ANDROID APPLICATION TO VERIFY CHILD PICK UP IN SCHOOL TO PREVENT KIDNAPPING

Tugas Akhir

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ABSTRACT

School is the most time spent by school-age children. The presence of children at school is the responsibility of the teacher and the principal. Schools must increase student supervision to support child abduction. Therefore, as an effort to save the children's future, all parties must ask for help to prevent kidnapping. One way to minimize this case is schools must not let children wandering on their own after school hours which they should be picked up by their parents. The development of technology is so rapid at this time. This has resulted in the development of the use of technology in daily life. This paper describes the uses of newly developed school security measures to verify child pick up if they are their parents, so children did not go to the wrong hands. The technology used for Android Application to minimize child abduction cases including QR Code, Firebase Database.

Keyword: Child safety, Android, Firebase, QR Code
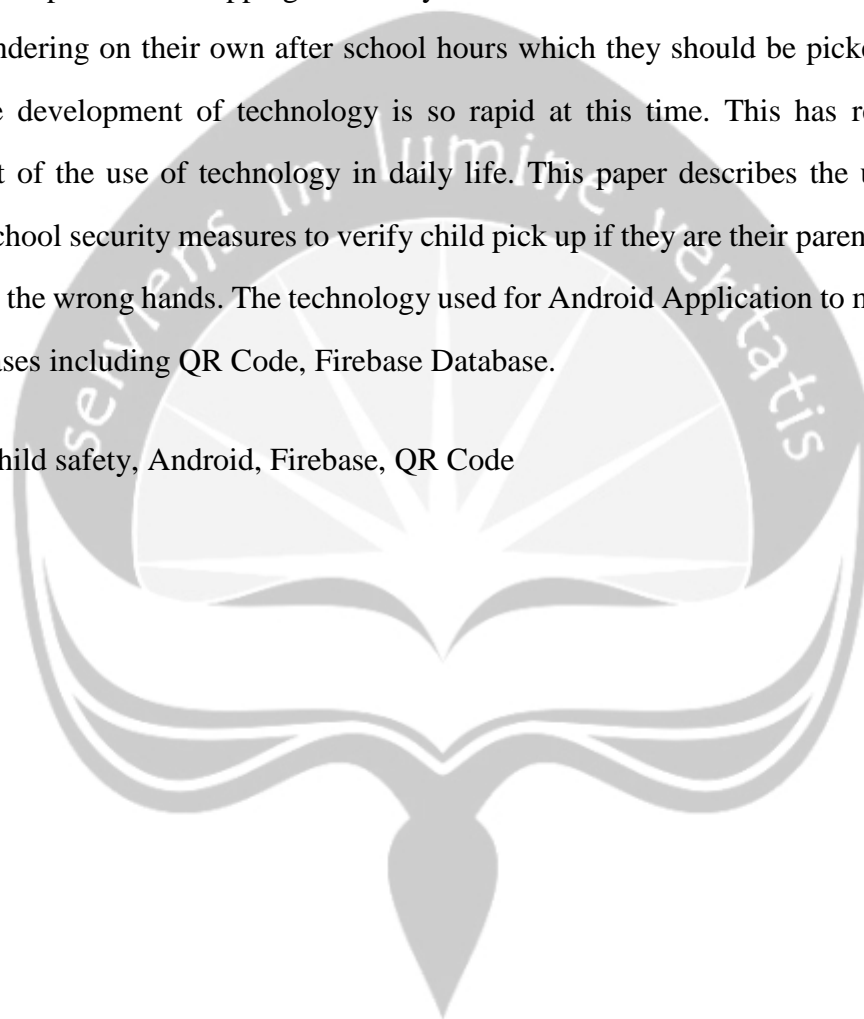
CHAPTER 1. INTRODUCTION

1.1 <u>Background</u>

One of the phenomena of crime that always happens in society is kidnapping crime. The rise of child abduction cases lately has made parents worried and uncomfortable releasing their children to school and other places. (Hasni, 2018). Many national and regional news sources in television, print, and online media present this case as the main story. Indeed, the case of child abduction has warmed up even viral on social media and the news adorned in the mainstream media and other mass media. Data shows that indeed every year cases of child abduction continue to increase (Daipon, 2017).

Several factors cause cases of child abduction that can occur, including attitudes and personalities of children who are still innocent so they cannot protect themselves, lack parental supervision of children outside the home for example at school, limited supervision of teachers and schools of their students out of school. So, some gaps or opportunities can be exploited by certain individuals to commit crimes such as kidnapping (Sembiring, 2019).

For parents who have less time for family and children, it is not uncommon this results in parental attention towards their child will be reduced and unable to monitor children's activities, this causes parents to not know where the child is. Even children can be on their own and go to places that they should not visit. Even more dangerous is the occurrence of cases of child loss or abduction of children (Beni, 2017).

Therefore, as an effort to save the future of children, all parties must work together to prevent kidnappings. Wherever the children are, they must have the right to have protection as a vulnerable little people. To realize this, awareness of all parties to prevent kidnapping is very much needed motives and ways in which people abduct children. Economic hardship is one of the reasons for the abduction, namely by requesting ransom from the abducted parents and families.

Child abduction needs special attention from the school and parents so that the abduction events do not occur in the school environment, so students can participate in learning activities safely and comfortably, and parents also do not feel threatened. Educational institutions, in this case, schools, are institutions that become the media in developing all aspects of human life, both cognitive, affective, and psychomotor aspects. So, the school must play an active role in student activities, starting from the arrival of students, rest, and time of return. Including preventing kidnappings in the school environment. School principals are asked to immediately disseminate to teachers and homeroom teachers to increase awareness of their students' presence while in school.

The development of technology is so rapid at this time. Many things can be used to help parents monitor the existence of children who are beyond the reach of parents (Anwar, 2014). Current technology is inseparable from GPS (Global Positioning System), almost all sophisticated transportation equipment today both on land, sea, and air, has used GPS. Not only that, but several brands of sophisticated gadgets have also embedded GPS components in them. Some of the use of technology that uses the concept of GPS to minimize cases of child abduction include (1) the Child Tracker application uses the Assisted Global Positioning System (A-GPS technology) (2) Android applications using LBS (Location Based Service).

Currently, the development of Android-based software can be done by anyone. The advantage of other Android smartphones is that they have many additional technologies so that now they can not only be used for telecommunications equipment but also for other purposes such as the GPS (Global Positioning System) feature that can be used to monitor a person's presence. Parents can also determine the geofence (boundary area) of the location that may be visited by the child at a certain time, if the child does not follow the geofence then the parent will get a notification that the child has violated the specified geofence location (Beni, 2017).

This paper will describe an Android application for the writer's thesis by using Android studio. The use of the application is mainly to verify children's pickup person, whether they are the child's parents, or maybe even the kidnapper. This works by the pickup show QR code

containing child ID to be scanned by the teachers. If the QR code is valid, then the child may leave the school. This way, children will never go to the wrong hands.

1.2 Problem Identification

Based on the existing problems in the background, the author identified the problem listed as follow:

1. How to develop an Android mobile application to verify child pickup in school?
2. How to implement the QR Code and Firebase technology in Child Pick Up application?
3. How can Child Pick UP application help reduce child abduction rates?
4. How to input, update, delete student's and teacher's information to the database?

1.3 Research Purposes

The purposes of this research are listed as follow:

1. This research aims to develop an Android-based Child Pickup application using QR Code and Firebase technology.
2. This study aims to help teachers in verifying child pickup person in school.
3. This research aims to make school data about their student and teacher more structured, valid, secure, and reliable.
4. The developed application is intended to reduce child abduction rates.

1.4 Limitation of the Problem

Child Pick Up application that will be developed has the following limitations:

1. The application is only available on smartphones with Android OS version 5.0 (Lollipop) and above.
2. The application requires an internet connection.
3. The application's administrator role can only add students and teachers to the database.
4. This application requires a VPN to run in China.

1.5 <u>Research Benefit</u>

The benefit of Child Pick Up application that will be developed has the following benefits:

1. This application can help teachers in verifying child pick up a person in school.

2. This application can help parents pick up children from school safely.

3. This application can help reduce child abduction rates.

5. This application can help simplify the work of teachers and reduce the working human resources.

1.6 <u>Research Methodology</u>

1.6.1 <u>Research Type</u>

In conducting this research, the type of research used is qualitative research with the Design and Creation method. Qualitative research objectives are to describe and explore, and to describe and explain. The Design and Creation method was chosen because, in addition to researching this title, the author also developed an application that was carried out by the research conducted.

1.6.2 <u>Research Location</u>

The location of this research was carried out in Pelita Nusantara Kasih school and Tarakanita school in Surakarta, Central Java, Indonesia. The author researches by inspecting the school's security and how parents pick up their children.

The location author developed Child Pick Up application is at the author's hometown is Surakarta, Central Java, Indonesia. The author develops by using the Android Studio tool.

1.6.3 <u>Research Flowchart</u>

Figure 1.1 below shows how the research goes from start to finish in a flowchart with a detailed explanation.
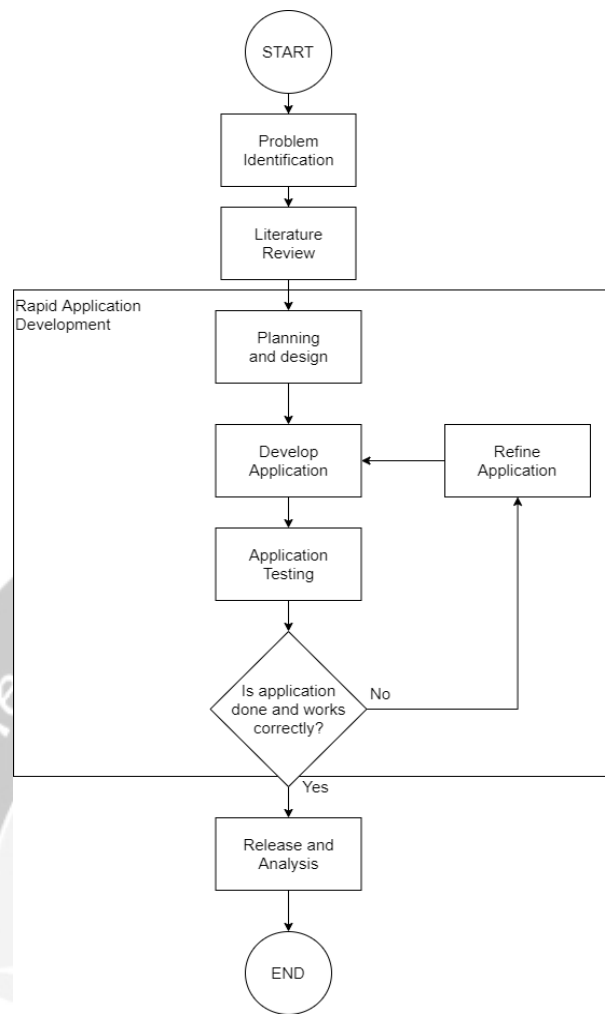
Figure 1.1. Research Methodology Flowchart

1. Problem Identification

    The author identifies the problem, which is determining the problem to be solved in research including its purpose, limitation, and benefit.

2. Literature Review

    The author obtains theories about this research, as well as related works such as child security which will serve as research material.

3. Planning and Design

    The first stage carried out in the development of the Child Pickup Application is planning. At this stage, the author researched by inspecting school security in schools and plan application requirements.

The second stage carried out in the development of the Child Pickup Application is designing. The author designs system and the interface uses Unified Modeling Language (UML) and database design of the system to be built.

4. Develop Application

The next stage is to develop the application, which is by coding. At this stage, user code application by using Android Studio and use Firebase for the database.

5. Testing

The next stage is testing the application. The completed program is then tested using the Black Box software testing method. If the application does not run according to the analysis, it will then be refined to be developed further. If it has been running correctly, it will go to the next stage.

6. Release and Analysis

After the application development is completed, the Child Pick Up application will be released to the user in the form of an APK file to later be installed on both Parent's and Teacher's Android mobile phones. After that, the result will be analyzed whether the research has succeeded in solving the problem.

1.7 <u>Schedule</u>

The process of this thesis takes around 10 weeks, start from 3rd February to 15th May 2020. The schedule for the research is detailed in Table 1.1.

Table 1.1. Research Schedule

NO	ACTIVITY	WEEK														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Planning	■														
2	Design		■													
3	Development			■	■	■	■	■	■	■	■	■				
4	Testing								■	■	■	■				
5	Documentation											■	■	■	■	■

1.8 <u>Writing Structure</u>

This thesis is made to facilitate the writing of the final project. Thus, this thesis is divided into five chapters, with an explanation for each chapter, as follows:

CHAPTER I.   INTRODUCTION

This chapter discusses the background of the research, problem identification, research purposes, limitations of the problem, benefits of the research, and research methodology.

CHAPTER II. REVIEW OF LITERATURE

This chapter discusses the basic theories that support this research and related works.

CHAPTER III. ANALYSIS AND DESIGN

This chapter discusses the author's research result, and the system analysis and design of the application to be created.

CHAPTER IV. IMPLEMENTATION

This chapter discusses the application implementation result, including Black-box testing.

CHAPTER V. SUMMARY, CONCLUSION, AND RECOMMENDATIONS

This chapter discusses this paper summary, conclusions that can be drawn, and recommendations for further development.

CHAPTER 2. REVIEW OF LITERATURE

2.1 Application

In terms of understanding, the application is a program that is ready to use that is made to carry out a function for users of application services and the use of other applications that can be used by a target to be addressed. According to the executive computer dictionary, the application has a problem-solving meaning that uses one of the application's data processing techniques that are usually driven by a desired or expected computation or expected data processing. Understanding the application according to the Big Indonesian Dictionary, " A program or piece of software designed and written to fulfill a particular purpose of the user." (KBBI).

2.2 Android

As technology has evolved, mobile devices have become about more than simply making calls, but their software and development platforms have resisted keeping pace. Android is an open-source software stack that includes the operating system, middleware, and key applications along with a set of API libraries for writing mobile applications that can shape the look, feel, and function of mobile handsets. Small, stylish, and versatile, modern mobile phones have become powerful tools that incorporate cameras, media players, GPS systems, and touch screens. Android provides an open platform for developers to create their applications so they can be used by a variety of mobile devices. Android applications are written using Java as a programming language. The Android SDK carryings several powerful tools to help with common Android development tasks. The Android emulator can be used for running and debugging Android applications virtually, without the need for an actual device. (Esmaeel, H. R., 2015).

2.3 <u>Login System</u>

Security problems are important and major problems in computer systems that are connected in a network. Data and information are the targets of attacks by irresponsible parties, so it is necessary to maintain data and information integrity. In a web application needed a mechanism that can protect data from unauthorized users. This mechanism can be implemented in the form of a login process which usually consists of three stages, namely identification, authentication, and authorization. As many internet facilities require login access such as e-mail, web server access, or other accounts, users need to be more careful especially if the account is very confidential and valuable considering the internet is a public network.

Khairina, D. M. mentioned that the login system is the process to access the computer by entering the identity of the user account and password to get access rights using computer resources goal. When logging into the system, the user will be asked to enter the user's identity such as user ID and password in anticipation of system security. Passwords can be changed as needed while the user ID is never changed because it is a unique identifier that refers to a particular user. If both of these safeguards are successful or compliant then the user has the right to access the system. The login process has a mechanism consisting of three stages, namely:

a. Identification. The stage where the user tells his identity.

b. Authentication. The stage where the user verifies the user's claim is something known, such as a PIN code or password; something that is owned, like a magnetic card; and something that becomes an identity, like a fingerprint.

c. Authorization. The last step is if the user identification is successful or correct, the system completes the login process and associates the user's identity and access control information with the user's session.

2.4 <u>QR code</u>

Utilization of IT is one of which is using the code "QR (Quick Response)" or "QR Code" or barcode to read an identity. QR Code is a two-dimensional barcode that was discovered by a Japanese company called Denso Wave in 1994. This QR code is a development of the

previous barcode. In the old barcode model, data is stored horizontally, whereas, in the QR Code, data is stored both vertically and horizontally. QR Code is a type of matrix barcode or has 2 (two) dimensions. QR Code has been found to trace automotive components in manufacturing plants and buy many to find their way to transportation spaces and mobile devices. QR Code (Figure 2.2) has an advantage compared to other types of barcodes (Figure 2.1), that is, information is encoded in vertical and horizontal directions, thus saving data several hundred times more than traditional bar codes.

Figure 2.1. Barcode   Figure 2.2. QR Code

Sutheebanjard, P., & Premchaiswadi, W., 2010 in their article mentioned that QR code is now being widely used in a variety of businesses. QR code is a way of encoding more information than a traditional bar code. And most importantly, it contains information that can be easily decoded at high speed. Rahmat, E., Heroza, I., Jannah, M., Palembang, J., Km, P., Ogan, I., & Sumatera, I in their paper mentioned that the application of the BYOD (Bring Your Own Device) concept, the system becomes more modern and helps make time-efficient (Rahmat, E., Heroza, I., Jannah, M., Palembang, J., Km, P., Ogan, I., & Sumatera, I., 2016).

2.5 **Firebase**

Firebase is considered a web application platform. It helps developers" build high-quality apps. It stores the data in JavaScript Object Notation (JSON) format which does not use a query for inserting, updating, deleting, or adding data to it. It is the backend of a system that is used as a database for storing data. Firebase is a real-time database that makes it stand above all the traditional database services like SQL, SQLite, shared preference, etc. firebase is added to your app very quickly and the app using firebase requires least development time. Under firebase

you do not miss any step, you have to follow all the steps to make your app run. Firebase is provided by Google itself which means its most reliable and going to have a lot of new features in the future (Navdeep Singh, 2016).

Khawas, C., & Shah, P. in their article mentioned that the study material is based on the data provided online and referring to the examples given. Google has been updating Firebase regularly, AdSense is the beta phase of Firebase. It can not only be used in Android but also to connect cross-platform. The work can be further extended by adding new features and exploring new possibilities in Android applications.

2.6 Android Studio

Android Studio is the IDE for Android that was announced in May 2013 at the Google I/O developer event and is intended as an alternative to Eclipse. Android Studio is based on the Java IDE called IntelliJ. Android Studio comes bundled with its version of Android SDK, which is preconfigured to be used with Android Studio upon installation.

2.7 Kidnapping

Kidnapping is a violation of the law. Kidnapping is the offspring of terrorism and social crime that spread throughout the world. Kidnapping refers to a criminal offense that involves kidnapping a person against his freedom and conquering him with the threat of murder or murder and requesting a ransom before his release. This is a criminal and traumatic behavior designed by gangsters with the pattern of thinking about abducting humans for ransom (Abiodun, 2017).

2.8 Abduction Concept

Abduction is a criminal act involving confiscation, confinement, kidnapping, subjugation, violence, acts of threat, acts of terror and slavery. Abraham (2010) defines kidnapping as an act of seizing, taking and detaining someone by force or fraud. However, that includes grabbing

and snatching someone to collect a ransom in return or settling scores of disagreements among people.

2.9 <u>Motive and mode of abduction action</u>

There are various causes of kidnapping actions, including economic factors, psychological illnesses (deviant behavior), household/family problems, and so forth. By far the highest motivation in child abduction cases is economic factors that are carried out in the form of ransom requests or syndicated child trafficking. Then, some modes in the case of abduction related to school activities are:

1. Pick up children at school by pretending to be siblings or online drivers.
2. Going to the child in a public place when going to or coming home from school, then doing tricks such as offering a ride, offering food (candy, chocolate, etc.), offering money, asking something, asking for help, showing pets, and so on.
3. Open friendships on social media and invite them to meet in a place, both inside and outside school hours.

2.10　　　<u>Related Works</u>

The author researched the internet to search for journals mainly about child safety. There are three parties which participated to minimize child abduction cases, including: (1) School, what the school does to prevent kidnapping (2) Technology, what are the technology that is used for parents to track where their child is, and (3) Android Application that is used for both parents and school to pick up the child in school while verifying is the picker is the real parents.

2.10.1　<u>The Role Performed by Schools</u>

School is the most time spent by school-age children. The presence of children at school is the responsibility of the teacher and the principal. Schools must improve student supervision to anticipate child abduction. Supervision of students must be tightened during school hours and at school hours. (Kam, 2016). The presence of students while at school is entirely the responsibility of the teacher and the principal. School principals can remind

teachers to be careful of strangers who want to pick up their children. If there are people who pick up students who are not known, they should not be sent home.

Every student's activities at school or when learning activities outside the classroom, should always be monitored by the teacher so that the slightest thing that happens to students can be known and handled because the teacher is the parent of the students. If there are among students who have broken homes, then the school must know clearly and surely about the trusting care of the child, making it easier for schools to take policy.

Things the school can do to minimize abduction cases include:

1. Strengthen student data security

   Children's personal information, such as name, date of birth, and parental data is very vulnerable to being misused for crimes such as kidnapping. Student data must be stored in a safe place to avoid the possibility of theft both physically and online through the internet network.

2. The Role of Picket Teachers

   Maximizing the role of the picket teacher when the time comes home, whether the picket teacher comes from the teacher who taught at the last hour or a special teacher who gets a special assignment as a picket teacher so that every student who returns home can be recorded on his return, it can be supported by the presence of return

3. Install the security device

   In addition to the presence of school security officers, the school environment also needs to be equipped with security devices such as CCTV, alarms and auto gate, and others. The existence of security devices can make criminals discourage action in the school environment. Besides security devices such as CCTV can also be used as a tool in the process of investigating crimes such as kidnapping.

4. Establish effective collaboration between home and school

    For young children who still have to be picked up by the house, ask the school to take part in making sure the child is not picked up by strangers. Parents can also contact the school if the child will be picked up late or will be picked up by a new person who is not used to pick him up. Whereas for teenagers who can go home independently, the school can ask them to go home immediately if there are no specific needs that require children to linger in school until late afternoon.

5. The alarm on School Backpacks

    There is an alarm that is pinned next to a school backpack that is given free of charge from the school as one of the fastest actions to do. Children will press the alarm button, as a sign to ask for help from others, if there is someone who is very suspicious wants to approach him. The power of this alarm is almost 100dB and this power is the same as the sound of an ambulance siren. an alarm placed in a school bag can at least protect the safety of a child from an evil person who wants to harm him.

6. School Security

    Strengthening school security through the active role of security guards in schools, so that everyone who comes to the school can be identified, and their purpose, of course, the role of these security guards can be supported by relevant equipment. Then instructing the security guards, every student coming home from school, the security guards will always monitor and ensure the children return safely and return home (Daipon, 2017).

7. Face Detection System Technology

    Intel Galileo boards will compare the visitor's face with the data in the system and then unlock the gate if the face is recognized in real-time. In this technology, there are also emotional detectors that can be applied to detect the emotions of visitors whether

visitors are happy, sad, or sad angry. Someone is usually nervous when they try to do something bad. in the picture the system will recognize the face and if the recognition fails, the system will make a video call to the school owner with Wireless Network Technology (WIFI). If not, the system will detect eye blinks. When blinking is detected, the system will unlock the gate. If there is no blinking eye detection, the system will do so sending an alarm to the handphone.
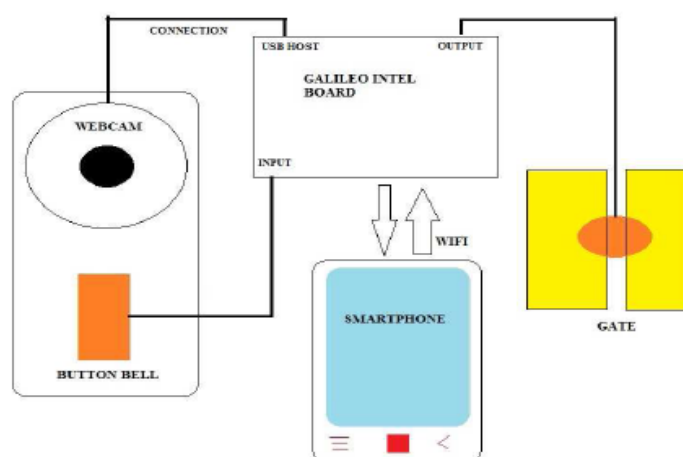
Figure 2.3. Hardware Connection System Prevention of kidnapping children through face recognition on Intel Galileo boards

Intel Galileo Board functions as the main processor. Used to control all signals and also input and output data. The facial straightening process measures the correct position and scale of the face. In this process, faces will be analyzed according to face size, background environment, facial poses, and facial components which are the eyes, nose, and mouth. In this system, the active appearance model is used to align the face. For Active Appearance Models, this is a method for matching models with pictures taken. The process of matching features is performed for images taken by the camera with faces of images from the database. In this process, faces that are detected by the camera will be compared to faces in the database and it will produce faces whether recognized or not.

The database will store image data and compare it with images of people captured by the camera. The database must initially be trained by face recognition to detect faces. The original image of the visitor will match the face in the database. In the database, it will have several guardian images in different poses. Face recognition does not have any effect if the face is not similar to the data in the database. The visitor's name will appear on the screen if the visitor's face matches the image in the database. The smartphone will then function as a key to unlock the gate.

Using this system, the main entrance is automatically controlled by only allowing the original guardian to enter the school. This also avoids kidnappers from entering the school area, thereby reducing the number of cases where children are abducted. As a result, schools will be in maximum security and the safety of children will increase (Hasni, 2016).

2.10.2 Child Tracking Technology

Sometimes, the parent cannot pick their children at school. This may result in that child go back home on their own, which is very dangerous. Innocent attitudes and personalities of children sometimes cannot make them unprotected. Moreover, lack of parental supervision of children outside the home for example at school added with limited supervision of teachers and schools of their students when out of school makes gaps or opportunities that can be exploited by certain individuals to commit crimes such as kidnapping.

For parents who have less time for family and children, it is not uncommon this results in parental attention towards their child will be reduced and unable to monitor children's activities, this causes parents to not know where the child is. Even children can be on their own or go to places that they should not visit. Even more dangerous is the occurrence of cases of child loss or abduction of children.

The technology that parent used to track their children include:

1. Child Tracker Applications Using Assisted Global Positioning System Technology

The Child Tracker application on an Android smartphone is an application that is used to determine the whereabouts of a child. This application can find out the whereabouts of children when traveling by using an android smartphone. It also can help children provide the location and contact parents quickly and in an emergency. This application uses a device that is A-GPS on an android smartphone so that the position of the presence of children is more accurate and precise, then it is done anywhere because this application is connected to the internet.
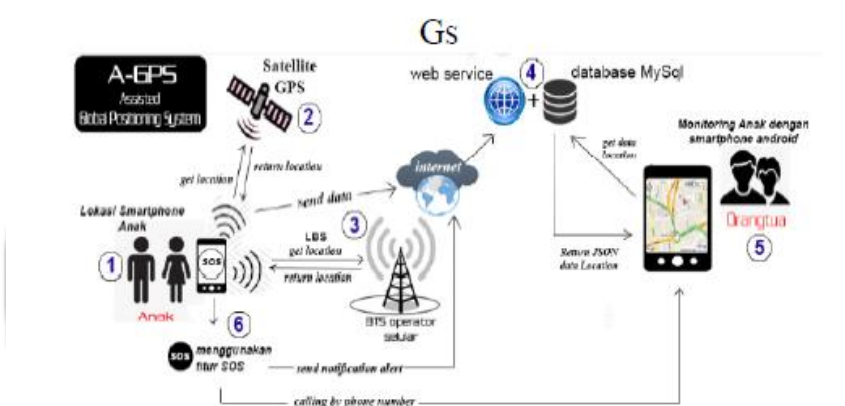
Figure 2.4. Child tracker System Architecture

Juansyah in his article mentioned that positioning on A-GPS is to use distance calculation. The distance in question is the distance between the user and the GPS satellite. This distance can be obtained after the length of time the GPS signal travels from sending by satellite to being received by the A-GPS receiver is known.

2. Geofencing Technology on Android Smartphones

One way to do geofencing is by installing a GPS receiver to be tracked to an object and using GPS data from the receiver to determine where the object is located compared to the geofence location. The main function of geofencing is to conduct remote monitoring (monitoring) of a mobile device from a virtual map when the mobile device exits or

enters a geofence-restricted area (virtual fence). A variety of geofencing techniques have been developed for a variety of different needs namely:

a. Geofenced Area

This technique provides automatic monitoring of mobile objects that move around or are in the geofence area. The alarm will sound when the mobile device enters or exits the specified boundary. The coordinates of several points needed to determine the geofence area. This coordinate becomes the source of algorithm calculation that allows for a warning, either exclusive or exclusive of a geofence.
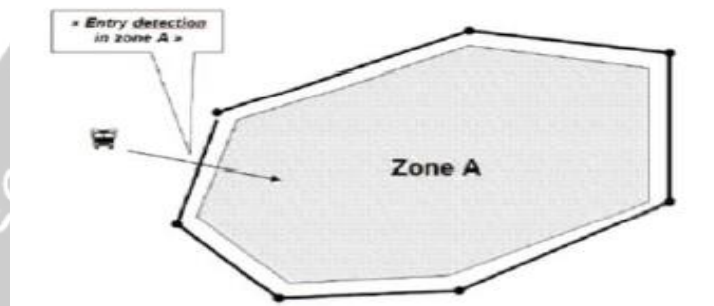
Figure 2.5. Active geofence (black circle) around region A

b. Proximity with a Point of Interest

This technique has two parameters, namely the coordinate center point and radius distance which are intended to detect the proximity of the mobile object to the point of interest. In reality, the geofence is circular, and the point of interest is in the middle. Radius is parameterized according to the distance considered as proximity to the point of interest, from several meters to several tens of kilometers.
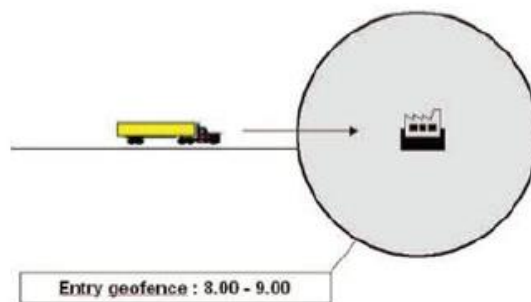
Figure 2.6. Detection of proximity with circle geofence

c. Service Architecture

The architecture of this service adopts Enterprise Mobile Architecture which enables mobile devices to communicate with each other through RESTful Web Service. Mobile devices used by children will periodically send GPS location data to the server. The presence of children who are constantly updated and monitored in a predetermined area (geo-fence) by parents will then trigger if the last location obtained is outside the area. The server will send a notification to the parent's cellphone as a notification of violations of location regulations (Beni, 2017).

Figure 2.7. The architecture of Child Monitoring Services

3. GSM-GPRS-GPS Technology

GPS tracking devices for children are very versatile devices that have the potential to tell parents where their children are. This GPS locator is combined with the latest technology to make it more advanced for and better use. That's all because of the latest

technological efforts that the device has a size like a key chain that can be used instantly and cheaply to watch over children anytime, anywhere.

The GPS locator system for children has a transmitter that can be attached to a child's wrist or school bag or a cellphone or computer. The transmitter with the help of the GPS network will calculate its position and then transmit it to the cell phone or computer. Individual positions are usually given as coordinated maps and if the person is smart using a telephone or computer then the location is presented in real-time on a high-resolution map, just like Google maps.
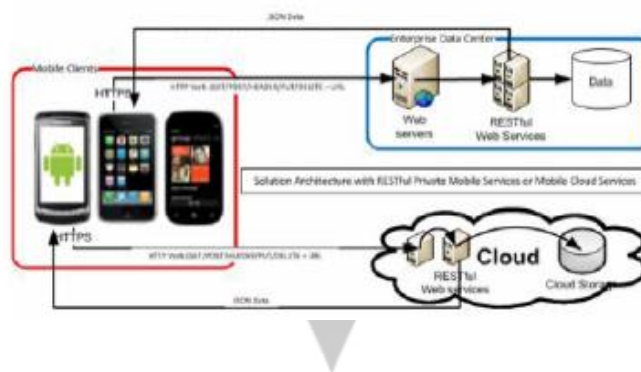
4. GPS tracking devices for children have been a boon for parents who are very concerned and stressed about their children when they are out of their protection. With a GPS child tracker, parents can track their children 24/7, thereby assuring them of their full safety and protection.

   a. GPS - Shoe Tracking

   Equipping shoes with a GPS tracking device is one way to help parents calm their minds. parents lose their children, like in a crowded mall or through kidnapping. Many are looking for ways to ensure they can find their children if they are separated. Some other parents want a way to know when their teenagers arrive and are safe at their destination and to make sure they are where they say they are going. Smart GPS shoes, which have built-in GPS devices with cellphone capabilities and motion detectors show the number No. 1. Parents can program their shoe text devices if their child is traveling more than the specified distance from a central location. The device sends its location in real-time, so parents can enter the tracking site from anywhere and use Google Maps to see where the device is. This device is designed to track almost all over the world.

   b. Advanced Shoe location services

   Combines a small and powerful GPS tracking device that connects with the GTXC internet user portal to offer a very attractive range of very attractive personal location

services. This portal makes it easy to determine safe zones or insecure zones or geographic boundaries on Google Earth maps and to set cell phone warnings if the perimeter is breached by the wearer. This should be significantly beneficial for caregivers of children and parents, because it can easily adjust monitoring and warning of the location of their texts through a simple "set it and forget it" system.

These shoes also use assisted GPS to improve the accuracy of indoor locations and will send for days before recharging. The intelligent resource allows parents to track the whereabouts of their children. This device contains a GPS receiver, cell phone, motion detector, battery charger, weighs more than one ounce, and is slightly larger than a matchbox and is waterproof, shockproof, and interchangeable as an external, rechargeable battery. Use the Global Positioning System (GPS) location of the reporting platform to determine its location, then forward the information with a timestamp on the GSM cellular system to the allocation of central data reception. Information is processed and available through the internet. It can be accessed with any PC connected to the internet, laptop, or PDA, and location information is displayed as a location on google maps.

Figure 2.8. Shoe trackers

c. Tags for children

The tag for children is a pointer Great location for children in a crowd. This device does not interfere and easily attaches to children's shoes, clothes, or book bags. The

main transmitter functions as a key ring, making it easy to carry anywhere as shown in the picture. When a child wanders 30 feet away from the transmitter, parents will receive an instant warning that will make it easier for parents to find it. Besides it, they can push a button on their transmitter to sound a loud alarm to their child.

Figure 2.9. Tags for children

Shoes that are connected to a belt that contains a GPS tracking system can be installed on all types of shoes that can be used by children when he wants to change or replace shoes with others as well to reduce the layout and can be charged far from electric shoes and it can be cared for and spare the spare parts can be replaced. researchers using a GPS tracking system provided with cellphones can send text messages to parents' phones if they reach the device is not active and they can hear the sound of their children (Afifi, 2015).

CHAPTER 5. CONCLUSIONS

5.1 <u>Conclusions</u>

From the implementation and testing results, there were some conclusions that the authors obtain. These conclusions are:

1. In this research, the author successfully developed an Android-Based Child Pick Up application.

2. The author successfully implemented QR Code and Firebase technology in this application.

3. This Android-based Child Pickup application is a very effective and efficient application to facilitate in and help teachers in verifying pickup person in school so that child is in safe hands when leaving school. Teachers who previously had trouble recognizing the pickup person, now made easy with this application.

The benefit of the developed Child Pick Up application are the following:

1. This application can help teachers in verifying child pick up a person in school.

2. This application can help parents pick up children from school safely.

3. This application records the time when children are picked up every day.

4. This application may help reduce child abduction rates as children are in safe hands.

The advantage of the developed Child Pick Up application used for picking up a child in school over the traditional are the following:

1. In the past, it was hard for teachers to recognize students' pickers who could be different every day. Now with this application, teachers can easily verify the pickup person.

2. In the past, the picker could have been a kidnapper who claimed to be a relative of the child, and because the child was still small and innocent they did not know that they were going to be kidnapped. Now with this application, all pickers must provide proof that they are a trusted person to pick up children at school by showing the generated QR Code.

3. This application is connected to the student's data, makes it systematized in the database.

4. Student's data becomes more structured, valid, and reliable than manual recording.

5. The level of student data security is higher because it goes through a series of validation and verification processes,

6. Simplify the work and reduce the working human resources.

7. Now, every child will be recorded when they leave school every day.

5.2 Recommendations

The system built still has some shortcomings, therefore some things need to be developed to be better, including:

1. Design the better modern User Interface.

2. Give a push notification for parent role when their child has been picked up.

3. Add a function for teacher role to see all students who have or have not been picked up.

4. Add search function for teacher role to see a specific student.

5. Development on iOS platform.

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