Child Safety and Tracking Management system for Mobile Devices

Vinod Gupta*,Saqiuzzaman Hossain*,Balraj Singh*,Pooja Ingale* and Dr.Sharvari Govilkar**

*Student(UG), Department of Computer Engineering, Pillai College of Engineering, New Panvel, Maharashtra, India

**Head of Department of Computer Engineering, Pillai College of Engineering, New Panvel, Maharashtra, India

Abstract— **Children use different types of mobile devices with no constraints. Parents are concerned about the effect of the technical explosion on their children's development. Also,nowadays lots of cases are seen of missing childs.Controlling, monitoring, and managing approaches are in need to help in overcoming some of these worries.The proposed system will help parents to control and evaluate their kids use of mobile devices.The system will provide real time location tracking of child using GPS with the help of A* algorithm and allows parents to view the child's calls and sms details even if the internet connectivity is not present.It enables parents to track the browsing activity and applies a time limit on the internet usage.In a case of emergency an alert message can be sent to parent by shake gesture or by calling a unique number.The parent can set a boundary in order to restrict the child from going outside the safe premises using Geofencing. All the data is stored in the database in an encrypted format using Advanced Encryption Standard(AES) and the same is decrypted at the receiver side.The system uses a client-server based architecture and Firebase realtime database.The realtime location tracking will be implemented using Google places API and location services.Telephony services will be used to retrieve the sms and call details. The application will be deployed on android and ios platform.**

I. INTRODUCTION

In the digital century where technology reaches kid's hands, guardians may worry about the effect of this very open world on their kids' development. They may worry about the detrimental effect of this technology on their educational, emotional, and social developments. To help overcome some of these worries, guardians may need to have some controlling technology to check and track their children's usage for personal devices. Android devices are one of the most used technologies by children in our society, guardians will need to have some automated technologies to observe and supervise the time and quality of their children's usage for these devices.

The proposed system will help parents to control and evaluate their kid's use of mobile devices. The system consists of two main subparts, one is the parent side and other will consist of a hidden application that will be in stealth mode in the child's device. The overall advantage of the system is taking control of a child's device that allows parents to get a greater understanding of what kids are using and how they are using them.

Objectives of ChildSafety and Tracking Management system for Mobile Devices are as follows:

1. To block or prevent access to specific websites and limit child's exposure to inappropriate content.
2. Controlling a child's device by limiting the use of the device. 3. Device monitoring,keeping an eye on kids mobile activities. 4. Tracking a child's location.
5. To set a screen limit so that health is not affected.
6. To teach cyber etiquette. 7. To establish good cyber safety habits. 8. To help defend online reputation.

Scope is to improve the project by means of computational intelligence,modifying and installing it in mobile devices,to develop an application which helps parents to control child's use over mobile in android platform as well as in IOS platform,to make application work even in low or no internet through offline SMS services and to build a system where parents can force enabling of GPS overriding child's preference.

II. RELATED WORK

The basic idea of this project came from the observation that without a proper guidance and observation, the children might be trapped in between the contentment that technology can possibly offer. We have gone through several papers to gather information about various techniques for child safety and tracking. Some of these reference papers are mentioned below.

Prof Rohini Temkar, Sandesh Nambiar, Sidharth Purohit [1] proposed an Android Parental Control app which maintains control by monitoring ,which includes web content filtering,app blocking,time management and location tracking.Proposed System contains two modes parent and child .System provides control of features such as location, messages and call logs, website and application usage to parents. Data from child's mobile is stored in database which can be read by parents using parent mode. On child,s mobile it is a background process.

Ahmed M. Elmogy,Khawater Elkhowiter [2] proposed a system which is a mobile application titled as "Times Up". It is mainly used by parents or guardians to control the kids' usage of mobile devices. The proposed application will allow users to set policy and restrictions for other applications, as well as to time out the usage duration for application or for over the entire device. It also allows the users not only to control their kids' usage, but also to evaluate the time their children spent on using mobile device and to 3 have an overview of the usage based on the restrictions by displaying diagrams to compare and evaluate the device usage for certain time

Aditi Gupta , Vibhor Harit [3] proposed a model for child safety through smart phones that provides the option to track the location of their children as well as in case of emergency children is able to send a quick message and its current location via Short Message services. The main aim of the author is to rectify the worries of their parents regarding their child's security.The four main services mentioned in paper are Global Positioning System(GPS),Geofencing,Short messaging service(SMS),Child Tracking.

Walter Fuertes, Karina Quimbiulco,Fernando Galárraga, and José Luis García-Dorado [4] proposed a system which is a web application. It is mainly used by parents or guardians to control the kids' usage on the world wide web.

III. PROPOSED SYSTEM

A. Exising system Architecture

The existing system is a mobile application titled "Times Up". Times Up is mainly used by parents or guardians to control the kids' usage of mobile devices. It allows users to set policy and restrictions for other applications, as well as to time out the usage duration for application or for over the entire device. The application allows the users not only to control their kid's usage, but also to evaluate the time their children spend using mobile devices. The application will also allow users to have an overview of the usage based on the restrictions by displaying diagrams to compare and evaluate the device usage for certain time. The flow diagram of the application is as shown in fig 3.1. The system does not provide any detail related to the child's live location. The system of live location tracking is implemented as a different application.

The system does not provide any detail related to the child's live location. The system of live location tracking is implemented as a different application. The author proposed a model for child safety through smart phones that provides the option to track the location of their children as well as in case of emergency children are able to send a quick message and its current location via SMS. The 6 main aim of the author is to rectify the worries of their parents regarding their child's security.The four main services mentioned in paper are Global

Positioning System(GPS), Geo-fencing,Short messaging service(SMS), Child Tracking.

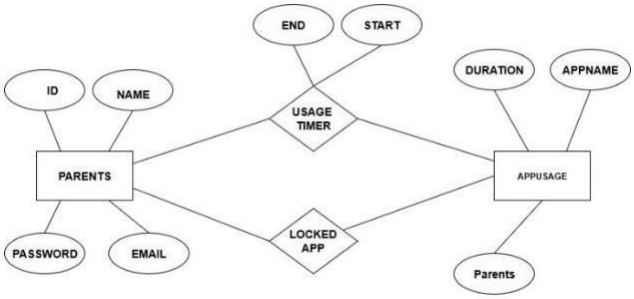

Fig 3.1: Existing system architecture

B. Proposed System Architecture

The previous sections discussed the strengths and weaknesses of the existing system. In order to achieve better results, we are using the following architecture which seeks to inherit advantages and eliminate disadvantages.

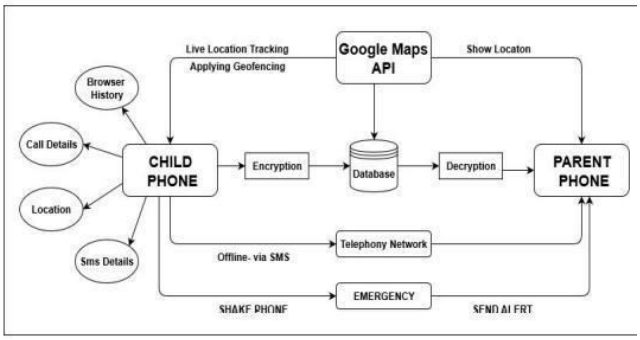

Fig. 3.2 Proposed system architecture

a. *Real Time Location Tracking:*This module is used for getting the Location Details of the child's Device. It Initialises the GPS Tracker,then Creates an instance of GpsTracker by passing context as parameter.If the instance is not null then it calls the GetLocation() ,method. Then stores the details in encrypted format in the Database.This data is then sent/fetched by the Parent's application where is it decrypted and displayed on the Parent's device.In case of non availability or poor internet connection,this data or live location is send to the parent device through offline SMS.

b. *SMS and Call Details:*This module is used for getting the SMS and Call details of the child's Device.For SMS it uses the query " content://sms" and for Call details it Creates an instance of CursorLoader by passing CallLog.Calls.CONTENT_URI as a parameter.The data is then stored into the database after encryption.This data is then sent/fetched by the Parent's application where is it decrypted and displayed on the Parent's device.In case of non availability or poor internet connection,this data or SMS/call details is send to the parent device through offline SMS.

c. *Check weather application is installed or not:*This module is used for checking weather the application is installed or not in the child's device.Using this module the parent's can confirmed if the child has deleted the application on his/her device.It checks the package name of the application using isPackageAvailable() method.This module is launched in the background after every one hour and the result is stored in the database.This data is then fetched by the parent's application and the result is displayed.

d. *Encryption and Decryption using AES Algorithm:*This module is used for encrypting the data before storing it in the Firebase Database.It uses Advanced Encryption Standard algorithm for Encryption and Decryption. More details on AES encryption and decryption is mentioned in the latter sections.

e. *Telephony Network:*One of the major disadvantages of previous system was that is was completely dependent on internet connection.Even the slightest loss in internet connectivity,reduces the performance.The proposed system overcomes this disadvantage by sending offline SMS about the child's phone to the parent.It uses telephony services for sending an offline SMS to the parent. This module first checks weather the internet connection is available on the child's application.It uses the -------- package to check weather internet connection is available or not,also the "ACCESS NETWORK STATE " permission is required.If internet is not available then the SMS,call,location details is passed as a text message to the number previously registered.

f. *Emergency Alert:*This module uses shake feature for sending SMS alert at the time of Emergency.Just by using gestures like shaking the device an emergency alert can be sent to the parent device.Other gestures such as double tap/three fingers swipe can also be implemented but shake gesture is the most convenient of all.The module uses the SensorManager class and register the sensor with desired flags.We can set the threshold for detecting weather it is a shake or not.

g. *Text to speech:*This module is used for converting the output from the parent's device to speech.This helps the parents to use the app even if they are less educated.This module can read the SMS details, numbers in the call details also weather the applocation is installed or not in the child's device.This module uses the TextToSpeech class provided by android.To use this class we need to initialize object of this class and specify the initListener.Language can be set by calling the setLanguage() method.

IV. IMPLEMENTATION

This section explains the details of the proposed system developed for child and parent. Including the languages to be used, functions, and screens. The following languages, database and software are used to develop the proposed applications.

A. *Integrated Development Environment (IDE):*
An integrated development environment (IDE) is a software application that provides comprehensive facilities to computer programmers for software development. In our system we have developed a native android application using Android Studio IDE. The Android Studio is the official programming environment that allows developers to build Android apps. These features include Project Structure, Gradle Build System, Debug and Profile Tools, Memory and CPU monitor, Data file access, Code inspections, Annotations in Android Studio, and Log messages[6].

B. Emulator:
The Emulator is one of the used tools within the Android SDK. The importance of having such tool is to provide developers with a virtual mobile device showing on the screen. The Emulator uses the virtual mobile device for testing developed apps with no need to have actual mobile devices

C. *Languages:*

a. *Java:*The Java language is a key pillar in Android, an open source mobile operating system. Although Android, built on the Linux kernel, is written largely in C, the Android SDK uses the Java language as the basis for Android applications. Depending on the Android version, the bytecode is either interpreted by the Dalvik virtual machine or compiled into native code by the Android Runtime.

b. *XML (Extensible Markup Language) :*XML stands for Extensible Markup Language. XML is a markup language much like HTML used to describe data. XML tags are not predefined in XML. We must define our own Tags. Xml as itself is well readable both by human and machine. Also, it is scalable and simple to develop. In Android we use xml for designing our layouts because xml is lightweight language so it doesn't make our layout heavy.

D. DataBase:
FireBase Realtime DataBase:-The Firebase Realtime Database is a cloud-hosted database. Data is stored as JSON and synchronized in realtime to every connected client. Database is discussed in more detail in next chapter.

V. EXPERIMENTS AND RESULTS

The application was tested on different android versions. Various features of the application with their respective results have been presented . The parent application displays the call and sms details as shown in figure 1 and figure 2 respectively. Parent can also see the child's live location and trace it using google maps as shown in figure 3 and figure 4 respectively.

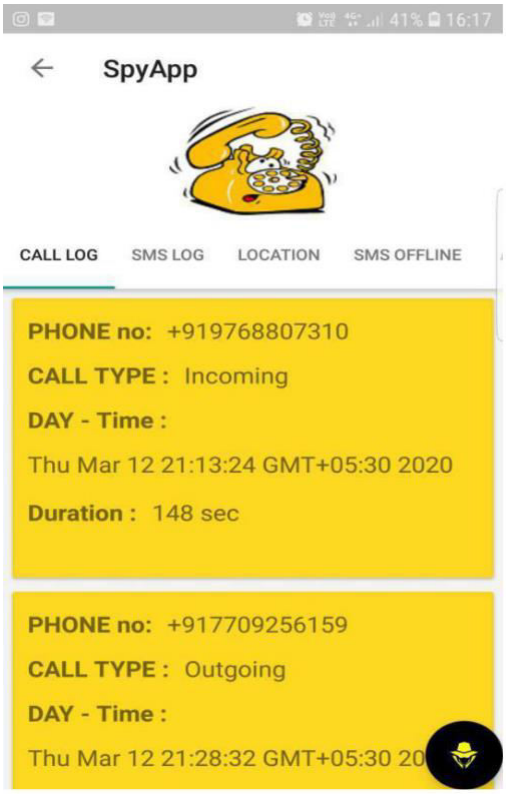

Fig 1: Call Log fragment

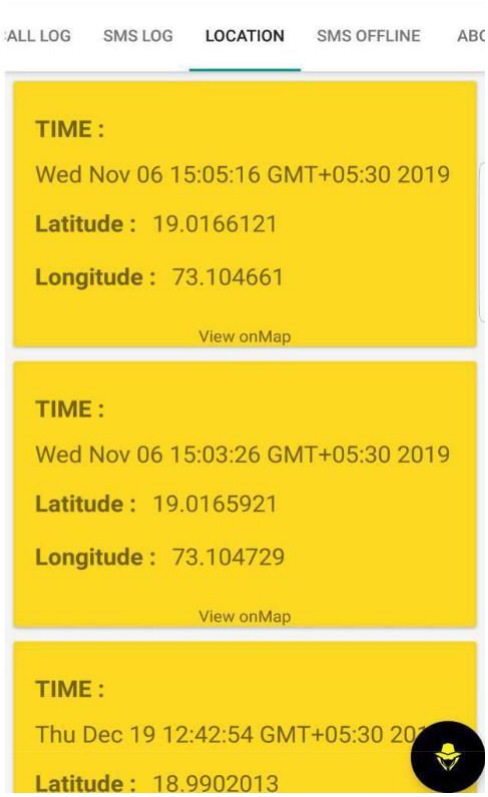

Fig 4.3 : Location detail fragment

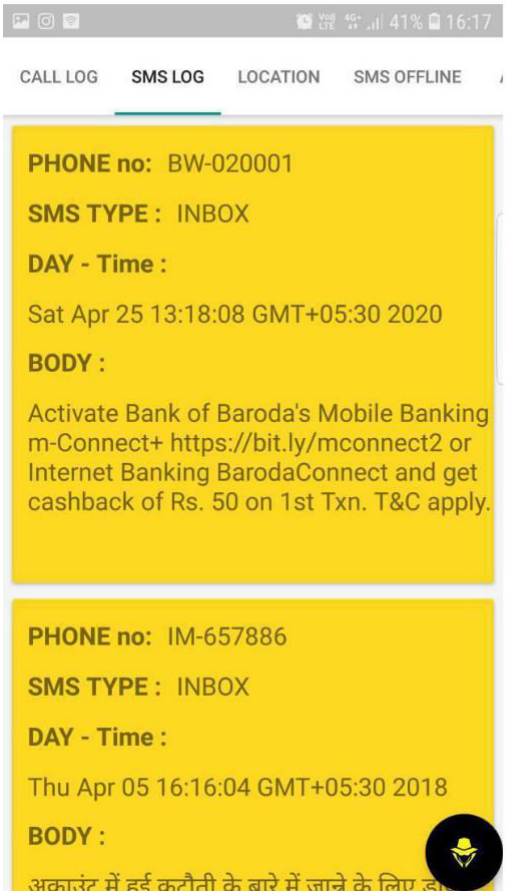

Fig 2: SMS Log fragment

Fig 4: Location tracking using google map

Different Evaluation criteria such as Response time,CPU usage,Memory usage,Disk space have been considered to observe the Application's performance on both SpyApp(Parent's side) and Stealth(Child's side). The table gives the score of all the tests.

Device Version	Response time (ms)	Memory Usage (MB)	CPU Usage (%)	Disk Space (MB)
API 22 (SpyApp)	LRT-1122,1022 **(2G,4G)** FRT-7032,2020 **(2G,4G)**	115	21	23.25
API 22 (Stealth)	LRT-568,448 **(2G,4G)** FRT-1122,698 **(2G,4G)**	26	15	6
API 26 (SpyApp)	LRT-1321,966 **(2G,4G)** FRT-6653,1890 **(2G,4G)**	117.6	12	23.36
API 26 (Stealth)	LRT-784,416 **(2G,4G)** FRT-1012,686 **(2G,4G)**	24.21	7	6.21
API 28 (SpyApp)	LRT-986,845 **(2G,4G)** FRT-5692,1836 **(2G,4G)**	112.5	7	23.31
API 28 (Stealth)	LRT-496,398 **(2G,4G)** FRT-1122,686 **(2G,4G)**	21.21	4	6.21

Fig 5.1: Response Time,Memory usage,CPU Usage,Disk Space scores on all devices.

Based on the results following Graphs were obtained.

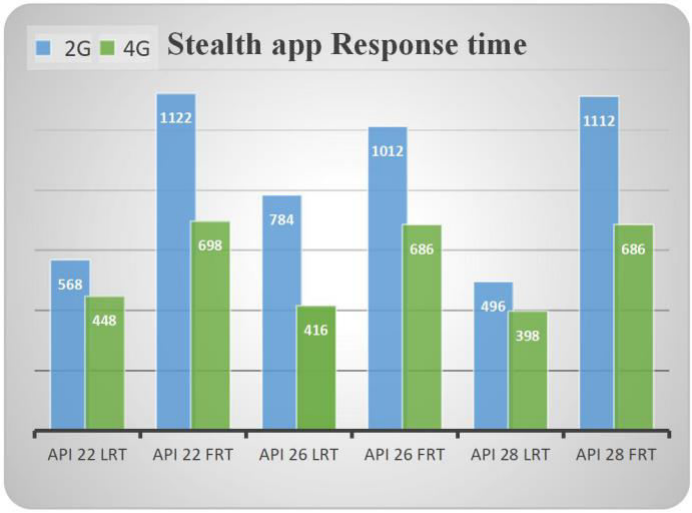

Fig 5.2(a): Response time comparison for stealth app (child's side)

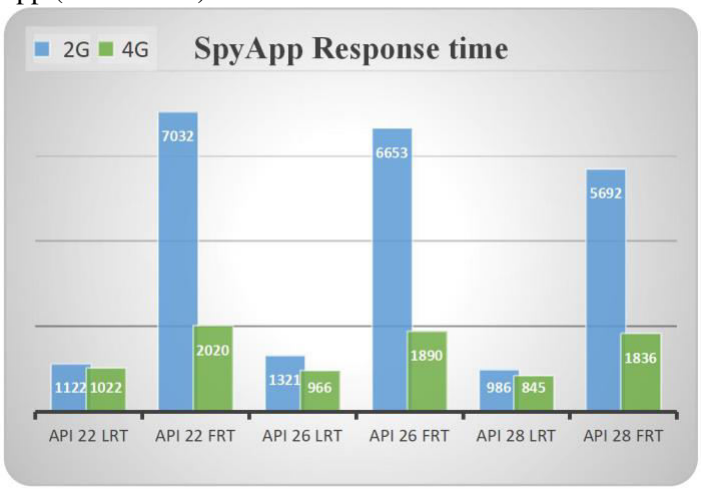

Fig 5.2(b): Response time comparison for SpyApp(parent's side)

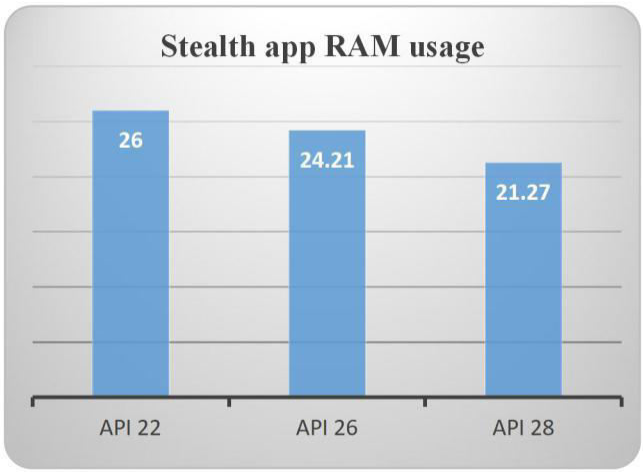

Fig 5.3(a): RAM usage on child side

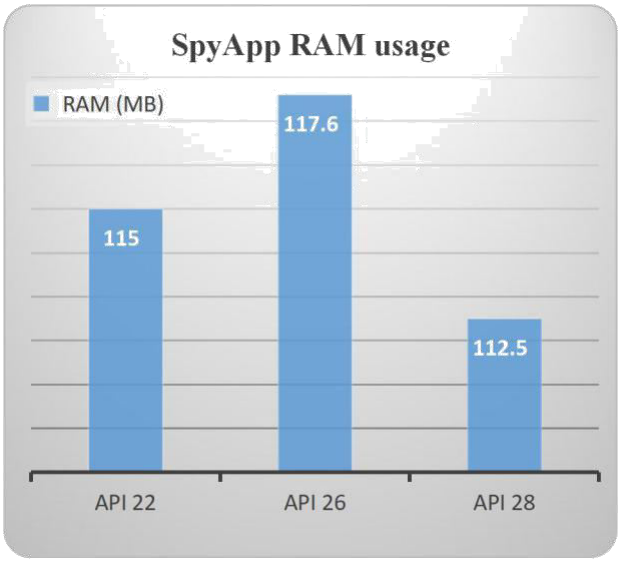

Fig 5.3(b): RAM usage on parent side

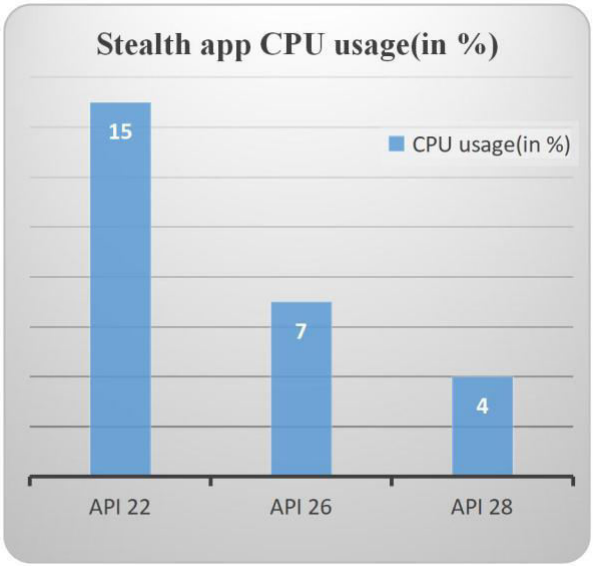

Fig 5.4(a): CPU usage on child side

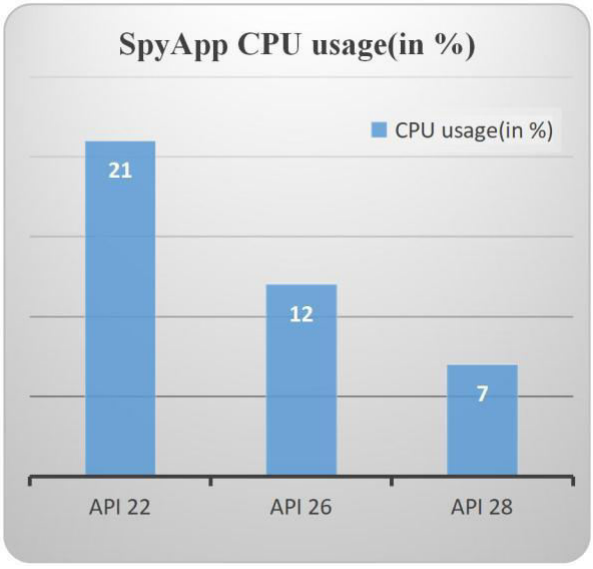

Fig 5.4(b): CPU usage on parent side

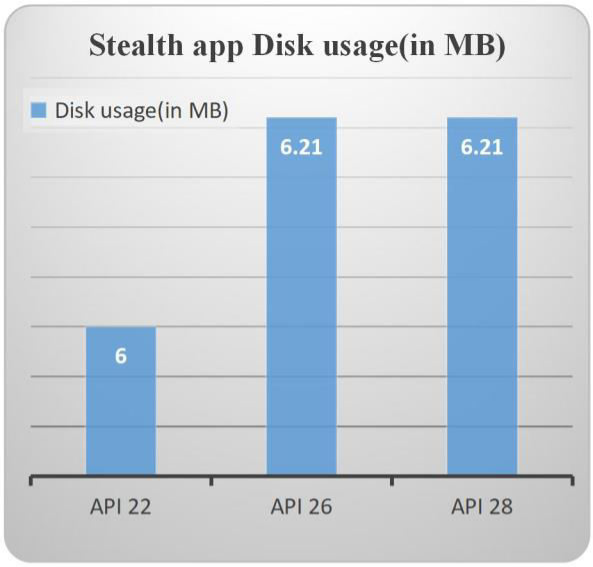

Fig 5.5(a): Disk usage on Child's side

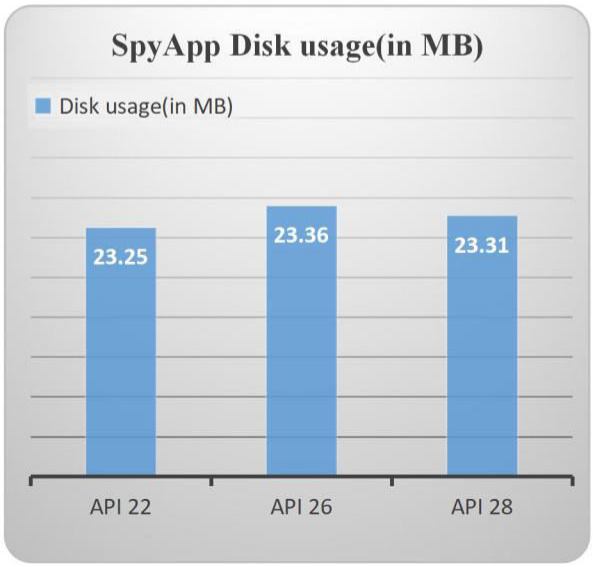

Fig 5.5(b): CPU usage on parent's side

VI. CONCLUSION

Children are shaped by the information they are exposed to. The kind of information they are exposed to not only can grant them healthy social life but also affect their decision making in a negative manner. It is a responsibility of parents to decide what content is healthy and useful to their children.Child Safety and Tracking Management system for Mobile Devices has various modules to facilitate this without curbing the child's knowledge about worldly things or putting a stop to their curiosity. It gives control to the parents about what their children view, which keeps them away from negative influences.This application is

designed for locating missing children. The solution represented in this paper takes advantage of smart phones which offer rich features like Google maps, GPS, SMS etc. Some of the best works implemented in the past relies on SMS based tracking which is not helpful to get an accurate location in our proposed system we have provided real time tracking. We have added Emergency messaging services to enhance the system.

Live Control panel can be implemented to view the phone's screen (Live Screenshot*) and location live, perform remote control commands, and obtain the phone's information instantly.Web History can also be implemented to discover which sites the child has visited.

VII. REFERENCES

[1] "An Android Parental Control",Prof Rohini Temkar,Sandesh Nambiar, Sidharth Purohit,IOSRJournalofEngineering(IOSRJEN)2250 -3021,Vol.08,Issue6(June.2018)

[2]"Parental Control System for Mobile Devices",Ahmed M. Elmogy,Khawater Elkhowiter,InternationalJournalofComputerApplications(0975–8887) Volume177–No.3,November2017

[3] "Child Safety & Tracking Management System",Aditi Gupta , Vibhor Harit,2016 Second International Conference on Computational Intelligence & Communication Technology Tomohiro Fujita,2017.

[4]"OntheDevelopmentofadvancedParentalControl Tools",WalterFuertes,KarinaQuimbiulco, Fernando Galárraga, and José Luis García-Dorado-2015 1st International Conference on Software SecurityandAssurance