AN IBEACON BASED SMART CHILD MONITORING SYSTEM

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Abstract— **Child monitoring system is a project which helps to protect children in hospitals and home from theft. The Raspberry Pi is a low cost, credit-card sized computer that plugs into a computer monitor or TV, and uses a standard keyboard and mouse. IBeacon is Apple's implementation of Bluetooth low-energy (BLE) wireless technology that supports iOS and android (version 4.3 or above) devices. This technology helps to transmit an advertisement that includes a universally unique identifier (UUID). Node.js is a JavaScript runtime built on Chrome's V8 JavaScript engine. Node.js uses an event-driven, non-blocking I/O model that makes it lightweight and efficient. We can use raspberry pi as a server for IBeacon transmitter. We use two IBeacons in one room. The signal analyzing depends on the strength of signal received from IBeacon on raspberry pi. A security alert is indicated on web panel for following cases. If the mother is Out of signal, the server does not indicate alert. If the mother and child are out of signal, the server does not indicate any alert. If the signal from Child's IBeacon is disconnected, the security system indicates an alert.**

Keywords— **Ibeacon, rashberry pi, child monitoring, hospitals.**

I. INTRODUCTION

Alerting systems are widely used in various applications. For example, security camera monitoring system used on public places, monitoring unwanted signals on radar, manual alerting system on rails.

Some common Problems faced in using a CCTV camera monitoring system are analyzed. Input supply voltage variations causes blurry image on output. Mishandling causes Iris to get closed during image capture. The image of CCTV camera looks bad due to dirty things or fingerprint on the lens. If the distance of transmission being too far will make the image bad and cause color distortion and deviation. This leads to less secured environment.

Likewise, Problems in human monitoring system (security Guards) are analyzed. Human security holds that a people-centered, multi-disciplinary understanding of security involving a number of research fields, including development studies, international relations, strategic studies, and human rights. Common problems are identified by the nature of human beings. Normally every human can continuously concentrate at one object for only 12 minutes. A lot of problems are faced due to lack of awareness.

We eliminate this type of less secured environment. Costs of these devices are less expensive than CCTV and it also reduces the human security systems. It restricts the theft of Children to a great extent.

The problems on most of the security systems are shown in following sections.

A. Security Cameras

A common problem many installers face with CCTV installations is earth or ground loop problems which makes rolling the tearing picture. There a lot of things that can go wrong with security cameras. The most noticeable are going to be problems with the image itself. Each one of those problems presents themselves with their own set of unique characteristics. These are shown in following Figures

Figure 1 Sun Induced Burn Out Problem on Security Cameras

The sun is more than capable of destroying the cameras if you're not careful. Direct sunlight entering camera's lens will eventually run into image sensor just beyond that. Over time

this will start to create distortions on the glass but this is nothing compared to the effect it has on the image sensor.

Bleeding is usually a result of something being wired improperly and that current is making contact with the conductive surface. That current will move around everywhere and eventually travel right into the camera if it's not insulated.

Another notable problem is hackers hacking the security camera router with simple low cost computer. They use brute force and social engineering method to hack the wireless router username and password. Another way is to place the HD photo copy near the CCTV cameras.

B. Carelessness Of Human Guards

It is human nature to concentrate on their work only up to 12 minutes at a time. After 12 minutes they are physically or mentally in need of rest before they continue with their work. This results in a less secured environment. For enhancing the security system with security guards we need two or more persons.

C. Manual Alarm Systems

An environment implemented with an alerting system, which is activated manually by pressing the electric switch or button usually causes delay. It needs at least one person who knows some incident has taken place to activate the alert system.

II. LITERATURE SURVEY

In existing system, monitoring system is not possible using CCTV and manual security systems. The human monitoring systems results in a less secured environment.
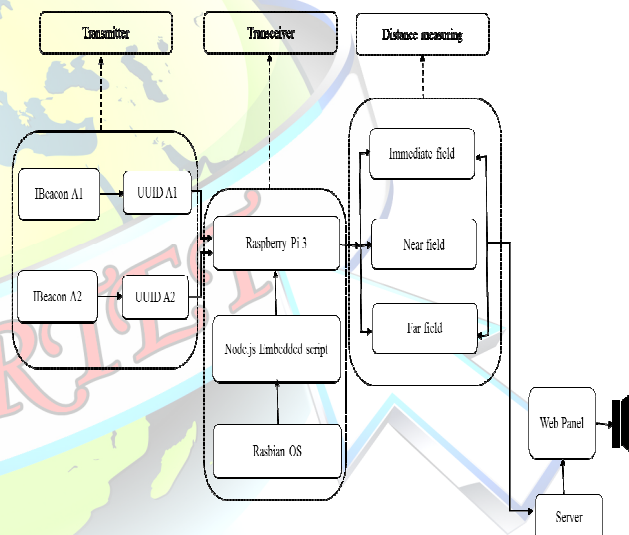
This paper deals with the design and implementation of Smart surveillance monitoring system using Raspberry pi and PIR sensor for mobile devices. It increases the usage of mobile technology to provide essential security to our homes and for other control applications. The proposed home security system captures information and transmits it via a 3G Dongle to a Smart phone using web application. Raspberry pi operates and controls motion detectors and video cameras for remote sensing and surveillance, streams live video and records it for future playback. It can also find the number of persons located with the help of the Infrared sensor. For example, when motion is detected, the cameras automatically initiate recording and the Raspberry pi device alerts the owner of the possible intrusion having a smart phone. Raspberry- Pi has two main components interacting with each other: one is the Web Application that executes on the mobile device's browser and server-side scripts that run in a cloud which will be operated by the Raspberry Pi Hardware tool component.

This paper presents a flexible standalone, low cost smart home system, which is based on the Android app communicating with the micro-web server providing more than the switching functionalities. The Arduino Ethernet is used to

eliminate the use of a personal computer (PC) keeping the cost of the overall system to a minimum while voice activation is incorporated for switching functionalities. Devices such as light switches, power plugs, temperature sensors, humidity sensors, current sensors, intrusion detection sensors, smoke/gas sensors and sirens have been integrated in the system to demonstrate the feasibility and effectiveness of the proposed smart home system. The smart home app is tested and it is able to successfully perform smart home operations such as switching functionalities, automatic environmental control and intrusion detection, in the latter case where an email is generated and the siren goes on..

III. PROPOSED SYSTEM

A. Block diagram

A1 = Child's IBeacon

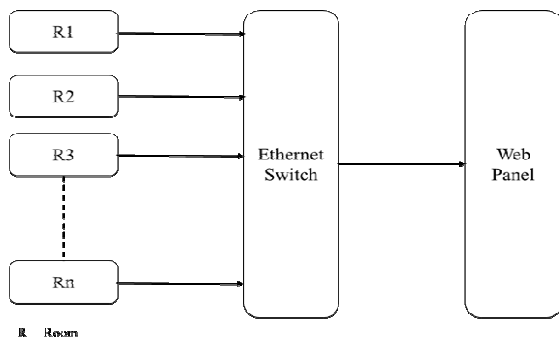A2= Mother's IBeacon

Figure 3 Block Diagram

Figure 4 CMSUWSN on multi room

B. IBEACON

The overall architecture of the general purpose IBeacon zone layers are shown in following Figure. It consists of four major blocks. These are,

Every IBeacon has the unique identity. Simply by using IBeacons mac address to find the status of subject.

Let locate the on and off button of IBeacon. To turn on the IBeacon push button for few seconds and after the blinking of green color light leave the button.

To turn off the IBeacon again push button for few seconds and after the blinking of red light leave the button. The IBeacon's on status is identified by green light blinking and off status is identified by the red light blinking.

C. Raspbian Jessie

The Raspbian operating system is based on Debian Linux for raspberry pi. It comes with basic 802.11 drivers on kernel. Raspbian Jessie requires less space to run and it is a highly secured operating system. Raspbian comes pre-installed with plenty of software for education, programming and general use. It has Python, Scratch, Sonic Pi, Java, Mathematical and more. Download the Raspbian Jessie on raspberry pi's official site given below

D. Creating Bootable Usb Hdd

Win32 Disk Imager is a simple open source application that writes CD or DVD image files to a USB or SD card, creating a virtual disk drive. After the download of win32 from source forge, just unzip the program (no installation required), select the image it wants to create from hard drive and finally the device where it has to be written and in a few seconds pen drive or memory card will become a virtual CD. It can also go back and create an image by copying the data on the storage device, but it can't create it from a CD, for that it will need a different program.Win32 Disk Imager is a simple program that carries out its function to perfection without wasting valuable

resources. The license is available in LGPL-2.1. Original version developed by Justin Davis <tuxdavis@gmail.com>Maintained by the ImageWriter developers. After the progress is finished, mount the SD card into the raspberry pi 3 SD /SDHC card slot.

E. RASPBERRY PI 3

Raspberry pi 3 has the HDML port for video output and 4 USB port for keyboard, mouse connections. Let the working on raspberry pi is done by the HDMI, USB keyboard and mouse. Else use this following steps to connect raspberry pi 3 to PC.

F. Angry IP Scanner

Angry IP Scanner is an IP address scanner tool. It is used for scanning of IP addresses with the goal of finding alive hosts and gathering interesting information about each of them. It can start by specifying the IP addresses to scan (local IP is entered by default) and clicking the Start button.

1) Main Terminology

Feeder - generator of IP addresses for scanning. Angry IP Scanner provides various kinds of feeders: IP Range, Random, and IP List File. It can select a feeder using the combo box next to the Start button.

Fetcher - gathers specific information about a host, e.g. ping time, hostname, open ports. Feeders usually represent columns in the scanning results list. It can select additional fetchers by choosing "Tools->Select fetchers" from the menu.

Alive host - is the host, responding to pinging. These are blue in the results list.

Dead host - is the host, not responding to pinging (red in the list). However, it may still have ports open (if firewall blocks pings). In order to scan these hosts fully, check "scan dead hosts" in the Tools->Preferences dialog.

Open port - a TCP port, responding to connection attempts. Hosts with open ports are green in the results list.

Filtered port - a TCP port, not responding that it is closed (no RST packet). These ports are usually specifically blocked by firewalls for some reason.

2)   Pinging (checking if hosts are alive):

Angry IP Scanner can use different methods for pinging hosts. It can choose between them in the Preferences dialog.

ICMP echo - is the standard method used by the 'ping' program. This one requires administrator or root privileges on most platforms. Note that some firewall software disables sending of ICMP echo reply packets, making alive hosts appear like dead.

UDP - sends UDP packets (datagrams) to one of the host's ports and sees if there is any response (either positive or negative). This is non-standard, but works without special privileges.

TCP - tries to connect to port 80 (http) on the host. This may work better than UDP for some networks, but usually it is worse. UDP and TCP pinging most often doesn't properly detect routers or other network equipment.

TTL - this fetcher works only with ICMP pinging method. Its initial value is usually 64 or 128, and the difference represents the distance to the host in number of nodes it has travelled. The results list displays the scanning results, one line per each scanned address.

Configure to display:

• All scanned hosts

• Only alive hosts

• Only hosts with any ports open

3) Special values (also configurable):
[n/s] - Not scanned value that wasn't scanned at all (eg if the host is dead)

[n/a] - The value is not available, but was scanned

G. Putty

Putty is the open source terminal emulator for windows. For Windows on Intel x86, it can download from official site given below. Putty is a portable software no installation required. Open the putty software on windows seven pc then make the following configurations.

• On the session tab specify the IP address of raspberry pi 3.

• The default IP of raspberry pi 3 is 192.168.1.10

• On the second step go to connection tab and open it

• Then go to SSH tab and click it to see X11

• On the X11 is used for controlling X11 forwarding. The X11 forwarding is used to forward the raspberry pi 3 output screen into putty terminal emulator.

• Check the box labeled by enable X11 forwarding. The x11 forwarding is used to access raspberry pi display on another computer system via SSH.

• Finally click the open button bottom of the window.

1) Terminal Window
The default user name and password of raspberry pi is show n below. After entering the correct username and password the raspberry pi console window will open.

2) IP Addresses
An Internet Protocol (IP) address is a unique number assigned to every device on a network. Just as a street address determines where a letter should be delivered, an IP address identifies computers on the Internet. Network devices use IP addresses to communicate with each other.

Although computers use IP addresses - numbers - to communicate, it is easier for people to remember words than numbers. The Internet uses DNS (Domain Name System) to enable people to use words instead of numbers for Internet addresses. It can think of DNS as an address book for the Internet. DNS maps domain names to IP addresses.

3) Dynamic IP address
Most devices use dynamic IP addresses, which are assigned by the network when they connect. These IP addresses are temporary, and can change over time

4) Static IP Address
When a device is assigned a static IP address, it does not change. The device always has the same IP address. Most users do not need static IP addresses. Static IP addresses normally matter more when external devices or websites need to remember IP address. One example is VPN or other remote access solution that trusts (whitelists) certain IPs for security purposes.

A static IP address is not required for hosting a server, although it can simplify the setup process.

5) Setup static ip address
Static ip address on server:
Windows has traditionally been all about the GUI. However, in Windows 7 it is possible to set a static IP address from the command line. Here's how to do it.

Let's give Windows 7 system an IP address of 192.168.1.2, a subnet mask of 255.255.255.0, a default gateway of 192.168.1.254, and a DNS server address of 192.168.1.200. Go to an elevated command prompt (Start Menu☐ All programs☐ Accessories and right-click on the command prompt icon and select Run as Administrator) and type these two commands.

netsh interface ipv4 set address "local area connection" static 192.168.1.2 255.255.255.0 192.168.1.254

netsh interface ipv set dnsservers "local area connection" static 192.168.1.200

These commands will configure the Local Area Connection with a static IP, netmask, gateway, and DNS server.If you want to switch back to receiving the networking settings from a DHCP server, use these commands:

netsh interface ipv4 set address name="local area connection" source=dhcp

netsh interface ipv4 set dnsservers name="local area connection" source=dhcp

This will set the Local Area Connection back to using DHCP

6) Static Ip Address On Raspberry Pi 3

Let connect remotely to Raspberry Pi3 for that IP addressis required There are two main forms of IP address, dynamic and static. By default, the Raspberry Pi will have a dynamic IP address. This means that the IP address can change at any time - not ideal if you want to run Raspberry Pi headless, as we need to keep checking and updating the IP address in Server system. A static IP address however will not change, it assigns the Raspberry Pi a permanent address on network - so we know exactly where it is at all times.

For this guide, we're going to assume that you are running the latest version of the Raspbian operating system as it is the most common amongst Raspberry Pi owners.

The settings of static IP address is shown in following steps

Step 1: check connection & scan ip address of pi 3:

First we need to double check if Raspberry Pi is happily connected to network. A great way to find a dynamic IP address of raspberry pi use Angry IP scanner open source software. Angry IP scanner is a very fast IP address and port scanner. It can scan IP addresses in any range as well as any of their ports. It is cross-platform and lightweight. It requires JRE installations to run, it can be freely copied and used anywhere. Angry IP scanner simply pings each IP address to check if it is alive, then optionally it resolve its hostname, determines the MAC address, scans ports, etc. The amount of gathered data about each host can be extended with plugins.

Let run this software then Note the raspberry pi IP address

$ sudo ifconfig

As you can see inet addr on eth0 in the Screen our Raspberry Pi is connected to our network and has been given the IP address 192.168.3.116 (Number of raspberry pi boards will likely be different!)

Step 2: Take Notes Before Changing Static Ip

Before we can begin applying a static IP address to Raspberry Pi we'll need to gather the necessary data from it! We can get a lot of this from the "ifconfig" command we ran earlier. Make a note of the following data:

*   Current IP Address (inet addr)

*   Broadcast Range (Bcast)

*   Subnet Mask (Mask)

So, from our example, I would get the following information.

*   Current IP Address = 192.168.3.116

*   Broadcast Range = 192.168.3.255

*   Subnet Mask = 255.255.255.0

Different networks will give you different data, so make sure you don't just copy our results! With those noted down, run sudo route –n this will give us information from router. Make sure you note down the following information given from this command:

*   Gateway

*   Destination

So from the example, I would get the following

*   Gateway = 192.168.3.1

*   Destination = 192.168.3.0

So we've now obtained all of the data that we need to setup our Raspberry Pi with a shiny new Static IP address, it's time to save it to a config file.

Step 3: Edit The Files

Time to run sudo nano /etc/network/interfaces. This opens the configuration file for the network

Settings in the nano text editor. If you're more confident with an alternative text editor that's fine too! The line that reads "iface eth0 inet dhcp" is telling the ethernet "eth0" networking interface to use "dhcp" (dynamic IP). Firstly, replace "dhcp" with "static". Next up, add the following lines directly below the line you just altered, filling the []'s with the date you obtained above.

*   address [chosen IP address]

*   netmask [net mask]

*   network [destination]

*   broadcast [broadcast range]

*   gateway [gateway]

At this step finally then save the file by press CTRL+X then Q

Step 4: Reboot!

Finally we configure static IP address of raspberry pi 3.Run $sudo reboot to restart the Raspberry Pi with its new static IP address. The changes we have made will only take effect after a reboot.

7) Install Necessary Libraries

After the reboot, again log in with username and password, then type $ls to view list of files on current directory or $dir to view number of directory that places on current directory. Make sure you are on raspberry pi home directory. The kit

requires libraries for running node.js application. So, let us install the libraries through command. Install necessary libraries from GitHub by below command

$npm install cron, $npm install noble, $npm install request

H. Write Node.Js Script File Using Text Editor

Sudo (/ˈsuːduː/ or /ˈsuːdoʊ/) is a program for Unix-like computer operating systems that allows users to run programs with the security privileges of another user, by default the super user. It originally stood for "superuser do" as the older versions of sudo were designed to run commands only as the super user. Nano is an open source powerful text editor on the Linux terminal. For this usage we eliminate the GUI for handling text documents. For example

$sudo nano FILENAME_AND_EXTENSION

1) Scheduling Tasks With Cron

Cron is a tool for configuring scheduled tasks on UNIX systems, used to schedule commands or scripts to run periodically and at fixed intervals. Tasks range from backing up the user's home folders every day at midnight, to logging CPU information every hour. The command crontab (cron table) is used to edit the list of scheduled tasks in operation, and is done on a per-user basis; each user (including root) has their own crontab.

In jscr.js create a cron Job

var CronJob = require('cron').CronJob;

Make a constructor name and set the cron schedule for returning UUID status to server.

new CronJob('*/10 * * * * *', function()

{

/*Receiving UUID from IBeacon and simultaneously sending received values to server. */ });

POWER ON BLE ON RASPBERRY PI

If BLE is already power on, then power off by bellow coding

noble.stopScanning();

Then Power on the BLE on raspberry pi 3

noble.startScanning();

RECEIVE AND SEND TO SERVER

Let create a constructor inside of CronJob that returns the following data's to constructor CronJob

noble.on('discover', function(peripheral)

{

var macAddress = peripheral.uuid;

var rss = peripheral.rssi;

var localName = peripheral.advertisement.localName;

var serviceUuids = peripheral.advertisement.serviceUuids;

/* receive UUID and send to server through HTTP request*/

});

/* set time zone eg. Asia/Kolkata*/

To save file press CTRL+Z and press Y for saving.

2) Run Script
Node is a compiler that compiles and run script. This command execute the jscr.js file to start scanning available IBeacons and sends the appropriate data to the server. For example,

$ sudo node FILENAME.JS

I. Installing Web Server

XAMPP is an open source cross platform web server. To run the web application through a web browser by localhost Download xampp by its official site.

Make sure that PHP and MySQL is checked during the installation.

C:\xampp\htdocs

1) PHP create A MYSQL database
A database consists of one or more tables.

It will need special CREATE privileges to create or to delete a MySQL database. The CREATE DATABASE statement is used to create a database in MySQL.

The following code demonstrates the database connection with PHP web application.

• $username = "username";$password = "password";

Here $username is the user defined keyword that holds on username of the admin page. Similarly $Password is the user defined keyword that holds on password of the admin page.

Before you can get content out of the MySQL database, you must know how to establish a connection to MySQL from inside a PHP script. To perform basic queries from within MySQL is very easy. This article will show you how to get up and running.

PHP provides mysql_connect() function to open a database connection. This function takes five parameters and returns a MySQL link identifier on success or FALSE on failure.

Syntax**:**

connection
mysql_connect(server,user,passwd,new_link,client_flag);

You can disconnect from MySQL database anytime using another PHP function mysql_close(). This function takes a single parameter, which is a connection returned by mysql_connect() function.

Check MySQL connection through php by following Syntax

```
    if ($conn->connect_error)
{
        die("STATUS_LOG " . $conn->connect_error);
}
```

After the successful connection let create the database on mySQL

Syntax:
 $user_defined= "CREATE_DATABASE database_name";

2) Alerting Server

The alerting server was programmed by the server side scripting language HTML with PHP and real time data visualizing script. HTML is used to describe web elements such as input field, buttons, labels…etc. The cascade style Sheets is a style sheet language used for describing the presentation of a document written in a markup language. The flow diagram of alerting server is shown in following figure,

J.   APPLICATIONS

- Anti-theft system on hospitals.

- Restrict criminals escaping from jail.

IV.   CONCLUSION

We are living in a fast world. We need to create highly secured environment. Child monitoring System Using Wireless Sensor Networks provides secure environment. IBeacons are not hackable. It uses BLE to transmit advertisements. One major advantage of our project is that it is less expensive than other security tools. The raspberry pi 3 receives advertisement from number of IBeacons simultaneously. At the same time it transmits advertisement values via fast Ethernet cable. The Ethernet switch is used for better routing on number of raspberry pi 3. This system is also applicable for child safety at home.

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