Smart Academy an IoT approach
A survey on IoT in education

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Abstract: Internet has been dramatically changed over the years, with help of technology it comes to a world where everything is connected. The network that connects billions of computers will soon become a network that connects all kinds of digital devices, everyday objects, i.e. things. These things, also known as smart objects are interconnected then it is called Internet of Things (IoT). Here we present a survey on how we can use the IoT in an academic environment .With the advancement in sensor hardware technology, cost effective highly sustainable sensors are expected to be attached to all objects around us, so these can communicate with each other with minimum human intervention and also make them to aid us in an efficient method for developing the skills and accessing the progress of students in colleges and schools which may reduce the burden of faculties.

Keywords: Internet of things (IoT), Radio Frequency Identification (RFID), Near Frequency Communication (NFC)

I. INTRODUCTION

Imagine a world where trillions of objects can sense, com-municate and share information, and they are interconnected over public or private Internet Protocol (IP) networks. These interconnected objects have data regularly collected, analyzed and can be used to perform some action, and at the same time provide intelligence for planning, management and decision making. This is the Internet of Things (IoT) [13].

We are seeing the electrification of the world around us. Almost any manufactured good now contains an embedded processor, along with user interfaces, that can add programmability and deterministic command and control functionality. The electrification of the world and the pervasiveness of embedded processing are the key that helps in making objects smart [14].Here anyone and anything can be a smart object. These smart objects are internetworked together and they communicate and share information with each other. The IoT concept was coined by the member of the Radio Frequency Identification (RFID) development community and now it has become more relevant to the practical world largely because of the growth of mobile devices, embedded and ubiquitous communication, cloud computing and data analytics[13].

With more physical objects and smart devices connected in the IoT framework, the impact and value that IoT brings to our daily lives become more prevalent. People make better decisions about taking the best routes to work or choosing their favourite restaurant and so on, the list is limitless. New services can be used to address society challenges such as remote health monitoring for elderly patients and pay-as-you-use services. For the government, the convergence of data sources on shared networks improves nationwide planning, promotes better coordination and helps in quicker responsiveness to emergencies and disasters. For enterprises, IoT brings business benefits from improved management, tracking of products, new business models and cost savings attained by the optimization of equipment and resource usage. For Academy it is not a new concept several countries such as UK, Japan, USA etc has applied IoT in their classrooms. The education management process is not restricted to delivering lectures the interactive way to the students it could be expanded to include all academic activities that a student or staff might practice inside the campus [2].

II. OVERVIEW OF INTERNET OF THINGS

The next wave in the age of computing will be outside the realm of the traditional desktop. In the Internet of Things (IoT) paradigm, the objects that surround us will be in the network in one form or another. Radio Frequency Identification (RFID) and sensor network technologies will help us to meet these new challenge, in which information and communication systems are embedded in the environment around us. This results in a large amounts of data which have to be stored, processed and presented in an efficient and easily interpretable form. Smart connectivity with existing networks and context-aware computation using network resources is an indispensable part of IoT. The success of Internet of Things will need the computing paradigm to go beyond traditional mobile computing scenarios where we use smart phones and portables, and evolve into connecting everyday existing objects and embedding intelligence into our environment [8].

The Internet of Things is the new age of intelligent com-putting that provides a privilege to communicate around the world. The objective of IoT is Anything, Anyone, Anytime, Anyplace, Any service and Any network [5].

According to cisco IoT will:

1) Connect both inanimate and living things: The trials and deployments of Internet of Things networks began with connecting industrial equipment. Now the vision of IoT has expanded to connecting everything from industrial equipment to everyday objects. This can also include living organisms such as plants, farm animals and people. For example, the Cow Tracking Project in Essex uses the data collected from radio positioning tags that are used to monitor cows for illness and track their behaviour in the herd.

2) Use sensors for collecting data: The physical objects that are connected possess sensors. Each sensor will sense specific condition such as location, vibration, motion and temperature. In IoT, these sensors are connected to each other and to systems that can understand or present information from the sensors data. These sensors will provide new information for the user

3) Change the types of items that communicate over an IP Network: In the past, communication was with people with people and people with machines. If all of our equipment had the ability to communicate, IoT enabled objects will

share information about their condition and the surrounding environment with people, software systems and other machines. This information can be shared real time or collected and shared at specific intervals and everything will have a digital identity and connectivity, which means you can identify, track and communicate with objects.[11]

Automatic identification technologies such as Radio Frequency Identification (RFID), Near Frequency communication (NFC) are fundamental to the realization of IoT. RFID tags attached to objects provide unique identification numbers that can be read wirelessly by interrogating devices. This helps in obtaining information related to individual instances of objects which are managed by networked back-end systems [9].

A. Architecture of IoT

The IoT architecture shows us how various technologies are related to each other. This architecture shows us how they communicate and provide scalability, modularity and configuration of IoT deployments in different environments.

The architecture of IoT system divided into four layers: object sensing layer, data exchange layer, information integration layer, and application service layer. The four-layer architecture is shown in Fig.1
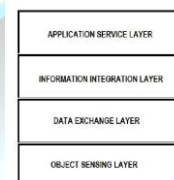

Fig. 1. Architecture of IoT

The object sensing layer is where sensing the physical objects and obtaining data is handled; the data exchange layer is where the transparent transmission of data is handled; the information integration layer handles recombination, cleaning and fusion of uncertain information received from the networks, and integrates these information into usable knowledge; the application service layer provides services for various users [10].

III. IoT In Education

IoT in Education is a two-faceted term. Some sees IoT as a course or a part of a curriculum so as to show students how our future life in the 21st century will look, where IoT can bring Interconnection, Human to Human, Human to Things, and Things to Things. Others see it as a tool to enhance education and make academic life easier [2]. Some of the scenarios where we can use IoT in education are

A. Classroom

Attendance is considered one of the most time consuming process in classrooms Using IoT here will not only help in saving time but also improves the performance of students and teachers. Sumit et.al [7] proposed a technique where we can identify individual students based on their unique RFID tag identifiers. With this technique we can generate report of attendees for a particular course with help of data centric student attendance database system and an improved overall efficiency.

The Cheah, Romin and Tanvi [4] proposed system is a web based attendance system using NFC technology in Android smartphones. The system has a reader unit and server unit which is hardware and software components respectively. The hardware component of reader unit are NFC enabled Android smartphone and student materials card with NFC tag while the server unit is the computer that host web services and databases.

The student taps the matric card towards the NFC android Smartphone and automatically the attendance will saved in the server. The lecturers check the attendance of the student from the Lecturers smartphones. The system also does give the information to students as well to check their attendance if its marked or not.

B. Library

Adding IoT to library helps in adding more services and offer rich library experiences for patrons. Most of the librarians are familiar with library using RFID which does the interaction of machine with tags and thing that using IoT makes it different is here we communicate using books [1]. Larsan, Arokian and Sheba [5] proposed a technique where the full library is IoT based. The different modules are

1) Authentication

The user places NFC enabled phone over the NFC reader at the entrance of the library. This sends the users information to the library database. If the user ID and the fingerprint match, the user can access library's local area network.

2) Locating a book

Each rack in the library contains a device known as the Rack Monitor and each library book is embedded with an NFC tag. The rack monitor contains a NFC reader and is connected to the library's WLAN. When a book is placed in the rack the rack monitor reads the information about the book through the NFC tag. When it reads the books information, it updates details books details in the library's database. When the user searches for a book through his mobile, the database identifies the rack. Once the rack is found, the rack information is sent to the user. A triangulation based local positioning system helps to find the users coordinates and an application guides the user to the correct position of the book

3) Issue and return

If only the book is issued, the book can be taken out of the library. NFC scanners will be placed at the entrance and exit of the library. If an unissued book is taken an alarm will be raised. The return of the book is by dropping the book in the return box which has an NFC reader.

C. Lab

IoT in labs helps in saving not only time but also avoids wastage of energy. Hsing [6] proposed a system where students who enter the computer labs have RFID tags which is read by the RFID reader and seat will be assigned to the student. On the lab side, the system tracks the usage of every computer in the lab. The system notes the information of computers that are occupied, available or malfunctioning. The students may use computers or mobile devices to connect to the system and get the usage status of the selected computer lab. This will allow the students to decide if they still want to go to the labs which may be filled.

The temperature sensor module of ZigBee checks the temperatures in the lab .The air conditioner are controlled in the lab by checking the temperature in the lab through an application that monitor the changes in the temperature. In addition, the usage of each computer is tracked so that the computer will be shut down once it has been idle. As a result more energy will be saved

D. Department

Hany and Amer proposed a system where students can

select their academic program with its related courses through the academic services defined for each department. This pro-cess can be done online either via particular IoT machines located within the campus through reading their RFID or by accessing traditional web or mobile application whereby the regular authentication process should be done. The Department provides all students with other IoT academic services that includes the e-learning services and social and academic events. We can Sending important notifications to smart devices (phones or TVs) [2].

IV. PROPOSED SYSTEM

IoT in education has its pros and cons. Taking attendance using RFID tags can cause a huge risk to privacy. RFID tags with tracking system that tells the actual position of the student was implemented in Northside Independent School district of San Antonio, Texas but this was strongly opposed by parents and students [15].The technique proposed for the lab is not feasible solution considering the number of computers and cost.

Even though IoT is still at its infancy, it has huge potential for libraries and these libraries have large fraction of books that are difficult to manage [1]. IoT can be used not only for finding a book, issuing or returning but also can be used for providing recommendations, saving energy by controlling the appliances and many more. In the proposed technique the NFC readers are placed in every shelf. When a person takes the book out of the book shelf the status of the book in the database is updated as taken. When the user places the book back on the book shelf the position of the shelf in the database is updated. This helps in finding the exact location of the book. The proposed technique also consist of the following:

1) Signaling an alarm when the person misplaces the book: The books in libraries are difficult to manage when misplaced. This can be solved by providing an alarm system that sounds an alarm when the book is misplaced.

2) Providing a detailed abstract: It's a time consuming task to select a single book out of many. Providing a oral abstract for the books taken out of the book rack is the perfect solution. When a book is take out of the book rack the signal is send which leads to the speaker attached to the book rack to produce the abstract.

3) Provide recommendations: Whenever the user keeps the book back in its place the signal is send, the system provides suggestion about similar books available in the same rack.

4) Letting the user know about new arrivals: The user will get messages on his phone about new arrivals based on past histories or transaction.

5) Encrypt the data to make it more protective: Protecting data is very important for privacy .Whenever the data is send they are encrypted and send to prevent hacking.

IoT has a great potential for libraries and may make value addition to library resources and assets. IoT will be the next after internet that will bring huge change to libraries

V. CONCLUSION

The research adopt to the concept of Internet of Things in education where we can connect anything anytime and anywhere. IoT is the second wave in digital revolution and like all revolution it causes lots of gains and losses [16]. IoT in education helps in saving time and increase performance of the education system but at the same time it causes many loss such as privacy and security. In the future new techniques may be introduced that can solve these problems and contribute in interconnecting the network over a wide range.

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