Apply Iot Paradigm to Smart Communication Model and Experimentation using Beacons

J. Krishna Chaithanya, K. Tejaswini

Abstract: ***Information and communication Technology has become a very significant means to support organization activities to reach its target. However, there is still not enough coordination and integration that makes the work proficient. This paper presents a model of classroom that makes several smart devices such as laptops, projectors connected to Bluetooth or Wi-Fi within proximity area in order to establish communication between students and teachers within the smart environment. Also, the gateway manages classroom smart devices by automatic detection and connectivity and it serves as an application execution platform. The software that is used here is called Beacon with which we can train the students and teachers online. The earlier application of Beacon is only through the direct interaction with students and teachers which is same as the traditional way of teaching. But, here in this paper the trainer need not come into the classroom to guide students or to clear the doubts physically. The trainer communicates through the smart devices even though being so far from the classroom through Wi-Fi. The authority can send circulars, alerts, notifications, and study materials to the students and the faculty can share the notes and case studies to the students whenever unavailable to meet the students directly. Whenever the student enters into the classroom, auto check-in happens and the attendance of the students is marked into the system and this list is centrally accessed by the faculty and authority. Thus, the time consumption of faculty is saved and the classroom becomes very smart with this implementation.***

Keywords **:** ***Bluetooth Low Energy (BLE), communication technology, Radio frequency signals, Smart communication, Smart devices.***

I. INTRODUCTION

Beacon technology is rapidly evolving now-a-days to provide the ease of communication. This technology is being used in various fields like education, shopping malls, theatres, hospitals, government offices, etc. In this proposal, we will discuss about one of its applications i.e. in education like schools, colleges to improve the existence smart communication. Beacon is widely accepted by manyusers due to its facile nature in communication. Beacons are tiny and low cost devices with micro-location based technology devices which can send the radio frequency signals and informs the nearby Bluetooth devices of their presence and then transmits the information. Smart devices like mobiles, laptops, tablets, etc. can capture the signals of beacon and can estimate the distance based on the strength of received signal. When the receiving devices are closer, then the stronger signaling is achieved and when the receiving devices are very long in distance, the strength of the signal is weak[1,2]. Beacons are powered with coin batteries or coin cells. Beacons have a powerful ARM processors, temperature sensors, Bluetooth smart module memory and motion sensors[3]. Not only small standalone beacon devices but also PC's, mobiles and tablets with Bluetooth Low Energy (BLE) support can all run or work as Beacons with the capability of both sending and receiving the beacon signals. Many industrial sectors including educational institutions, event organizing, enterprises, transit systems, retail, finance, etc. have adopted beacons technology solutions to track and to communicate with their existing and inherent customers[4]. A beacon which is fixed on to a shop wall or any public place or event location, can communicate easily with a corresponding Smartphone application and figure out where the person is located this moment with a great accuracy[5].The earlier application of BEACON is only through the direct interaction with the students but, here in this paper the teacher need not come into the classroom to communicate with the students directly[6]. The faculty can virtually interact with the students to guide them through this beacon technology. Thus, the classroom becomes smart and hence the smart communication is achieved between the faculty and the students wherever the teacher is present inside the campus. With this technology, the faculty and the institution authorities can save the time consumption to achieve theirorganization activities[7,8]. Moreover, by placing the beacons around the classrooms and labs, the lecturers can create a more interactive learning environment or workshop.

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II. SYSTEM DESIGN AND ARCHITECTURE

A. *System Architecture*

The project objective is to develop the application system that will connect within the IOT beacon device and connect to cloud to that various operations such as Indoor positioning system. Performing analysis of the collected data from this device will help the student and staff in the growth and improvement of result

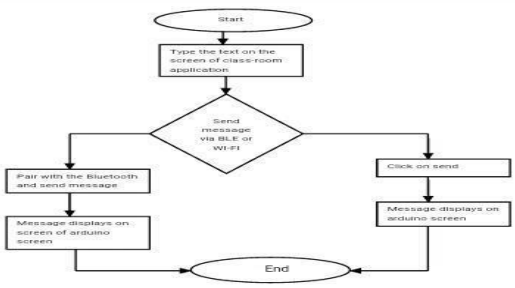

Fig.1 Flow Chart

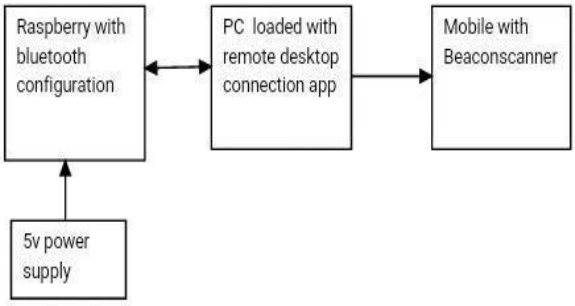

Fig.2 Block Diagram

III. SYSTEM DESCRIPTION

A. The core module

The speed of the processor ranges from 700 MHz to 1.4 GHz for the raspberry Pi Model B+. The SD(secure digital)cards in the form of MicroSDHC (SDHC on early models) are used to store the operating system and program memory. The board have 4 USB ports and 1 LAN port. For video output, there was an HDMI port. HDMI cables transmits digital video and digital audio signals between the two or more devices. They support high-definition and Ultra HD video signals. The composite video are supported with a standard 3.5 mm tip-ring-sleeve jack for audio output. Lower-level output is provided by a number of GPIO pins, which support common protocols like I²C. The B+ models have an in built wi-fi.

Fig.3 Raspberry pi model B+

B. IoT and Web Server

Further vital function of the fundamental module is to act as an embedded web server, the primary responsibilities of this server include, transmitting the message to the students /staff/ higher authorities in the college via Bluetooth or Wi-Fi. The receiver will read the messages and can give the reply to the student/staff. The message transmission through the Bluetooth can be achieved using the Raspberry pi module which is to be configured with Bluetooth[6,7]. If the message is to be sent via Wi-Fi, the android mobile must be installed with MIT AI2 application so that the message that you can't send within the proximity area via Bluetooth, can be sent via Wi-Fi even though being far away from the proximity .This system works as an embedded server approach for connecting with the user and with the internet/ intranet [8].

C. System Setup

System Setup
he primary goal of this project is to achieve the transmission and reception of the messages using BLE(Bluetooth low energy). The PC is initially connected to the raspberry pi B+ module through the LAN cable.Then connect a power supply of 5V to the raspberry pi board and the board must be loaded with the bluetooth configuration before establishing this connection. Now, the setup is ready to perform operations like sending and receiving the messages and the overall system module is in the below figure.

Fig 4 Test Setup

IV. DESIGN AND IMPLEMENTATION

The system must be arranged in such a way that as shown in the above figure 4. The PC must be loaded with the applications like Arduino , Bluestacks and MIT AI2 (classroom). Now, initially the system must be paired(Via Bluetooth) with the mobile (android OS). Check the communication port in the arduino app by clicking on the'Tools' and open device manager in the control panel, verify Whether the port connection is right. If not, connect to the communication port which was mentioned in the arduino app. Now open the application (MIT AI2-Classroom) in the mobile and click on the class to which you want to send the message(as in the figure 5). Then type a message on the screen and click on 'Connect' icon if you want to transmit the message through bluetooth . Otherwise, click on 'Send' icon if you want to transmit the messages through Wi-Fi. Here, the transmission of the messages through the application MIT AI2 (classroom) is achieved till now. The reception of these messages in the arduino application window is displayed. Now, if any response or reply needed to be sent, then the Arduino window have separate space to type the message and to send the text.

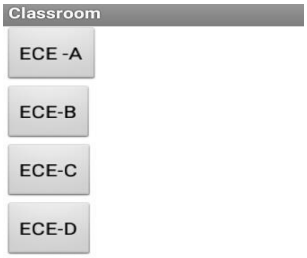

Fig.5 Various classes

Fig.6 Display to type the messages on Classroom app

A. ALGORITHM

Step 1. Open the classroom application and it displays 4 icons (ECE-A, ECE-B, ECE-C and ECE-D) with sub-classes students and staff as shown in fig.5.

Step 2. Now choose the required class to which you want to send the message either to student or staff
.
Step 3. As shown in fig.6 the display of staff with the cursor was ready to type the message and to send the message either by bluetooth with **connect** option or through wi-fi by simply tapping on **send message**.

V. EXPERIMENTAL RESULTS

The following figures accentuates on the results of this proposed system. Here i s how the message was read and sent by the students/staff/higher authorities.

Table 1.Proximity area to transmit the message

Proximity	Status of transmission
Up to 20mts	Transmitted via bluetooth
More than 20mts	Transmitted via Wi-Fi

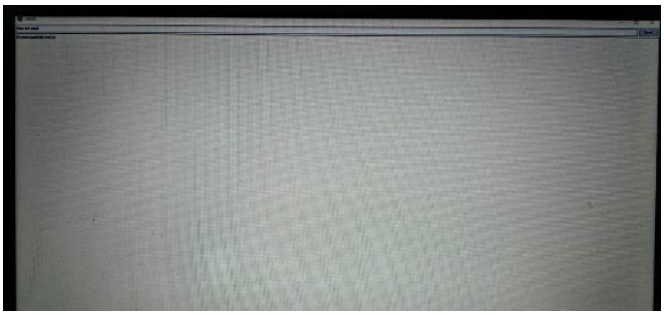

Fig.7 Screen on which messages are read

VI. CONCLUSION

This system solves all the problem occurred in college Indoor area. The previous system uses more hardware device for college activities like marking attendance, managing events and instructing for exam location which takes a long time for all the students to do that type of work. To avoid the time consumption of facilitators/faculty.

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