NFC based patient real time identification system

Deveshree Wankhede[1], Ankita Kokate[2], Mansi Nikam[3], Saburi Dhumal[4]

1,2,3,4 Department of computer engineering, SSJCOE Dombivli, Mumbai University, India.

---***---

Abstract - *NFC is short range communication technology which provides two-way interaction between devices. In a Health care sector, the use of NFC not only used to reduce the health care costs but also provide automatic and streamlining patient identification system. NFC technology can be available in any form such as NFC tags which stores short information in it as a unique identification system. This feature can be helpful in real time application. And now development rate in mobile technology can be used in such application. Now a days most of the smartphones are NFC supported. NFC technology can be available in any form such as NFC tags which stores short information in it as a unique identification system. This feature can be helpful in real time application. And now development rate in mobile technology can be used in such application. Now a day's most of the smartphones are NFC supported. Use of NFC based identification will surely reduce mistake of giving inappropriate treatment to patient in highly populated hospitals. In health care field, accuracy and efficiency are more important factors. So it will provide these aspects very well. It is wireless technology which not only easy to use but also technical and non-technical people like Doctors, Nurses can use them efficiently.*

Key Words: **Near Field Communication , healthcare, NFC tag, NFC enabled smartph one,Wireless communication**

1. INTRODUCTION

NFC is nothing but a short range communication technology and it provides bi-directional interaction between devices without contact and it also connects devices only with a single touch. The NFC tag are used for unique identification of patients in hospital then it will be a great step towards automation of healthcare. Benefits of NFC based identification surely reduce mistakes of giving incorrect treatment to patient in highly populated hospitals. It is kind of contactless transaction through which user can wave the NFC enabled mobile phone or a NFC tag over a compatible device to send data without touch the device or go to bunch of steps to set up a connection.

In hospital, each and every patient has different illness and different symptoms. When doctors operate on patient there are chances of getting confusion between patient's diseases and treatment which can lead to fatal death.

If a robust healthcare system is made using NFC it may protect patient form such fatal medical mistake. Along with this issue patient health record and report are retained on paper which is difficult to maintain and unreliable. NFC is technology manufactured by various companies like Philips,

Nokia and Sony etc. NFC is a platform technology Interface and protocol. NFC the frequency it operate is 13.56 mz and data which can be send at 106,212 or 424 kb per sec. Modes of NFC:-
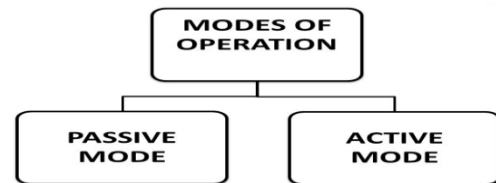

Fig 1: Modes of Operation

Passive mode:- In Passive mode, Tags and other small transmitters come under the passive devices, that can transmit data to NFC devices. And for these it doesn't require any power source. And They don't really process any kind of information sent from other sources , and cannot allow to connect to other devices which are passive. It cans also be used in walls or advertisements [2].

Active mode:- In Active devices, They allow us to do both task such as send and receive information, and able to communicate with each other as   well as with passive devices. In today's world, NFC enabled smartphone are active devices. Examples includes NFC technology which involves Public transport card readers and touch payment terminals etc[2].

 Modes of operation in the NFC which are depending on the kind of information is to be exchanged in the communication:-

Peer to Peer mode: This mode is used for two-way interaction between two NFC devices, for example confidential data exchange between two NFC enabled smartphones. There are two way behavior one is during transmission of data it become active device and second while receiving data it become passive device.

Card Emulation mode: In this mode the NFC device it can be act like a contactless smart card and it can become helpful in making payments at shopping malls and even tapping it onto a public transport system. This has leading towards the development of the concept which is called as the "virtual money".

Read/write mode: This mode allows reading as well as writing the content on the transponders and labels. It is

mostly used in fields such as customer loyalty and geographic localization by locating NFC labels.

1.1 Comparison with Bluetooth

The main advantage of NFC over Bluetooth is that NFC requires such low power consumption than the new Bluetooth 4.0 as well. This lower power consumption also has drawback of shorter range than Bluetooth. NFC contain a range of upto10 cm on other hand Bluetooth can send data up to 10 meters or more than that. When it comes to speed, NFC has faster connectivity. Inductive coupling is used in NFC technology.

	NFC	RFID	IrDa	Bluetooth
Set –up time	<0.1ms	<0.1ms	~0.5s	~6 sec
Range	Up to 10cm	Up to 3m	Up to 5m	Up to 30m
Usability	Human centric Easy, intuitive, fast	Item centric Easy	Data centric Easy	Data centric Medium
Selectivity	High, given, security	Partly given	Line of sight	Who are you?
Use cases	Pay, get access, share, initiate service, easy set up	Item tracking	Control & exchange data	Network for data exchange, headset
Consumer experience	Touch, wave, simply connect	Get information	Easy	Configuration needed

Table 1: Comparison between Technologies

1.2 Security Aspects of NFC

At first thing is that the communication is short range and with the concern of user interaction, it does not really assure secure communication [13]. One of the common concerns with NFC technology is data corruption or data manipulation. This may occur when a third party intercepts the signal being sent and tries to alter it which may leads to modification of data or corruption of data [14]. Another aspect is the data insertion is done by the attacker inserts messages into the data exchange between two devices. But this is possible only in case that the answering device needs a very long time to answer. If the inserted data can be transmitted before the original device starts with the answer then only insertion will be successful [15]. For detecting errors in NFC it uses the CRC technique (Cyclic Redundancy Check) which allow feature devices to check whether the received data has been corrupted or not . In the proposed system the use of NFC tag and card is done in such a way that it contains all the features and benefits of the NFC and smart phones. The use of NFC tag or bands with the NFC enabled

mobile gives the advancement of storing the digital data of patient to a server in a single tap.

2. Literature survey

Everyday tasks such as paying for groceries, receiving adequate health care treatments. The key aspects of the NFC technology are its small size and nonvolatile memory. It operates on radio frequency signals which make it user-friendly. Some cities in Japan are using NFC tags as a version of a train ticket which track the distance travelled. With NFC technology, hospitals can track patient information and prescriptions in real-time [1].

The existing system in healthcare involves manual intervention where there is note taking, updating the notes to the computer and maintaining the records under a unique id assign to every patient. This process is usually very slow and error prone due to which there is latency between data gathering information accessibility [1].

NFC makes use of interacting electromagnetic radio fields in mobile phones. Near Field Communication (NFC) is a set of standards for portable devices. It allows establishing the peer-to-peer radio communications. NFC enabled smart phones are necessary to transfer data.

After considering the literature, it can be proved that so many work has been done with the help of NFC in different sectors ticketing, smart posters etc. But no much work has been done with NFC in healthcare. Following are some present systems available with NFC.

A. NFC in Tourism

NFC technology will be very much important for various stakeholders in industry of tourism[8]. NFC device able to provide essential details to tourist so in this way it becomes convenient for tourist. NFC tags placed on monuments can give more information about that monument.

B. Loyalty Management in Retail Sector

Use of NFC loyalty manager replaces the use of loyalty cards and coupons. With use of NFC and it can help to reduce the work of keeping cards and vouchers in wallet [10]. By just touching NFC mobile phone to the reader, vouchers and the loyalty cards are sent.

C. Medical field

An application using NFC to track patients with some diseases has been deployed in Karachi [10].For reducing medical errors NFC tags are used for identification of medicines, in which tag is placed on medicine [11]. NFC technology can be helpful in tracking of patient information by collecting and transmitting in real time from variable health related devices like heart monitors, body temperature

sensors And blood pressure sensors to the patient's NFC tag. Recent development in technology is now a day playing a helpful role in technical assistance to support people with visual disabilities in their everyday tasks and to overcome various problems they face everyday. To overcome the problem of assistive tools in many countries, a wide variety of inexpensive applications use Near Field Communication (NFC) tagging technology in development of assistive tools for people having visual disabilities. Near Field Communication (NFC) based appointment system was developed which only requires the patient to tap their NFC card to make the registration process successful. Intelligent NFC based appointment system was developed to prioritize the appointment based on profile/age of the patient. NFC tags can be used for the reliable patient's record and for automating the health flow with Body Sensors.

3. Architecture

The proposed architecture for NFC based health care system is shown in Fig. 1. When any patient has to be admitted in the hospital then it will be done by using proposed system. If the patient is visiting the hospital first me then patient's information will be filled at the reception counter such the name, address, phone number and relative's phone number, initial amount to be filled in the card, ward number bed number etc. and in this way the patient will be admitted. Patient will be given the NFC tag enabled NFC card.
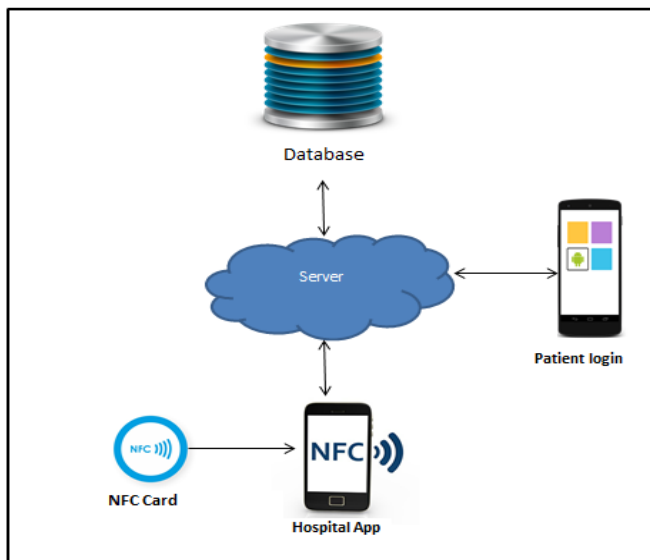

Fig -2: Overall Architecture of Proposed System

When the doctor will go on rounds for check up he/she will just tap his NFC enabled mobile phone to the NFC Card and he will get all the details of the patient's disorder/disease, consulting doctor, prescriptions given previously, bed no etc. Then the new prescription given by the doctor will be stored on to the server. Doctor is also able to see all reports of patients and able to write which test to be conducted on

mobile only. When the medicines will be brought from the medical or the patient will use the hospital facilities like Pathology, x-ray, CT-scan. Here medical manager and pathologist have limited access to database and they can only retrieve and read information about prescription and tests to be conducted respectively[12].

4. Methodology

This section explains the methodology of the Near Field Communication based system for health management.

A. Patient Admission

The patient admission procedure includes activities such as the patient's name, age, blood type, contact details, emergency contact details, allergies are collected at the receptionist and stored on the NFC tag as well as in the hospital database. In critical situations such as accidents, in this scenario, Health management system provides instant access to these details which help with the initial medication.

B. Prescriptions and Comments

The patient carries this NFC tag during each visit to the doctor. By tapping this tag at the NFC reader, the doctor can view the details about the patient. The patient's details and medical history in the database can be secured by making it password protected. Using the login ID and password the authenticated doctors can view the data and prescribe medicines. Prescriptions and comments made by the doctor are automatically updated to the hospital's database. Through the global link which stores the medical record, prescriptions and wireless sensor data, the care-takers can have a constant update on the health of the patient. The same NFC tag can be used to buy medicines at the pharmacy [15].

C. update report on server

NFC can be used to monitor patients whose monitored data needs to be collected and sent to a doctor periodically, say once in a day. After successful making test of a patient as prescribed by a doctor pathologist upload details of patient report online by mentioning the desired doctor. It will helpful to maintain report on server and reduce chances of mismatching the reports [12].

D. Appointment

Paper based appointment mostly required patient or fill up the form and submit to the registration desk or they could simply place their identification card or appointment card in the box provide and wait for their name to be called. So to avoid this proposed system provide feature to fix appointment online to reduce time and effort [12].

5. Conclusion and Future Scope

This technology is secure and easy to transfer of patient info in medical record. In 10 to 15 years experts predict that it will be commonplace in everyday life Patient easily tracks health information at home. Using NFC in hospital system decreased the required paper work. Providers quickly access accurate data from patient record, no need for special staff or user training. The possibilities are endless with the increased amount of research going into NFC. The benefits of NFC are clear. In the hospital, the database can be used to extract information about the number of patients suffering a particular chronic disease, treatment given for a particular medical condition, etc. The system provides more time for patient care as no paperwork is involved. The patient can use the same NFC tag to buy medicines from the pharmacy. Currently the prescriptions are handwritten on paper which is prone to misreading. Using the proposed system the pharmacist can read the Prescriptions from the tag using the NFC reader, thus avoiding such fatal mistakes.

REFERENCES:

[1].International gournal of computer applications technology and research volume 4-issue 12,956-959,2015,ISSN:2319-8656

[2].https://www.androidauthority.com/what-is-nfc-270730

[3].AV.Gopi Krishna C.Sreevardhan,S.Krun,S.P.Kumar,"NFC based Hospital real time patient management system".in IJETT-VOL.IS 4-IS4-APR2013.

[4].S.challa,G.Geetakmari,CSSN Prasad,"Patient data viewer:an android application for health care" in india conference,2011 annual IEEE 16-18 DEC 2011.

[5].Laganga L.R. lawerence (2008)sr clinic no-shows and overbooking reflection and new direction in appointment Yield management.

[6].Laganga L.R. lawerence (2008)Service appointment scheduling and walk in short term and tradition scheduling.

[7]A. Lotito, D. Mazzocchi, "OPEN-NPP: an open source library to enable P2P over NFC", 2012 4th International Workshop on Near Field Communication

[8]. Coskun, V., Ozdenizci, B., & Ok, K. (2013). A Survey on Near Field Communication (NFC) Technology. Wireless personal communications.

[9]. near_field_communication_in_cell_phones.pdf white paper from NFC forum.

[10] Adam Marcus,Guido Davidzony, Denise Law, Namrata Venna, Rich Fletcher, Aamir Khanz and Luis Sannenta, "Using NFC-enabled Mobile Phones for Public Health in Developing Countries", IEEE Proceedings on First International Workshop on Near Field Communication, pp. 30-35. 2009.

[11] Lahtela, A., Hassinen, M.and .Iylha, V., "RFID and NFC in healthcare:Safety of hospitals medication care", IEEE proceedings on Pervasive Computing Technologies for Healthcare, pp. 241-244, 2008.

[12]. 2017 2nd IEEE International Conference On Recent Trends in Electronics Information & Communication Technology (RTEICT), May 19-20, 2017, India

[13]. Coskun, V., Ozdenizci, B., & Ok, K. (2013). A Survey on Near Field Communication (NFC) Technology. Wireless personal communications, 71(3), 2259-2294.

[14]. A. Alzahrani, A. Alqhtani, H. Elmiligi, F. Gebali, M. S. Yasein, "NFC Security Analysis and Vulnerabilities in Healthcare Applications", IEEE Pacific Rim Conference on Communications, Computers and Signal Processing (PACRIM), ISBN: 978-1-4799-1501-9, 27-29 Aug. 2013, pp.

[15]. Ernst Haselsteiner and Klemens Breitfuss: Security in near field communication (NFC), Philips Semiconductors, Printed handout of Workshop on RFID Security RFIDSec 06, July 2006.

[16]. Near_field_communication_in_cell_phones.pdf white paper from NFC Forum.