

The Ambient Sound Shower: Experience Sharing with Ubiquitous Sensors

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ABSTRACT

An interactive poster exhibition intended to be a venue for sharing informations and discussing new ideas can feature a very unfrequent attendance of both visitors and exhibitors. The system we present uses ubiquitous sensors to infer the visitor's current situation and provide him if required with audio data. This audio data consists of other visitors' past discussions selected by the user's interest which is inferred from the sensory data. The system tries to enable experience and information sharing in times of few interactions at the exhibition site while trying to not distract the user from the actual exhibits.

Keywords

ubiquitous sensors, contextual information, experience sharing, exhibition assistance

INTRODUCTION

An academic conference is a good example of a situation where people with the same interests try to share their experience and ideas with each other. One part of a conference is usually an interactive poster exhibition where visitors have the possibility to get highly active. The exhibited posters are not only meant to be looked at, visitors are wanted to discuss with the exhibitors and each other about them. As posters often feature mainly figures and images and are not always self-explanatory additional information is very helpful for understanding the content. Usually the exhibitor will be present and give a small presentation about the poster's topic. But this often is only the case during certain scheduled times. During other times the exhibitor might not be in reach and there might be an unfrequent attendance of visitors. For these situations a kind of embodied conversational agent acting as substitute for exhibitors and visitors would be a convenient technical solution. Being able to create an agent like this is still out of reach today.

To receive more insight in how agents should interfere and interact with people is one intention of our work done to create an *interaction corpus* containing human-human and human-artifact interactions as described in [3]. As a first step towards an agent as mentioned above we present in this paper a system which is using the past interactions between the exhibition's participants to present them in a personalized way to other visitors which are attending the exhibition

at times with low interaction potential.

The main focus of our work lies on using the user's and his environment's current and past context in order to:

- achieve an appropriate system's behaviour considering the user's interruptability
- provide the user with meaningful information based on his current situation and interests
- proactively present information without requiring explicit user input.

As this presentation of additional information is not the main attraction in the situation of a visitor, the information should be presented in a non disruptive way, so that the visitor can still keep on focussing the exhibits. For this reason our system is restricted to present the information only in the form of audio data to the visitor. This audio data consists of the conversations exhibitors and other visitors held at the different posters. The system tries to select the most meaningful discussions for the user.

RELATED WORK

There are several other projects in which nomadic information systems for conferences or exhibitions in museums were explored. In the HIPS project [1] a hand-held electronic museum guide was developed. The Museum Wearable [2] uses a similar ubiquitous sensor system to ours. Both projects focus on presenting the user information adapted to his needs and interests out of a database which was created beforehand by a curator or similar person using additional audio or visual data.

In our approach however we try to avoid having to spend a large amount of time to fill the database by hand. We try to acquire automatically additional informations about the exhibits from visitors' experiences situated in the exhibition. This procedure enhances the possibilities of visitors and exhibitors to share their experience and information like it is also the concept of the system described in [4].

UBIQUITOUS SENSOR SYSTEM

The ubiquitous sensor system we use was originally developed for the purpose of collecting human behaviours and interactions between humans and artifacts in order to create an *interaction corpus* [3].

The sensor system consists of three different parts:

- The wearable sensors include video camera, microphone, throat microphone, infrared light emitting ID tags and corresponding tracker for detecting ID tags which are connected to a very small portable personal computer.
- Similar sensors are being attached to different objects and walls of the rooms.
- A backbone of database and application servers is connected to the sensors via a wireless network.

IMPLEMENTATION AND OPERATION

Our system is implemented by a distributed environment and extends the backbone of the sensor system by other application, database and file server.

The recorded audio files are first preprocessed to normalize their sound level and mute disturbing noise before they are streamed over the wireless network to the client computer the visitor is wearing. In order to reduce the bandwidth, several mix downs of the audio files are performed prior to transmission.

For detecting the user's situation and deciding if providing additional information is useful or disturbing the system takes into account the user's context sensed by wearable sensors like a throat microphone or IR tracker. The system infers from the sensory data contextual information like the user's

- conversational status (is he involved in a conversation)
- social status (is he accompanied by people)
- plan (does he want to look at exhibits at all)
- interest in particular exhibits.

In case the user is at an exhibition which not many people attend at that time the system will first try to establish a stimulating ambient atmosphere by playing back on the user's earphone a mix of all conversations that were held at the exhibits by other participants in the past. If the user is then showing interest for a particular poster by focussing it the system will switch to playback a mix of all conversations that were held only about this particular exhibit. The number of conversations the user can hear shows him the amount of popularity this exhibit had. If he keeps the poster in focus the system assumes that he is still interested in it and starts the play back of only one conversation at a time. The presented conversation is assumed to be of particular interest for the user. It is selected by taking several context information of the user and his environment into account (see figure 1). A major role plays a matchmaking between the user and the participants of the conversation by looking at their contextual history.

One of our premises is to avoid the use of automatic speech recognition as the use in real environments is still difficult and error prone. Also the use in more than one domain is still difficult to achieve and requires a large amount work.

SUMMARY AND FUTURE WORK

In this paper we presented a system which tries to compensate that the user can not actively participate in discussions at

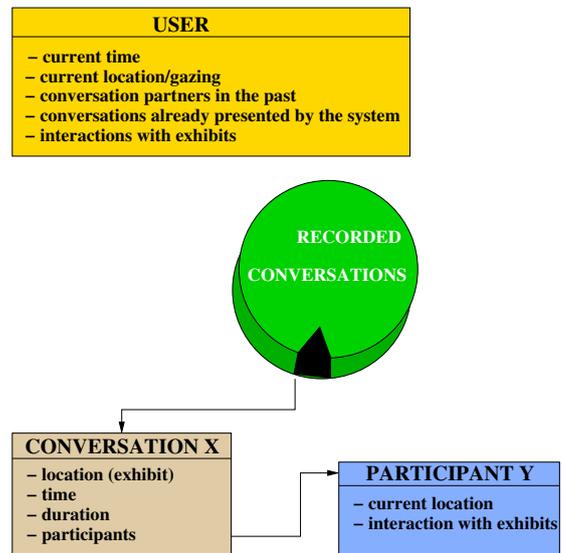


Figure 1: Several contextual aspects of user, conversation, and conversation's participants are used to select conversations.

a poster exhibition due to a lack of discussion partners. Our system instead presents him conversations which were held in the past by people who have similar interests and so can maybe substitute the user as participant in the conversation.

The system is in an early prototype status. There has not been an extensive evaluation about the performance of the system yet. After conducting smaller tests we plan to use the system at the next ATR Open House.

After verifying the use of our system in the poster exhibition domain we plan to port the system to daily life situations.

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