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Android Based Interactive Information System For Museum Using RFID Technology

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Abstract *—A museum is an institution that cares for a collection of artifacts and other objects of knowledge base, cultural, or historical importance and makes them available for general public. The conventional museums and art galleries usually provide visitors either with paper booklets or with audio guides providing a contrive information of the artifact. Thus we have proposed a system which will give the details such as title, artist, historical context, and critical review of the artifact to the visitor in their own respective language. Such an augmented reality application could assist to appreciate art more deeply and also make it more accessible to everyone. The presented museum guide system is implemented as Personal Digital Assistants (PDAs), so as to provide a multimedia touring experience to visitors. Moreover, the museum guide system is capable of being aware of the current position of the visitor, and then automatically displays the related multimedia information of the exhibit that is being gazed by the visitor. As the visitor walks up to a new exhibit the screen on the palm device will be changed to the related multimedia information of that exhibit on its own. To facilitate further improvement in our system we have provided rating and feedback from the users. Besides, the evolution of automatic identification technologies based on the Radio Frequency Identification (RFID) is making identification of objects simpler. The key purpose of this system is offering visitors a fresh and immersive experience when visiting the exhibit.*

Keywords*- Radio Frequency Identification (RFID), Personal Digital Assistant (PDA), Museum Guide, Android, Tags.*

I. INTRODUCTION

India has a rich cultural heritage which attracts many tourists from all around the world. The tourists visit Museums and galleries that improve their awareness for a particular subject, provide inspiration and general education. A good guide can make all the difference between a mediocre and a memorable museum experience as a talented guide is able to attract the spectators with their stories. The key purpose of this system is to provide such an unforgettable experience to the visitor. In this paper we have demonstrated a system to that has an interactive device which can function as a veteran museum guide through textual, visual and audio guidance. Here, the RFID reader receives the identity of an artifact displayed and then compares it with the corresponding ID stored in the database. If a positive match is found, complete information is retrieved and provided to the user in their own respective language. The palm device eliminates the need of human guides which in turn eradicates the malpractices and the spread of erroneous information provided by them. The goal of our project is to design a knowledge-based information system that can be used by tourism organizations, both, to manage their resources promote them on a larger level. We describe how knowledge acquisition techniques and inference services can be used to alleviate tourism experts' annotation tasks and control the validity of the data imported into the knowledge base. Then, we analyze how semantic data can be used to provide targeted information and interactions so as to improve exploratory search. In a human-computer communication context, data that have been internalized also need to be externalized. To attract potential tourists, Museum can present their territory via Android Based Information System(ABIS). When visiting this system, end-users need to have the means to discover the tourism resources that this territory has to offer. In current tourism information systems, several factors often slow down and limit end-users' exploration of the information space. In the second part of this report, we offer to analyze the externalization process and to present a framework of analysis to characterize exploratory search. We describe how data related via explicit semantic relations can be translated into targeted information and interactions and articulated within a system of interfaces that can let end-users explore, thoroughly, the information space[1].

II. EXISTING TECHNOLOGY

Many technologies can be used in palm devices like, camera, zigbee, Bluetooth, Wi-Fi, infrared and RFID. But in comparison to all other methods only RFID provides accurate results in the least cost per unit. The use of camera to identify the artifact in the museum can many times be a complicated process requiring byzantine algorithms which are time and resource consuming. Radio-frequency identification (RFID) technology is among the best solutions for this issue because it is fast, robust, inexpensive and accessible everywhere. In order to make operations of the system as friendly as possible, RFID technology is exploited to associate artifacts, their background stories and related artifacts which make the system very simplified in nature. People in modern life are quite good at enjoying their free time [6].

Knowledge-based trips, such as visiting to exhibitions, museums and galleries are getting more popular. People could simultaneously enjoy their holidays and learn new ideas that would not be noticed in the daily life [2]. Walking in a gallery, a simple painting may tell you a history about Vikings. In such an occasion, a normal visitor without further help is no way to see exhibits more then what are said on the introduction tags [4]. This is as shown in the fig. 1.

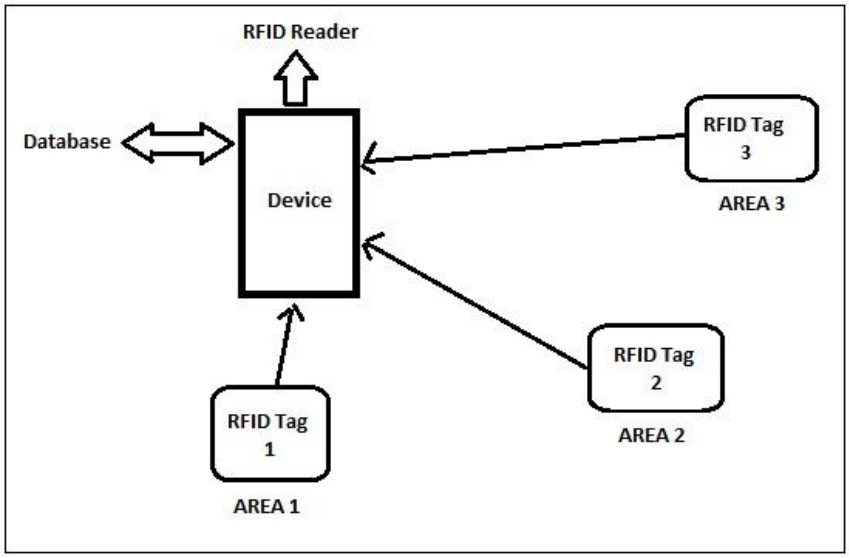

Fig. 1 System Architecture

III. SYSTEM COMPONENTS AND ARCHITECTURE

The heart of this project is ARM11 processor which communicates with various hardware components via input port. It is powered by a 9V power supply. There is 256mb RAM and 1GB ROM interfaced with ARM processor to help it work efficiently. This RAM is utilized to buffer the audio tracks and visual information with efficacy. There is a provision of external memory card to store the audio and video information and retrieve it whenever required by the user. The advantage of using a removable memory card is that it can be updated with latest information without tuning on the system. There is an RFID module EM-18 interfaced to the ARM processor via serial interface port. The RFID module scans the artifact and receives unique code from it and retrieves the related information. There is a circuit of audio amplifier connected to a 3.5mm universal headphone jack as in fig. 2. It is used to provide audio information to the user about various objects in the museum. We have also interfaced the 7"TFT LCD display with resistive touch panel which serve two purposes:

- It works as an output device and displays the information to the user.
- It acts as an input device taking the input from the user with accuracy.
- Using a large 7" display with a high resolution ensures better visibility to the user. This Operating system is Android which encapsulates all the hardware and provide a stable platform for the application software.

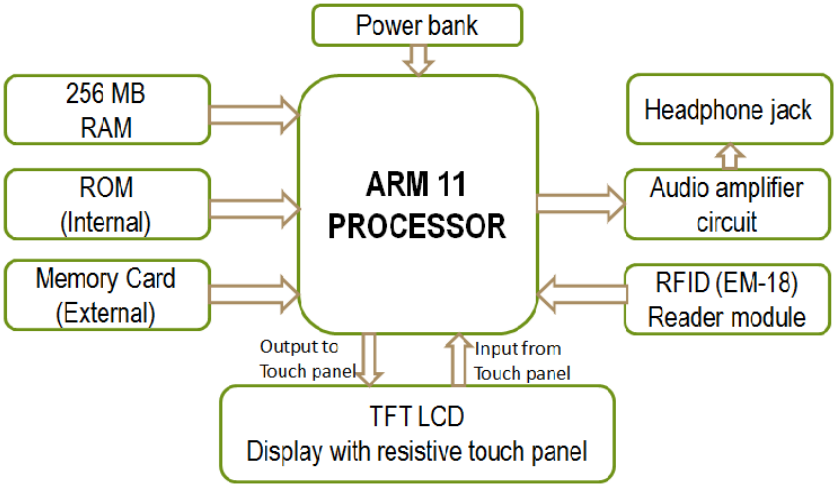

Fig. 2 System diagram

IV. FLOWCHART

First initiate the system and the RFID tag for a valid tag. After initiating the tag wait for a valid RFID tag authentication. Select a language suitable as per the preference viz. English/Hindi/Marathi. Next is to select two user

options available i.e. Audio/Visual Audio. If Audio is selected then the audio data of the respective RFID tag from the memory of the microprocessor will be presented to the user. As well this is done for Visual Audio. But in this case the Visual Audio data will be displayed to the user. There is a provision of feedback facility in the system.

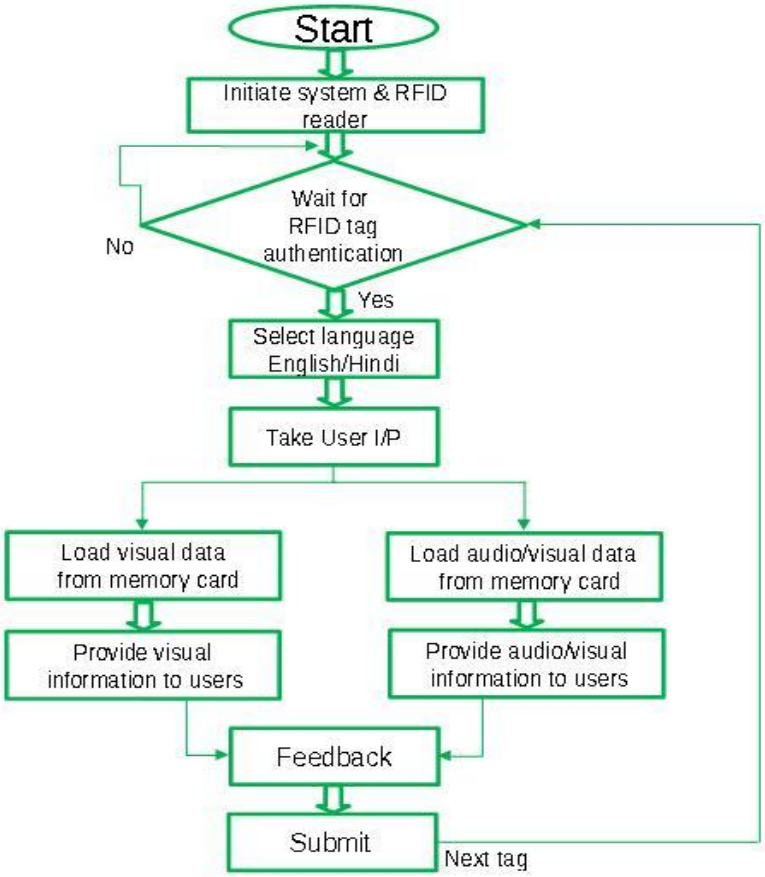

Fig. 3 Flowchart

V. PERFORMANCE ANALYSIS

This system is based on ARM and RFID technology. ARM processor has been used for its efficient capabilities and lower power consumption. An RFID tag is attached near the exhibit. The tag is identified by the RFID reader built within the device. The RFID reader is interfaced with the ARM processor which identifies the exhibit scanned and displays its information on the TFT LCD screen and also in an audio form through the headphones. The user will also provide valuable feedback which will be used for future developments and statistics. To provide the system with the above listed capabilities, a suitable information architecture has been designed, reacting users' profile and visualization issues. Summarizing, the system arranges the content to deliver according to four basic identifiers:

- Language
- User level
- Device type

Then, these four pieces of information are arranged in a tuple: (item ID, lang ID, level,device). Thus, the information structure is hierarchical and can be represented through a tree-shaped layout listing several resources for each item and, for each resource, a variety of implementations. The flow of information happens as described in the above paragraphs describing the system as well as in the app. Thus, the device by interacting with a given artwork, sends parameterized information to the underlying framework. We highlight that such a piece of information is composed by a static part embedded in the RFID tag, which is completed with a variable portion depending on users approaching the items, according to the schema of the tuple already introduced. This results in a query to be executed on the underlying data structure written in JAVA, which returns the selection of the best suited contents to the visitors. Contents are altered into a page through a display performing the final rendering. This system was built on a laptop computer. The system was programmed using eclipse software for developing the control command for the RFID reader. A relatively low cost device was considered at this stage in the development, therefore a passive type of RFID was used. The system utilized a EM-18 RFID reader as the locating sensor. This type of RFID is based on the RS-232/ USB communication protocol,

ISO14443A standard and a maximum 10 - 15 cm communication range. It should be noted that an active RFID device can be alternatively adopted to increase the contact range between the reader and the tags in order to expand the feasibility of this guidance system. The tag used in combination with the RFID reader is Passive RFID, which has a 1 KB memory. This type of tag consists of 16 sector sets and 4 block sets. A total of 64 data blocks (16 x 4) can be dened to contain all the location and spatial information required for indoor guidance.

Performance	**GPS**	**Bluetooth**	**Infrared**	**RFID**
Accuracy	Low	Medium	High	High
Signal Error Ratio	High	Low	Low	Low
Power Consumption	High	High	Low	Low
Penetration	Bad	Good	Bad	Good

Table 1 Comparison of Indoor Locating Techniques

VI. EXPERIMENTAL RESULT

Our proposed system consists of the PDA touch screen device as shown in the fig. 4. We have provided various options for the visitor.

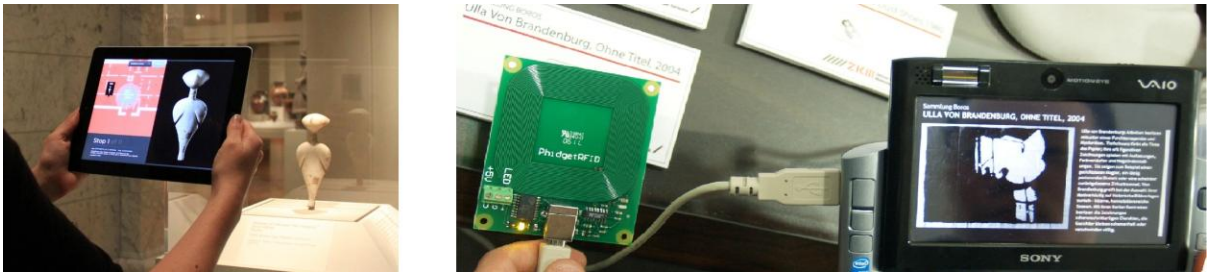

Fig. 4 Displaying the artifact information

VII. CONCLUSION

Museums invest human and financial resources to improve the learning experience that they offer to their visitors. Especially groups of visitors, like school going children, tend to carefully observe only a small fraction of the exhibits, unlike younger visitors which usually move fast from one exhibit to another. Therefore, by rushing among the exhibits, visitors cannot fully explore the provided learning experience that the museum has designed for them. So that, within a limited time user can get the appropriate and correct information about the object. This paper presented guide systems that are used in dissimilar environments. We can also use internet (3G or WiFi) to enhance the user experience and retrieve related information for the artifact.

Parameter	**Android Based Information system**	**Traditional system**
Information type	Audio, Visual & text	Audio & text
Screen type	TFT Touch panel (7")	Non touch panel (upto 2.5")
Language options	Provided (English, Hindi, Marathi)	Not provided
Operating System	Android	N.A.
Processor/Controller	ARM 11 Processor	8051 Microcontroller
Feedback	Provided	Not provided
User Interface	Graphical user interface	Not present

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