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Smart Campus an Android and Web based Application using IoT and NFC Technology

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Abstract **–** Researcher in smart campus area is still growing, where every researcher defines the concept of smart campus with less perspective that hasn't been conical in the same conception of the concept. Education is the one of the basic necessity of every individual. Running a collage with all, students, parents and faculties with complete communication between each other on a single platform will be boon for everyday associated with it. This system considers the basic and primary need of College. The main contribution of smart campus development based on the new advance technology to make easier campus life. Contact less technology provides easy way to enter data when accessing any class room or equipment in the campus. IoT support easier way to report a real time environment status and cloud computing is use to organize various information effectively and provide data service The purpose of Smart Campus helps to deal with the present problems faced by schools, campus or educational organization. The Proposed System carried out the task such as Student Attendance, Marks Report, Smart Teaching, video Surveillance, and Notice and so on. It Improves Quality of education and is efficient of time. This system is carried out using Internet of Things (IoT).This system makes use of Web Application and Android Application which communicate with NFC tags to Perform Campus activities. Cloud computing is used to store information and to communicate with user.

Keywords **- Internet of Things (IoT), NFC Technology, Arduino, Cloud Computing.**

I. INTRODUCTION

Smart campus is to promoting learning research, innovation and developing capacity through the using advanced technology. Smart campus has focused on innovation, searching for solving problem new way to build a stronger education ecosystem, but at present it is unable to satisfy these needs, and fail to provide the variety integrated information services to implement educational modernization and educational informationization. The campus network should be converted from mono network access services into stereo smart network application services. Smart campus takes use of advance technology, Internet of Things (IoT), cloud computing, face recognition, virtualization technology, networking and other new technologies to change the living way of students, faculty to interact with each other. The smart campus teaching, research, administration and resources application systems is integrated to improve application flexibility and speed of response interaction, enabling intelligent services and monitoring and management campus model. Recently, solution based on self-service terminal, cloud computing, software engineering techniques, rfid method and other techniques have been proposed. The application of advanced technology has brought a new revolution to the development of smart campus network. Based on the NFC technology In Campus, college people work for long hours to complete Collage activities. Many Collage owners are seeking comfort and convenient way to run collage. The idea of having control over collage environment from anywhere and anytime driven a seek technique to remotely control and monitor. However the cost of the system for both installation and maintenance are still major concern. The motivation behind this work to make a campus operate in smart way, present society running a collage with all students, Parents, and faculties in communication with each other on a single platform will be a boon for everybody associated with it. This system "Smart Campus" is focused on providing a solution for problem like security and administration of collage by monitoring the campus with advanced technology called Internet of Things (IoT) and NFC Technology.

A. OBJECTIVE:

- The objective of this system is to provide the essential requirement for campus in smart way using Internet of Things (IoT).
- A Web application and android App has been developed to control activities. Smart campus can be achieved using Internet of Things (IoT).
- Various activities have been done into Internet of Things (IoT) and computation of stored value is done using cloud storage.

II.LITERATURE SURVEY

In order to overcome inefficient traditional way of campus management system we develop an efficient smart system to maintain campus in digital way use many old electronic based technology To maintain a campus in traditional way is very difficult and time consuming process in campus area All those having their advantages and disadvantages, smart campus is the best replacement to bulky, time consuming manually or digitally management of campus system. This system is for monitoring campus in smart way and performs various activities for security purposes.

TABLE 1: DIFFRENCE BETWEEN DIGITAL CAMPUS AND SMART CAMPUS

	Digital Campus	Smart Campus
Technical environment	Local area network internet	IoT, Cloud Computing, wireless network, mobile terminal, RFID
Application	Learning resources in digital form distance learning, digital library, network management	Intelligent system using sensor, interoperability, and control ability
System Management	Isolated	System sharing, intelligent, push

To overcome some problems related with these systems we are using advanced technology such as NFC Technology and Face recognition to maintain and monitoring the campus area. Proposed system preserves the records in a large database using cloud computing than the conventional method.

III. IMPLEMENTATION

Near Field Communication (NFC) is a form of advance technology has many improvements due to the increasing availability of NFC enabled devices in recent year. It is used for short range communication based on the existing standards of Radio frequency identification (RFID) infrastructure. Simple and safe two ways communication between NFC enabled devices is made possible using this technology. Wireless Technology is fast replacing the wired technology. According to Information Handling Service (IHS), End users now expect that a single device can be used to access variety of services, such as communication, entertainment and commerce. This has brought huge improvements of contactless technology; NFC being one of them, NFC is a promising technology that establishes connection between two similar enabled devices over a radio frequency, but only within a close range of less than 4 cm. Instead, any two NFC enabled phones and NFC enabled tag can pair by just tapping against each other.

IV. BACKGROUND

Mobile devices are pervasive in our everyday life and have a high acceptance rate. Thus NFC enable mobile devices have the potential to be a new technology that would change the way do things, making things easier, more intuitive and more effective. NFC is a short-range wireless communication technology focused on around affirmed and full grown gauges in the field of RFID and smart cards. The RFID tag originally holds an antenna for receiving and transmitting the radio signal and an integrated circuit for processing and storing information and for modulating and demodulating the signal. The lack of affordable and regularly available mobile devices containing RFID readers, has led to the more or less prevalent absence and unattractiveness of the RFID technology. NFC is a derivative of RFID and uses the concept of magnetic induction for communication if the two NFC enabled devices lie in a close proximity. These 2 technologies for the basis of NFC which are explained below:

A. RFID

RFID is a form of wireless communication uses radio waves to identify and track objects. This system has readers and tags that communicate with each other by radio frequency. An RFID System is made up of three components: Antenna, Transceiver and Transponder (the tag).

B. MAGNETIC INDUCTION

In magnetic induction: A small electric current that creates a magnetic field around it is emitted by the reader. Another coil in the client device receives this field and turns it back into electrical impulses for the communication of data explains this concept. On activation of NFC, a signal is sent to the NFC chip inside the smartphone. Electricity flows through the circuitry of this chip that generates a magnetic field. At this stage, it is the smartphone that uses power to generate a magnetic field. Due to this a magnetic field is induced in the transponder or a device that does not have its own power supply. This results in the creation of radio field by the transponder that interacts with the electromagnetic field generated by the smartphone.

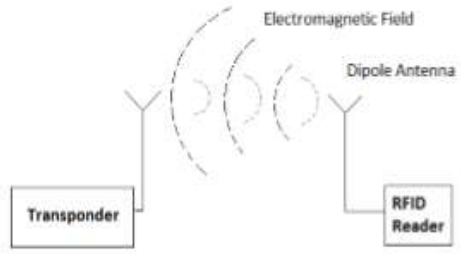

Figure 1: .Magnetic Induction

V. NFC

NFC is a wireless short-range communication technology based on existing standards of the RFID infrastructure. NFC operates in a short range of four to ten centimeters for communication. For a communication NFC device generates a radio frequency in 13.56 MHz spectrum. The principle of magnetic inductive coupling is used to send and receive data within close proximity. NFC supports data rate of 106 Kbps, 212 Kbps and 424 Kbps.

A.COMMUNICATION WAYS

Communication in NFC is either in active mode or passive mode. Active device is the one that generates RF

and has its own power supply. The passive device is powered by another active device. Following are the two communication ways

1) Two-way communication: Devices that is capable of reading and writing to each other. For example, using NFC, you can touch both Android devices together to transfer data like contacts, links, or photos.

2) One-way communication: One-way communication: Reading and writing to an NFC chip is done by a powered device (like a phone, credit card reader, or commuter card terminal).Hence, when a commuter card is tapped on the terminal, money is subtracted from the balance by the NFC powered terminal.

A. COMPARISON OF NFC WITH OTHER WIRELESS DEVICES

Table 1: comparison between NFC and other devices

	NFC	RFID	Bluetooth V2.1	IrDA
Information Transmission	Coupling of magnetic field	Magnetice field	Electro magnetic C radiation	Infrared D Light
Operating Frequency	13.56 MHz	13.56 MHz	2.4 GHz	~ 2 MHz
Modes	Active-active, active-passive	Active-passive	Active-Active	Active -active
Transmission Range	0.04 – 0.1 m	Up to 1 M	10 – 100 M	0 – 2 M
Network type	Point-to-point	Point-to-point	Point-to-multiple	Point - to-poin t
Communicate On	Two way	One Way	Two Way	One Way
Maximum data rate	424 kbps	128 kbps	2.1 Mbps	16 mbp s
Setup time	< 0.1s	< 0.1s	~6s	~0.5 s
Maximum Current Consumption	< 15mA	< 15mA	< 30mA	< 5mA
Authenticatio n n and Encryption	Yes	Yes	Yes	No

B. OPERATING MODES

NFC devices can be in any one of the modes which are reader/writer mode, peer-to-peer mode or card emulation mode. These operating modes are based on ISO/IEC 18092 NFC IP-1 and ISO/IEC 14443 standards.
1) Reader/Writer Mode in Reader/Writer modern NFC enabled device reads NFC tags like contact less smart cards and RFID tags. A tag if in close proximity is immediately detected. Once detected, it can read data from or write data form to the detected tag. Important application for this mode is smart posters.

I. NFC CARD EMULATION

NFC-enabled devices like smartphones to act like smart cards, allowing users to perform transactions

II. NFC READER/WRITER

NFC-enabled devices to read information stored on inexpensive NFC tags embedded in labels or smart posters when it enables.

III. NFC PEER-TO-PEER

NFC-enabled devices communicate with each other to exchange information in an adhoc fashion

V. STANDARDS

A. ISO 14443 A/B Two version of ISO 14443 are –A and –B. Similarly, ISO 144.043 shows two versions of packet framing and low-level protocol (ISO 14443-3). The uppermost layer of the ISO protocol stack defines a command interface (ISO 14443-4) for transferring information. This well-known standard was originally developed for contactless chip card communication over a 13.56 MHz radio.

ISO/IEC 18092

It also defines both the Active and the Passive communication modes of Near Field Communication Interface and Protocol (NFCIP-1) to realize a communication network using NFC devices. ISO/IEC 18092 specifies, in particular, modulation schemes, coding, transfer speeds, and frame format of the RF interface, as well as initialization schemes.

VI. ARCHITECTURE

A. NFC (Forum Specification Architecture) NFC Forum Specifications is a technology standard that in tunes and extends existing contactless standards unlocking the full potential of NFC technology across the different contactless operating modes. The different types of NFC Forum Technical Specifications are explained below:

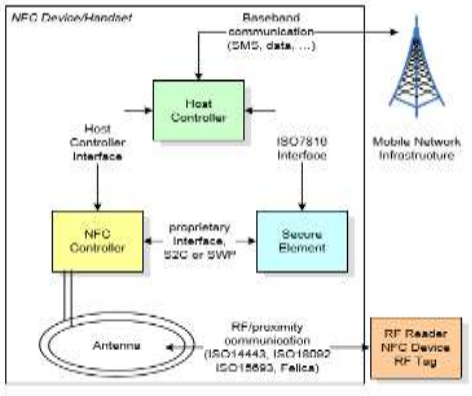

Figure 2: Architecture of NFC enables Mobile Device

VI. PROPOSED SYSTEM

A Web and Android application developed, in the proposed system all the list of registered students in a particular course will be displayed when the lecturer start the application. The attendance is marked on the name of the students that are present, and then marked onto the web portal according to their presence. We are implementing proposed system using advanced technology, (IoT), NFC and Face detection. NFC stands for Near Field Communication (NFC) which is a wireless communication interface for the devices that equipped with NFC. Face detection is used to detect the identity of object using camera. They have five subsystems: data collection, signal processing, matcher, storage and transmission. Steps in proposed system

1. Students mark his attendance using face detection and NFC card on gate.
2. Then student will use own NFC card and Face to mark his attendance in classroom.
3. Monthly report of attendance will be generated.
4. Marks and attendance along with comments will be sent to parent application.
5. Teachers can view student information or Record on web portal and perform activity using web portal.
6. Students are purchase any food items at canteen using NFC card in campus area.
7. Also able to purchase Stationary items.

Record of every student is being maintained by every school, college and university. Faculty has to maintain proper record for the Student activity like attendance, Fee Record, Results, Library record, placement record, sports activity and so on. Authentication system is used to track the attendance of any student, teacher's and is applied in the industries, colleges, universities or working places using NFC Technology. new system will developed for maintaining the student record in a smart way using advance technology.There are different Module in the proposed system above module perform different activities in the smart campus.

1. Student Module

All the registered student will display the dashboard after login and student will various activity will perform in particular login student will able to see notice, marks, attendance in the dashboard student mark his attendance using NFC card and Face detection and monthly report of attendance will be generate Student will access the library for performing an activity related to Library using the NFC card and face detection NFC tag that keeps the student basic data including the login credentials

2. Teacher Module

This module has only two elements smartphone and PC. The PC is optional if the mobile phone is a smartphone; this is because the teacher can make use of the smartphone to interface with the system but because normally limited functionalities are provided by mobile version of web based applications, so it is better to use both mobile phone and a PC. To maintain the student record of student in the college in smart way in the college, teacher will perform the various activity using NFC technology and Face Detection in there login Teacher will perform the various activity like uploading the result, attendance, notices and so on. And also perform the GFM activity using NFC Technology.

3. Admin Module

In this module monitoring the campus in smart way using the advanced technology, NFC Technology, and face Detection to maintain the campus in smart way

4. Library Module

To access the central library in the college will perform using NFC technology, face detection and Internet of things (IoT) and computation result will store using cloud computing. Student will access the library using NFC unique id and face detection.

5. Examination Module

In the examination module examiner perform the activity of exam using the NFC technology and computation result will store using cloud computing.

6. Training and Placement Module

In this module perform various activity related to placement performing using the advanced technology in this module provide the information regarding placement, company history and so on using the advanced technology.

VII. BLOCK DIAGRAM

The proposed smart college can be divided into different sections Internet of Things (IoT), cloud computing. Architectures used in proposed system are given below.

1. Overall Smart Campus-Architecture

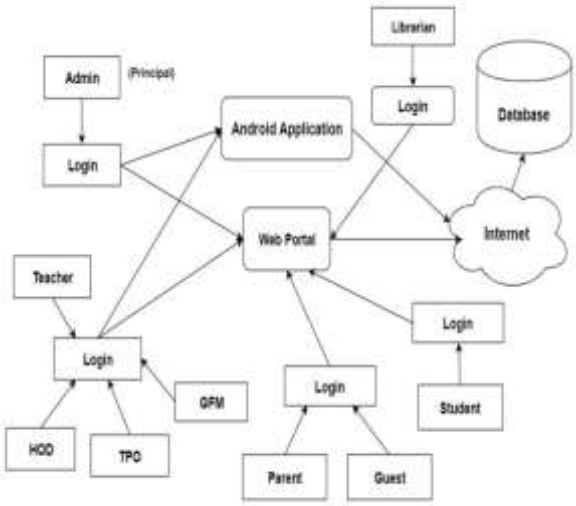

Figure 3: Architecture of Campus system

1. Authentication Module using NFC.

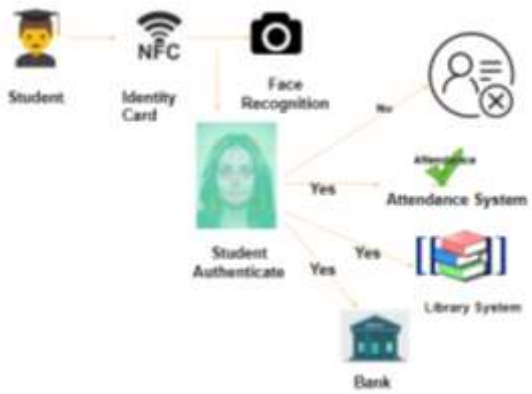

Figure 4: Authentication Attendance Module

VIII. CONCLUSION

Smart campus has been one of the main development directions of the digital campus, and will inevitably change the mode of traditional teaching, research, management, study and living. This paper mainly discusses the topology of smart campus based on NFC technology and face recognition. The design idea of smart campus and its architecture are designed to support research, innovate and develop capacity through the use of existing network facilities in colleges and universities this proposed system gives access to a student via NFC and Face Reconginiton. The inclusion of information technology approaches to optimize already existent practices is to be encouraged as any hope towards achieving the developmental visions of turning the our country from an underdeveloped nation to a developed nation can be actualized by the infusion of information technology approaches and technologies. This proposed architecture can perform the most desired activities of the student in an attractive and user-friendly environment. Typically students have provided features like attendance, alerts and notices, study materials so on. By the lecturer and students which spends a lot of time in traditional way. Also lot amount of time wasted in manual or traditional system. This system will make use of wasted time to utilize it for value added tasks; this will help to improve campus related strategies.

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