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Abstract—The value of an open event is in active communication between participants. However, it is difficult to look for those who have a common interest or a common friend. You would miss an opportunity to speak directly to your SNS friends or to those who have common SNS friends, unless you notice that there are such participants and you recognize them. This paper proposes a participant managerial system for using the human relations in SNS in an actual event site. Each participant makes his registration to an event using his SNS ID. In the event site on the day, the participant only has to touch his mobile terminal to a NFC tag. The participant and his SNS are bound by this action. The organizer as well as the participants can understand the background and the interests of each participant using SNS information. NFC tag provides real time attendance-and-absence status of the participants. It is expectable that the proposed system promotes exchange between participants.

Keywords: *NFC, mobile device, smart phone, SNS, web mash-up, augmented reality*

I. INTRODUCTION

Participant management is one of the key issues to make an event successful. A prior participating registration and an attendance-and-absence management on the day, is very important, particularly, to the public events opened to wide range of participants. Web based registration is becoming common in many events, where participants register their personal information. On the event day, attendance registration is made at the reception desk in many cases.

The number of users of SNS services, such as twitter [1] or Facebook [2], is increasing in recent years. The exchange among those on-line users is becoming popular. It is often the case that the study meetings and exchange meetings in off-line are not successful as they are expected compared to those in on-line. One of the reasons of these failures is in the discrepancy and mismatch of the on-line ID (SNS ID) and the real person. It takes some time to come close and to start

talking until they have chances for introducing themselves, even though they know well each other in on-line.

The present paper proposes to use the user IDs, which we call as SNS IDs in this paper, given by SNS services for the registering users. The user can check and see if his friends and followers are attending the meeting. The links between people can be formalized as the links between SNS IDs.

ATND [3] is one of the SaaS-type participant management services of public events. Anyone who wants to have his meeting, he can start and manage his meeting and participants simply by registering his meeting on ATND. Since the API of ATND service is open to the public, it is easy to create a mash-up with other Web service. Indeed, the ATND service provides the interfaces to accept the Twitter ID or the Yahoo account as the participant's identifier and person-himself/herself attestation. However, most of the participant management systems consider only the on-line meetings and on-line participants. There is no system that helps exchange of people in an actual conference hall, as far as the authors know.

We pay attention to NFC (Near field communication) as a method for communication in the real field. NFC is spreading technology related to RFID (Radio Frequency IDentification) and contactless smart card. Contactless IC cards and IC tags are widely used in traffic fare management in many countries. Some airline companies use them as passengers' ticket and for passenger boarding check. Smart phones and tablet terminals with NFC function are now available on the market. We can expect the increase of users of such devices in a couple years.

The present paper proposes a method to use NFC (Near field communication) to connect on-line SNS IDs, on-line meetings, off-line meetings and actual people. This method helps transfer the on-line environments of exchange into the off-line exchange and in the actual meeting room. Participants of an off-line meeting can share and enjoy the on-line linkage.

The rest of the paper is organized as follows. Section 2 describes the model of participant management. Section 3 reviews NFC technologies. Section 4 describes the overview of the participants management system for off-line meeting based on NFC. Section 5 shows a prototype focused on a restricted situation. Section 6 summarizes and considers further work.

II. MODELING OF CONFERENCE PARTICIPATE MANAGEMENT

This section defines the model of meeting and participants of a meeting. The process of meeting on the day and the process of participating check work to each session are described.

A. Entities of conference

The entities of a conference are people, that is, the organizer and the participants. The organizer may be a person or an organization, and the organizer sets a conference.

Let C be a conference proposed by a sponsor, let a conference consists of several sessions s_1, \dots, s_m .

$$C = \{s_1, s_2, \dots, s_m\}, s_i \text{ is a session in } C.$$

A conference and sessions may have the program and the meta-data, such as, the name of the conference, the date and time, the venue, the name of the organizer and the registration fee. The present paper does not concern the meta-data and the program.

A conference has a plural number of participants. Let P be the set of all participants of p_1, \dots, p_n . The set of participants at the session s_i is a subset of P and is written as P_i .

P : Participants. $P = \{p_1, p_2, \dots, p_n\}$.

P_i : Participants of session s_i , P_i is a subset of P .

B. Pre-Registration

A conference and an event require some procedure of the registration. It is not concerned with no charge or the charge, Web-based registration system are popular. The registration proceeds as follows:

- Registration by participants
- Confirmation by organizer
- Fee payment in case of charged conference

III. RFID AND NFC

NFC can be considered as a developed version of RFID. This section explains RFID first, and then describes the technology of NFC.

A. RFID

RFID stands for Radio Frequency IDentification, which means methods and the devices for identification of individuals by wireless devices. Massive production of RFIDs realized the price decline.

There have been many performance improvements in communication distance and the read-out speed. In 2000s, the international standardization of interface accelerated the

application of RFID in various fields. In 2012, RFID is being spreading in many situation such as NFC, and yet is continuing technological innovation.

B. Standard of a contactless IC Card

The standard of a contactless IC card focuses on the management of people and is discussed in the sub-committee of RFID standard. There are three standards for contactless IC cards: ISO/IEC 10536, 14443, and 15693.

TABLE I. THREE STANDARD FOR CONTACTLESS IC CARDS

Standard number	Communication range	Career frequency	Note
ISO/IEC 10536 Close coupled	< 2mm	4.9152MHz	
ISO/IEC 14443 Proximity	< 10cm	13.56MHz	There are two types; Type A (MIFARE) and Type B
ISO/IEC 15693 Vicinity	< 70cm	13.56MHz	Mainly for distribution.

C. NFC and NFC Forum

NFC (Near Field Communication) is a set of international standards for wireless communication which contains NFCIP-1 (ISO/IEC 18092) [4] and NFCIP-2 (ISO/IEC 21481) [5].

NFCIP-1 (NFC Interface Protocol-1) was proposed by Sony (who promoted FeliCa) and NXP Semiconductors (formerly Philips, who promoted MIFARE). NFCIP-1 maintains the downward compatibility with noncontact wireless communication technology such as an already diffused card ISO/IEC 14443(MIFARE). NFCIP-1 uses the same operating frequency 13.56MHz as MIFARE does.

NFCIP-2 (ISO/IEC 21481) is an extension of NFCIP-1, which corresponds to ISO/IEC 14443 Type B as well as ISO/IEC 15693. NFC Forum is the industry standard organization started by NXP Semiconductors, Sony and Nokia in 2004 to aim at the spread of NFC and to decide the detailed standard of NFC.

NFC covers the products of FeliCa and MIFARE in broad sense. If saying it strictly, a NFC tag should be referred as the tag based on the data format defined by NFC Forum.

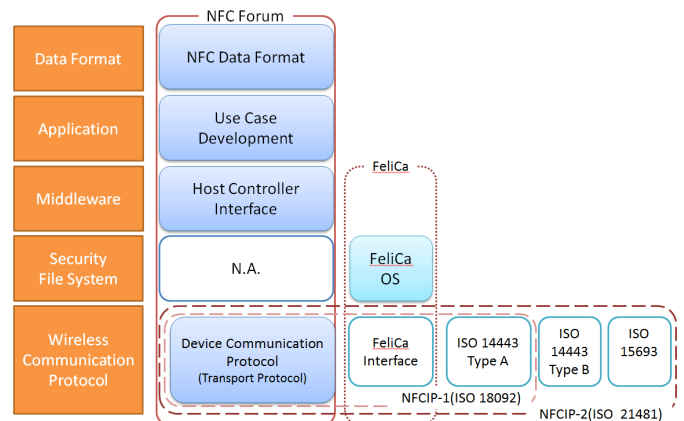


Figure 1. Scopes of NFC, NFC Forum and FeliCa

Figure 1 shows the scopes and relation of NFC, NFC Forum and FeliCa. We pay attention to the fact that FeliCa and MIFARE follows NFC as its communication layer. We use the card IDs, which are called as UID, IDm and NFCID, for identifying the participants.

IV. MEETING PARTICIPANT EXCHANGE PROMOTION SYSTEM USING NFC AND SNS

This section describes the meeting participant exchange promotion system using NFC and SNS.

As we said in the previous section, some off-line meetings are not so successful compared to the on-line discussion. Even if there are many exchanges between members of an on-line meeting, the participants require some ice break to start communicating with each other. One reason is that they do not recognize each other by their online ID (SNS ID) and that they have difficulties in binding the real person and the SNS ID. Therefore, in spite of being acquainted on on-line, the distance will be kept until they have the opportunity of conversation or self-introduction. This psychological distance bars the promotion of the exchange between participants.

The present paper proposes a method to use NFC to connect on-line SNS IDs, on-line meetings, off-line meetings and actual people. Figure 2 shows the workflow of the proposed system. We assume that most of the participants of the meeting have smart phones or tablet terminals with NFC function. We assume that all participants have their SNS IDs (twitter or Yahoo account). This assumption is not idealistic one. In fact, most ICT specialists satisfy the above assumptions. We can imagine the situation where most students and active workers have their own smart phones and SNS IDs in a few years [6].

A. Workflows

The organizer of the meeting prepares the NFC tags assigned with the name of the meeting and the session. The tag informations are kept in a DB. The participants fill in their SNS ID on the pre-meeting registration Web site. They attend the meeting with their mobile terminal (NFC terminal) that has NFC reader. They are required to install application software to promote communication between participants. Each participant has to set their SNS ID, the meeting name and the session names in his/her application. Figure 2 shows the workflow for preparation before conference.

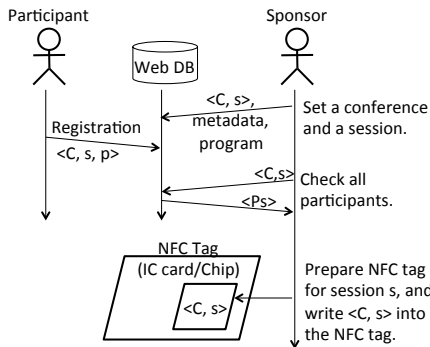


Figure 2. Workflow of before conference.

On the day of the meeting, the organizer sets NFC tags at the hall of the sessions. If the session is in a round table, the tag can be put on the table. In the sessions with a large number of participants, the NFC tag can be set at the front door of the hall.

Participants at a session can read the NFC tag of the session by their NFC terminals. The application of the NFC terminal sends a message to the management server telling that the user is in the session. At the same time, the NFC terminal receives SNS IDs who are attending the session and who are expected to attend the session. The management DB server notifies to other participants the SNS ID of the participant. The application software of NFC terminal can ask the SNS server about the status information of any participant by specifying the SNS ID. The status information in SNS can be used to draw a linkage diagram of participants. A participant may find his acquaintance or find someone who has the common acquaintance. Such suggestion and advice on time is useful to promote communication between participants. Figure 3 shows workflow at the conference, and dataflow between participants, and servers.

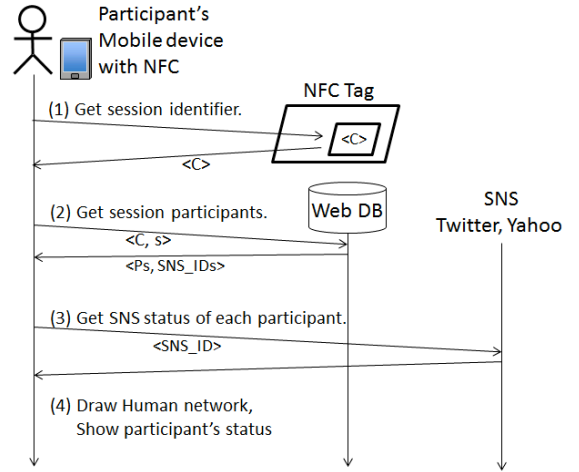


Figure 3. WorkFlow at conference

B. Binding

The exchange promotion system of the previous section requires 3 kinds of bindings between the actual entities and the identifiers of virtual space. The first binding connects a participant to the SNS ID of the participant (Figure 4(1)). The second one connects the meeting, or the session to a NFC tag (Figure 4(2)). The third one connects a NFC terminal of a participant to the SNS ID of the participant (Figure 4(3)).

The first binding between a participant and his SNS ID is relatively easy to realize. For example, the SaaS type meeting management system ATND, which we discuss later, realizes a user authentication using twitter account and Yahoo account. Preparing special accounts for a temporary meeting is awkward and troublesome task for the organizer and the participants. The existing accounts of twitter ID or Yahoo ID are available on the Web and have the biding to actual users. If the identification of participants were the main concern, identification by outer IDs such as twitter or Yahoo would be enough. We can apply the

OAuth technology to for appropriation restrictions of personal information.

The second binding connects the meeting or the session to a NFC tag (NFC chip). The organizer has to prepare NFC tags before the meeting. NFC writer makes the bindings.

The third binding connects NFC terminals and SNS IDs. The application software of mobile terminal can realize the biding of a NFC tag and the participants. Each participant needs to install the application on his mobile terminal and need to set his SNS ID in the application. For most of the participants, the mobile terminal, the application software in the mobile terminal and his SNS ID are uniquely connected.

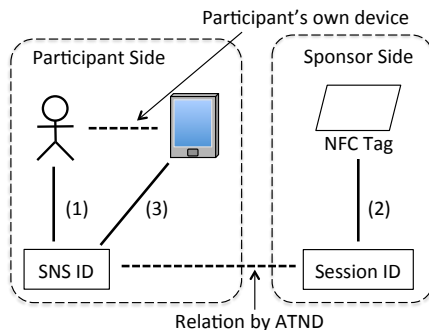


Figure 4. Bindings

V. PROTOTYPE SYSTEM

This section describes a prototype system which are being constructed. We chose a small number of crucial functions to realize as our first prototype, rather than to realize a general system with wide ranged various functions.

A. Scale of Meetings of Prototype System

A large conference may contain several sessions. However, there are a much large number of meetings of single sessions. Such small sized meetings are more active, attractive and suitable for the rapid growing Web world. So, we focused on such small-scale meetings or seminars.

We do not construct from the bottom. Instead, we use ATND system as a back-end management system of meeting participants. ATND is a SaaS-type cloud service by Recruit. The system is widely used as event management service. ATND provides the Web API, by which a mash-up service is easy to realize with other Web services.

ATND admits the SNS account outside of ATND, when a user makes an entry to a meeting in ATND. The social relationship in the SNS is useful to guess the linkage of people, even if the SNS is outside of the meeting.

B. Web DB System

We use the existing services in our implementation. However, we had to construct our own database, when there are no services for particular purpose. The current information of participant attendance-and-absence is such an example.

ATND has a pre-registration system. But, ATND does not support the function to check the attendance-and-absence of a participant in the event day. The prototype system obtains the list of all participants by ATND API before the meeting. The list is kept on the DB together with a slot for the current status of participant attendance-and-absence.

At the meeting day, the system updates the attendance-and-absence status of each participant when he touches his NFC terminal on the tag. The organizer and the participants can grasp the status of participants.

C. NFC Mobile Device Application

The application on NFC terminal has two main functions. The first function reads the ID of the meeting. Then the application sends the meeting ID as well as his SNS ID for Web DB. The user of the NFC terminal is required to set his SNS ID on the application. The second function is to ask the Web DB periodically for the latest information of participants. With these two functions, the status of participant attendance-and-absence is drawn graphically on his mobile terminal.

VI. RELATED WORKS

Yamashita proposed a detection system to find persons in rooms using sensors, and this system may be applicable for conference participant detection [7]. His system may be expensive because it needs multiple sensors, so it is not good for small seminar. Ozdenizci proposed a room navigation system using NFC technology in [8]. Kamei shows a visualization of human network in community [9]. We refer their visualization method for our prototype system.

VII. CONCLUSION

This paper proposed a participant management system of meetings. The system promotes communication of participants by binding SNS ID and NFC tag of participants. We will refine our model, and develop our prototype system in near future.

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