A Survey on Various Technologies Available for Smart Lab based on Internet of Things

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Abstract— This paper explores some approaches to harnessing the IoT in teaching field. The Internet of Things (IoT) is a fast emerging system of physical sensors and connected devices, enabling an advanced information gathering, interpretation and monitoring. Smart Lab is still in need of an efficient attendance system which takes attendance in real time. Various Research papers are summarized in this paper. This paper describes the concept of development of Smart Lab which takes attendance by using RFID technology. Then it improves the efficiency of attendance taking system by analyzing the reading range of RFID system. The Smart Lab concept also monitors and controls the temperature and humidity of the computer system.

Key words: Internet of Things, Smart Lab, Smart Attendance System

I. INTRODUCTION

The Internet of Things (IoT) is the network of physical objects or "things" embedded with electronics, software, sensors, and network connectivity, which enables these objects to collect and exchange data.[6] The Internet of Things allows objects to be sensed and controlled remotely across existing network infrastructure, creating opportunities for more direct integration between the physical world and computer-based systems, and resulting in improved efficiency, accuracy and economic benefit. Each thing is uniquely identifiable through its embedded computing system but is able to interoperate within the existing Internet infrastructure. Experts estimate that the IoT will consist of almost 50 billion objects by 2020.

IoT is expected to offer advanced connectivity of devices, systems, and services that goes beyond machine-to-machine communications (M2M) and covers a variety of protocols, domains, and applications. The interconnection of these embedded devices (including smart objects), is expected to usher in automation in nearly all fields, while also enabling advanced applications like a Smart Grid, and expanding to the areas such as smart cities.

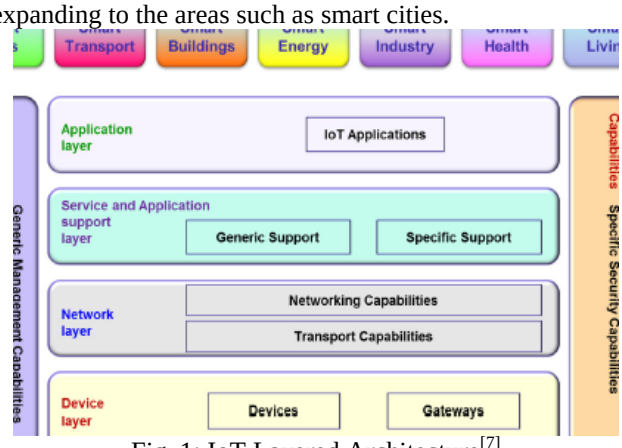

Fig. 1: IoT Layered Architecture[7]

"Things," in the IoT sense, can refer to a wide variety of devices such as heart monitoring implants, biochip transponders on farm animals, electric clams in coastal waters, automobiles with built-in sensors, or field operation devices that assist firefighters in search and rescue operations. These devices collect useful data with the help of various existing technologies and then autonomously flow the data between other devices. Current market examples include smart thermostat systems and washer/dryers that use Wi-Fi for remote monitoring.

II. LITERATURE SURVEY

A. Research Directions for the Internet of Things [1]

Author has stated the five prominent research communities are: Internet of Things (IoT), mobile computing (MC), pervasive computing (PC), wireless sensor networks (WSNs), and, most recently, cyber-physical systems (CPS). In this paper, as a backdrop to identifying research questions, vision and scope for a smart world is highlighted. Then it discusses open research questions categorized into eight topics. The research discussed is representative rather than complete. Two goals of the paper are: 1) to highlight a number of significant research needs for future IoT systems; 2) to raise awareness of work being performed across various research communities.

B. Internet of Things – A Paradigm Shift of Future Internet Applications [2]

In this paper author has discussed the potential scope of IoT. The major technologies involved in IoT infrastructure and some important application domains for IoT are also discussed. The security and privacy issues of two important technologies of IoT, namely WSN and RFID are also discussed.

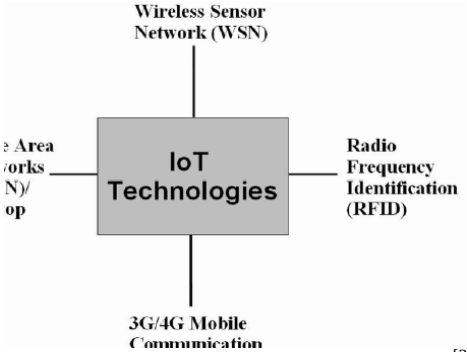

Fig. 2: Major technologies involved in IoT[2]

C. Educational Living Labs; A novel Internet-of-Things based Approach to Teaching and Research [3]

This paper explores some a novel approaches to harnessing the Internet-of-Things (IoT) as a teaching and research vehicle in education. For teaching we argue that the Internet-of-Things provide a highly motivating topic to

capture students' imaginations, and a perfect platform for teaching computer science. In addition, Authors explain the potential for entire campuses or buildings to be constructed from Internet-of-Things technologies and the potential for this infrastructure to act as a teaching platform. This proposition is perfectly captured by the axiom "The college building (or campus) is the lab". This philosophy is part of a wider movement that started in the EU, called Living Labs. In achieving these aims, work seeks to combine a number of concepts; first they utilize the Internet of- Things, second they incorporate Living Labs ideas, third they harness the iCampus vision, forth they use the 'Smart Box' concept and finally they implement the Pervasive-interactive-Programming (PiP) paradigm. They contend this approach can be used in various mixes to produce highly motivating and effective educational environments. They illustrate this work by describing the application of these ideas to a real-world venture, the Harlow UTC (in the UK). The main focus of this paper concerns the use of PiP, together with the Internet-of- Things, to teach elementary programming skills. In in support of this they present results of an evaluation of PiP with 18 participants (students and staff) of varied age and gender. The main conclusions of these evaluations were that PiP enabled students and staff, with diverse backgrounds, to quickly master the programming skills involved. The paper concludes by describing future plans for this work.

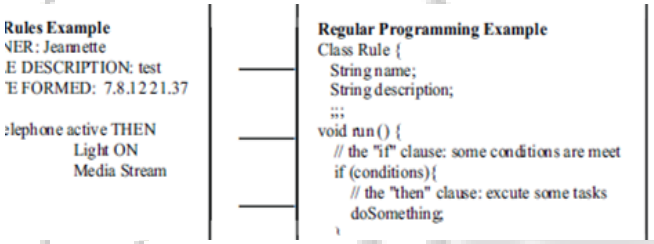

Fig 3: Equivalence between PiP Rules and Regular Programming Constructs[3]

D. Smart Attendance System by using RFID [4]

The paper describes the development Smart Attendance System (SAS) that will take an attendance by using information extracted from the RFID database handling system. In order to have complete system functionality, smart attendance system is needed to integrate with RFID database handling system. SAS will fetch the appropriate data from RFID database in order to execute the attendance taking process. This project is to simplify attendance recorded system by using Radio Frequency Identification (RFID) technology. SMART ATTENDANCE SYSTEM (SAS) is a web based application. With the RFID kit from Mifare Corp, the system has been developed by using PHP programming languages and MySQL for database support. The system also has been integrated with the RFID Database Handling System for a full functionality system. The information from the RFID Database Handling System has been used for most part of this SAS system. The Basics of RFID Technology are discussed.

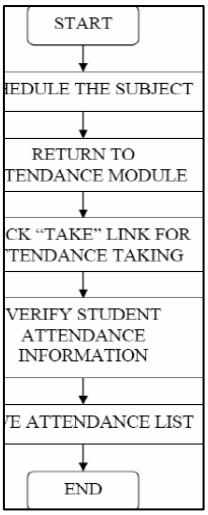

Fig. 4: Method of attendance module system[4]

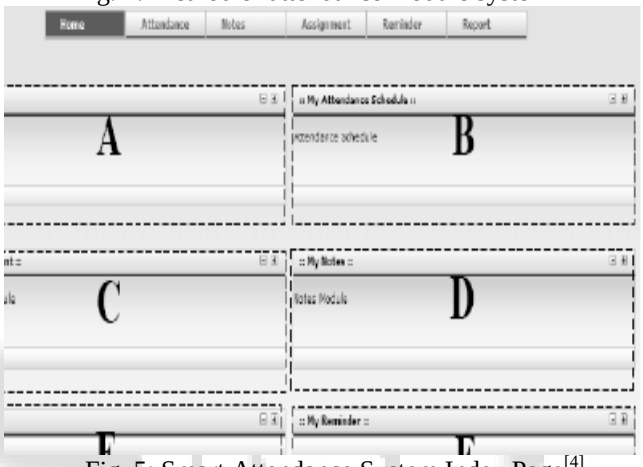

Fig. 5: Smart Attendance System Index Page[4]

E. Smart Classroom Roll Caller System with IOT Architecture [5]

Smart classrooms generally differ from other pervasive information technologies such as RFID. But the academic office is still lack of one effectual methodology to collect the 100% student actual attendance in time at the end of every period class. Nevertheless, the roll-call function in the smart classroom would be critical especially when they implement the RFID student's ID card to track the student attendance. And then the roll-call function only can lead to read everyone's ID card individually which can't avoid the agent to punch at the beginning of every class.

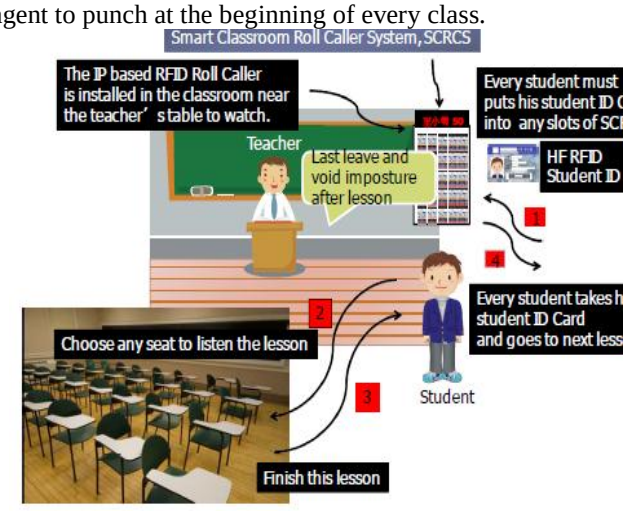

Fig. 6: Conceptual mode of RFID roll call system[5]

In this paper, they propose an efficient mechanism by IOT architecture, namely, the Smart Classroom Roll Caller System (SCRCS) that installed at every classrooms of university and read the student's ID card accumulatively to present the total number of the actual attendance on the LED display of SCRCS at the beginning of every class and let the all ID cards be visible on the multiple slots of SCRCS to avoid the student agent's activities. Finally, the academic office will collect every student's attendance at every class on time and help students have good study performance.

The standard operation process of SCRCS is divided into three steps as follows:

- Step1: School has chosen this kind HF card Tags as student cards and preload all card Tag IDs into school's database. Usually every freshmen has got the student ID card at the 2nd week while school open. Then every student would use this card for 4 years in the campus.
- Step2: School would install one smart roll caller on each classroom and configure it with IP network. Then the server of computer center would receive the RFID smart roll caller information about students' attendance. In a word, every classroom is implemented as the IOT architecture by RFID smart roll caller.
- Step3: Every students should remember to bring students' ID card when go to school and SCRCS would read these students' card to confirm every attendance.

F. Limitation of the system:

- The first limitation of the SCRCS is that how to educate every teachers to know this new roll call function by this RFID SCRCS.
- We need the teacher to stay at last moment and watch every one take off the ID cards to leave
- If some students forgot to bring their student cards, SCRCS cannot record the attendance for them

III. Conclusion

Reducing the rates of student truancy and chronic absenteeism has been and continues to be an important management goal of every level school systems. Attendance not only affects individual students but also can affect the learning environment of an entire school. In general, the managers of school always ask the tutors and teachers to do the education guidance but it is not the best solution for these chronic absenteeism students. This is an open area of this domain and we are going to work on automatic attendance system which will be effective and based on RFID system in Smart Lab. Smart Lab will also control Temperature and Humidity of the computer system.

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