

‘Chatter Colophon’ a Ubiquitous Computing Device using RFID and Text-to-Speech

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ABSTRACT

Many computing devices plays very essential role in day to day life but one has to take care of its functionality and its safety at the same time. As these devices are visible, there occurs a need of technology which is kind of invisible but works automatically and intelligently. In 21st century the technology will be transformed into everyday small objects and it will be invisible as well. This is the vision of pervasive computing also termed as ubiquitous computing. This paper presents the motivation and design of a device named ‘Chatter Colophon’ which is one way interactive under the domain ubiquitous computing. Text to speech conversion technology plays a vital role in the design of this device. Chatter Colophon provides functionalities like Physical world connectivity (using Radio Frequency Identification i.e. RFID), Reminder Systems. Desirable customization for this device is possible through user interface.

General Terms

Ubiquitous computing, Chatter Colophon, Text-to-speech, RFID.

1. INTRODUCTION

The idea behind ubiquitous computing is to get surrounded us with Computers and software that are carefully tuned to offer us unobtrusive assistance as we navigate through our work and personal lives. In ubiquitous computing, computers provide a helping hand with invisible force, assisting the user in meeting his or her needs without getting in the way. [1] Ubiquitous computing inspires application development that is “off the desktop.” Implicit there is the assumption that physical interaction between humans and computation will be less like the current desktop keyboard/mouse/display paradigm and more like the way humans interact with the physical world.[2] The ubiquitous computing is technology that makes the physical and digital worlds interlinked and thus intimately related. This unique linking of bits and atoms opens up numerous possibilities for new computing interactions which are currently explored by ubiquitous computing. Radio Frequency Identification (RFID), one of the earliest technologies to affect this physical/digital coupling and to support transparent automatic identification, RFID is readily available today at relatively low cost and has already found numerous applications. It is one of the most successful technologies in the history of computing. This

RFID concept is used in the ‘Physical world connectivity’ module of Chatter Colophon. As the name ‘Chatter’ suggests the proposed device is interactive; a concept Text-to-speech technology takes place to make this device interactive one. Text-to-speech (TTS) convention transforms linguistic information stored at data or text into speech. In the last few years, however use of text-to-speech conversion technology has grown far beyond the disabled community to become a major adjunct to the rapidly growing use of digital storage for voice mail and voice response systems, which provide telephone information access. [3] The proposed device is also provided with a full-fledged Reminder system with various types of reminders. The Chatter Colophon will prompt the specific messages which are stored by the user in its memory at the given respective time.

2. IMPLEMENTAION WITH DIFFERENT MODULES

The proposed system i.e. Chatter Colophon uses a very constructive and productive concept of ubiquitous computing. The system has two prime features first is Physical world connectivity and the other one is Reminder systems. In Physical world connectivity the Radio Frequency Identification technology is used. In this module the device digitally gets connected with the surrounding objects. RFID identifies a physical object using its unique ID recorded in the RFID tag. Automatic verification of the integrity and the determination of number of missing objects can be done. The determined number of missing objects provides the useful information to locate missing objects. [4]

In Reminder systems Chatter Colophon is provided with various types of reminders such as morning reminders, general reminders, and birthday reminders.

Being a prompting interactive device Chatter Colophon will prompt the messages which stored for a particular task. Text-to-Speech conversion technology plays an essential role for this functionality of the Chatter Colophon. In Physical world connectivity module, when the device will not be able to detect the tagged objects then a particular message will be prompted.

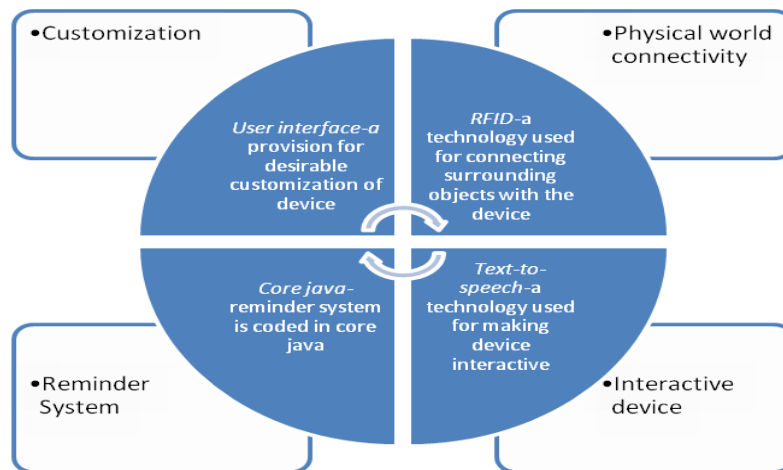


Fig 1: Modules of Chatter Colophon

In reminder system all those set reminders are prompted at the respective assigned time through text-to-speech conversion.

To customize the operation of the device, a user must require an interface which is simple and interactive. The goal of interaction between a human and a machine is effective operation and control of the machine. All the modifications and customizations regarding settings of the Chatter Colophon are done through the User interface which is provided with the device for user.

3. PHYSICAL WORLD CONNECTIVITY

Generally people tend to forget many things such as mobile, keys etc. somewhere outside. They also forget their important stuff at home when they leave for some work. Chatter Colophon a prompting device covers up for this tendency of forgetting things. In this feature of Chatter Colophon the objects which are essential for the user are tagged with the RFID tags. Chatter Colophon itself has an RFID reader which detects these tags and hence the objects. So if a person is having his mobile tagged with RFID tags and he has missed it somewhere outside, then when he enters in the house and especially in the range of RFID reader, The reader will not detect the tag so as mobile and therefore a certain message will be prompted By Chatter colophon to the person that 'you have missed you mobile outside'. similar process will take place if the person is leaving the house and while leaving if he has missed something inside in this case a mobile, then the device will prompt him 'you have missed you mobile inside'.

3.1 RFID (Radio Frequency Identification)

The RFID system consists of RFID tags, an RFID reader/writer and a server. Each RFID tag has a unique ID, and is attached to an object. Moreover, the Unique ID of an RFID tag is related to information of the object. Each RFID tag consists of IC memory with the unique ID and an antenna. The RFID reader is composed of a controller and antennas. Since the RFID system uses electromagnetic

wave, the RFID system is used in various fields. An RFID tag is classified into an active tag and a passive tag. The active tag includes battery into itself. Hence, the active tag radiates electromagnetic wave by itself, and transmits data to RFID reader. However, it is difficult for the active tag to reduce the size of it. On the other hand, the passive tag doesn't include battery into itself. The Passive tag uses energy of electromagnetic wave radiated from RFID reader, and gives back data to RFID reader. Moreover, the passive tag is cheaper and smaller than the active tag. Thereby, the passive tag becomes widely used in these days. Chatter Colophon uses passive tags. [5]

At present the bands of RFID were 135 KHz below, 13.56 MHz, 433.92MHz, 860M ~ 930MHz (that is, UHF), 2.45GHz and 5.8 GHz. The shortcomings for 135 KHz band is that only short distance, about 10 centimeters allowable, and the slow communication speed. This band in the majority of countries is opened for public, and there is no licensing and regulation issue involved, therefore it is widely used in pets control, access control and antitheft tracking. The 13.56MHz band transmission distance is limited to less than 1 meter, membership cards, identification cards, plane tickets and building access Controls are major applications. The UHF band RFID tags can transmit up to 5 meters distance. [6]

RFID tags can be read in a wide variety of circumstances. The tag need not be on the surface of the object (and is therefore not subject to wear). The read time is typically less than 100 milliseconds. Large number of tags can be read at once rather than item by item.

4. REMINDER SYSTEMS

Reminder System is one of the stronger features of this device. User can set remainder at specific time by using interface. There two main type of reminders Morning Reminders and General reminders. At every morning Chatter colophon will prompt the set reminder. User can set the general reminders as per his requirement e.g. if user want to get reminded some work at a specific date and

time then he will set a general reminder for this. At respective time Chatter Colophon will remind him about the work by prompting a message. User can set his desired messages for this type of reminder. In this module user can set birthday reminders as well. Chatter Colophon will inform the user the respective birthdays at respective dates.

5. TEXT-TO-SPEECH

To make Chatter Colophon an interactive prompting device text to speech conversion method is used. To implement this technology a sheer java coding is done. The basic idea of text-to-speech (TTS) technology is to convert written input to spoken output by generating synthetic speech. At the moment, numerous examples of TTS software can be found on the market, for example stand-alone speech programs that convert all types of text inserted through an input interface into high quality realistic speech output (TextAloud [7], VoiceMX STUDIO [8], etc.). Many of them can save the readings to a media file that can later be played on demand. On the other hand, there are also several speech synthesis libraries that can be included and used in various program languages. Free TTS is an example of such a TTS library written in Java programming language [9].

This text to speech program using lib.files of FreeTTS are internally connected to the Physical world connectivity module and Reminder system module so that the device will prompt the stored messages for relative purpose.

6. SYSTEM ARCHITECTURE

Fig. 2 is the architecture of the system which will give the complete idea of what the system is. Our two main modules are connected to the customization block. Customization block is the connected to the user interface block. Meaning of customization is; user can change the settings of reminders and RFID tags. According to the architecture, user interface is important because every user input is connected to the processor through the interface. Then the processor will do its job and we get a desired output.

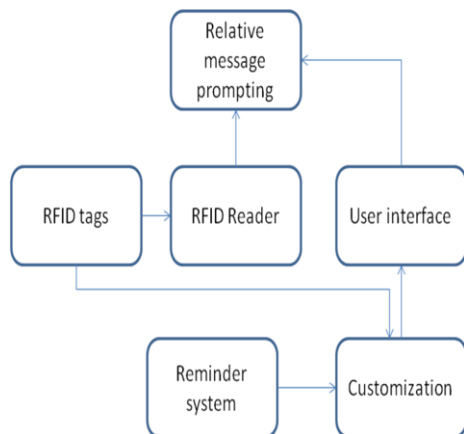
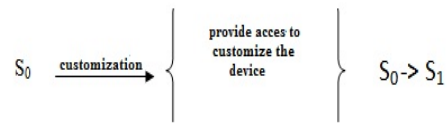
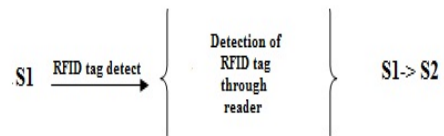


Fig 2: System architecture

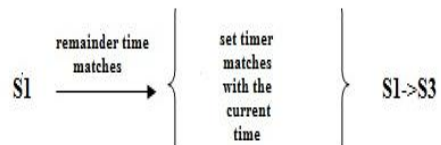
7. WORKING SCENARIO



When user wants to add new remainder or wants to change the RFID tag setting or wants to change the remainder system settings, it is made through customizing the user interface we will provide to user. All the changes get saved at backend. Transition is made from S0 to S1.

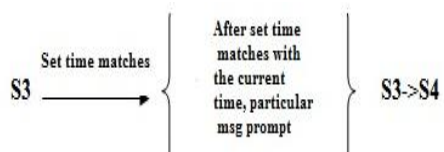


Successful detection of RFID tags will provide the desired action that the user wants. Particular message will get prompted which is again set by the user. Transition is made from S1 to S2.



Successful matching of time that user have set will provide user the action he has set during the customization of device through user interface. This transition is made from S1 to S3.

After detection of RFID tags & finishing the process working at backend, the message that has set by user will be getting prompted using text-to-speech technology.



After set time matches with the current time & finishing the process working at backend, the message that has set by user during customization will be getting prompted using text-to-speech technology.

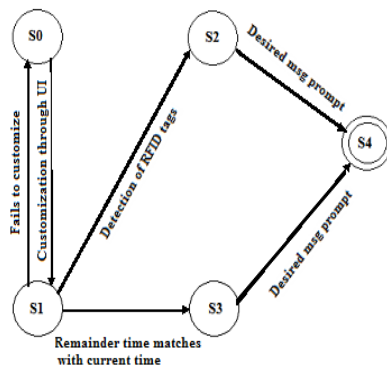


Fig. 3 State diagram of system

8. FUTURE SCOPE

With the use of RFID concept one can implement a ubiquitous computing technology in many other creative ways. Automation of a miscellaneous human work can be done with the use of such devices.

As a future work Chatter Colophon can be made two ways interactive. It can also have a provision for internet connection. If this device is provided with such an internet connection then it might be used as hands free mailing or messaging device. With the use of internet and some internal modifications in Chatter colophon, it will be able to connect to social websites and then it will prompt notifications and updates using text-to-speech. If this device is designed with a slot for SIM card and with hands free calling and messaging facility, it might be a replacement for Landline telephones.

9. CONCLUSION

In this paper there is a proposal of an innovative system i.e. a ubiquitous computing device which is interactive with the user and it automates the manual work of the user, it covers up for the human tendency to forget the things. Discussions are done regarding the use the RFID technology in an innovative manner and Text-to-speech technology to make the Chatter Colophon interactive. There is a consideration of all the short-comings which

may arise during or even post the implementation of the device and the system proposed is able to handle all these problems efficiently. With the use of interface provided user can customize the device as per his desire.

10. ACKNOWLEDGMENT

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