another way to engage in higher education, collect extra materials/hints and stay motivated. Whilst lecturers have a tool they can customize to their needs and engage with their students with different techniques by allowing doors to act as an extra point of contact to deliver relevant information.

References

Jessmer, S., Anderson, D.: The effect of politeness and grammar on user perceptions of electronic mail. N. Am. J. Psychol. **3**, 331–346 (2001)

Kelly, L., Keaten, J.A., Finch, C.: Reticent and non-reticent college students' preferred communication channels for interacting with faculty. Commun. Res. Rep. **21**(2), 197–209 (2004). Spring

Huett, J.: Email as an educational feedback tool: relative advantages and implementation guidelines. Int. J. Instr. Technol. Distance Learn. **1**(6), 35–44 (2004)

Kawsar, F., Fujinami, K., Nakajima, T.: Prottoy: a middleware for sentient environment. In: Yang, L.T., Amamiya, M., Liu, Z., Guo, M., Rammig, F.J. (eds.) EUC 2005. LNCS, vol. 3824, pp. 1165–1176. Springer, Heidelberg (2005)

Kuniavsky, M.: Smart things. Ubiquitous computing user experience design. Elsevier, New York, NY (2010)

Myers, C.L., et al.: Discovery of biological networks from diverse functional genomic data. Genome Biol. **6**(13) (2005). R114

Endo, J.J., Harpel, R.L.: The Effect of Student-Faculty Interaction on Students Educational Outcomes

Fusani, D.S.: 'Extra-class' communication: frequency, immediacy, self-disclosure, and satisfaction in student-faculty interaction outside the classroom. J. Appl. Commun. Res. **22**, 232–255 (1994)

Kuh, G.D.: The other curriculum: out-of-class experiences associated with student learning and personal development. J. High. Educ. **66**, 123–155 (1995)

Halawah, I.: The Effect of Motivation, Family Environment, and Student Characteristics on Academic Achievement

Terenzini, P., Pascarella, E.T.: Student/faculty relationships and freshman year educational outcomes: a further investigation. J. Coll. Student Pers. **21**, 521–528 (1980)

Astin, A.W.: Student Involvement: A Development Theory for Higher Education

Biesenbach-Lucas, S.: Making requests in email: do cyber-consultations entail directness? toward conventions in a new medium. In: Bardovi-Harlig, K., Félix-Brasdefer, J.C., Omar, A. (eds.) Pragmatics and Language Learning, pp. 81–108. Honolulu, HI: Second Language Teaching and Curriculum Center, University of Hawai'i (2006a)