DEVELOPMENT SYSTEM MONITORING OF CHILDREN IN SLB C SUKAPURA KIARACONDONG KOTA BANDUNG

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ABSTRACT

SLB C Sukapura is a school dedicated to children with special needs. Teachers in SLB C Sukapura stated that they experienced problems, namely difficulties in supervising students, because in SLB C group students tend to be hyperactive so that the frequent occurrence of students who disappeared from the school environment. And the teacher also has difficulty finding students when students are lost. Likewise parents of students, parents of students experience difficulties in supervising their children because parents have other jobs. So we need a child monitoring system in Sukapura SLB C. Development of a child monitoring system starts from an analysis of the existing system in the school, then analyzes all of the systems that will be built, namely the analysis of school coordinates that are used as geofencing areas. Geofencing is applied using a polygon API. System development also uses distance matrix to measure the distance between children and teachers. The test results are known that this application can make it easier for teachers to supervise children and make it easier for teachers to find children when children are lost and make it easier for parents to supervise children. The conclusion obtained is that the child monitoring system in SLB C Sukapura can help teachers and parents in monitoring children.
Keyword : monitoring, children with special needs, geofencing, polygon API, distance matrix API

1. PRELIMINARY

Sukapura SLB is a special school dedicated to children with special needs, especially children with mental disabilities, autism and deafness. Sukapura Kiaracondong SLB holds education starting from SDLB, SMPLB, to SMALB / SMKLB levels. This school is located on Jalan Bumi Bumi Asri Sukapura No. 3 Kiara tends to the city of Bandung [1].

Based on the results of an interview with Mr. Adang Sodikin, Spd. As deputy headmaster and public relations, it is known that teachers often experience difficulties in supervision of children, because in SLB group C students tend to be hyperactive so that often the occurrence of students who disappear (run away) from the school environment which causes teachers in the school to find students who are missing it. The last incident occurred on January 23, 2018, a child named lucky, a junior high school student lost (escaped) during recess.

As for the results of interviews with 5 parents of students, it is known that parents have difficulty supervising their children because parents have other jobs, so that children are out of parental supervision and leave home without the knowledge of parents. This makes parents worried because children with special needs cannot communicate well with others so that children are worried that they will not return home because they are lost.

Based on news obtained from Kompas, one of the incidents of missing children with special needs occurred in Cilincing, North Jakarta, on January 18, 2018. A 10-year-old child was found lost by residents, at Anasrullah Mosque, Sukapura, Cilincing, North Jakarta. The child is a child with special needs which causes the Social Services, Control and Control (P3S) officers to find it difficult to check and extract information. In addition, the child was also known to be unable to read and write when the officer asked him to write down his parents' name and home address [2].

Based on the exposure discussed, the researchers intend to make a system that can be a solution to these problems, namely the Development Monitoring System of Children in SLB C Sukapura Kiaracondong Kota Bandung. So that it is expected that this system can help teachers and parents monitor children.

2. CONTENT OF RESEARCH

2.1 Monitoring

According to Rizma Pretty Alsela monitoring can be explained as something that is repeated over time and obtain certain information for specific purposes [9]. Meanwhile, according to Rina Agustina and Nurhidayat, monitoring is a natural process that runs continuously and continuously [10].

2.2 Children With Special Needs

In the research of Miftakhul Jannah & Ira Darmawanti, Children with Special Needs (ABK) are children who are in the process of growth or in the process of development that require special services that experience abnormalities, mental-intellectual, as well as socially and or emotionally than other children of their age [12].

2.2 Geofencing

Geofence is a parameter that is used to limit a location so that when an object enters the geofence location it can display a notification [16]. The following examples of geofencing can be seen in Figure 1.



Figure 1. *Geofence*

2.3 Distance Matrix API

Distance matrix API is a service from maps API that provides services to be able to get the required distance and time from two points on maps. The distance is calculated based on the route of the two points [25].

2.4 Polygon API

Polygon API is a library maps API that is used to create a specific form on maps. The polygon represents a particular form of the area we want to form, which consists of a collection of several coordinates [26]. The following example of polygon can be seen in Figure 2.

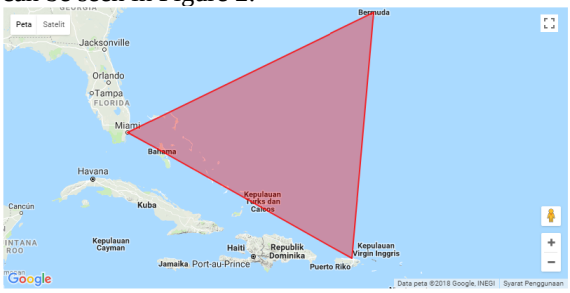


Figure 2. Example of Polygon

2.5 SQLite

SQLite is a library that implements a database engine that does not require external library support from the operating system, can be accessed directly without a server, does not require installation before use and is a transactional database that implements Atomic, Consistent, Isoalated, and Durable (ACID) [18].

2.6 Current System Analysis

The current system analysis is carried out by interviewing the deputy headmaster of the community relations section and the parents of students to get an overview of the current system. The following is the procedure for locating a child.

The procedure for locating a child's location is:

1. Parents or teachers get information that a child is running away (lost).
2. Parents or teachers carry documents in the form of photos of missing students.
3. Parents or teachers ask the surrounding community to include photos of students.
4. If people see, parents or teachers go directly to the place indicated.
5. If there are no people who see, parents or teachers search to the nearest place and ask the surrounding community again.
6. Parents or teachers go to the child's location.
7. Children found.

The procedure to find the location of a child can be seen in Figure 3.

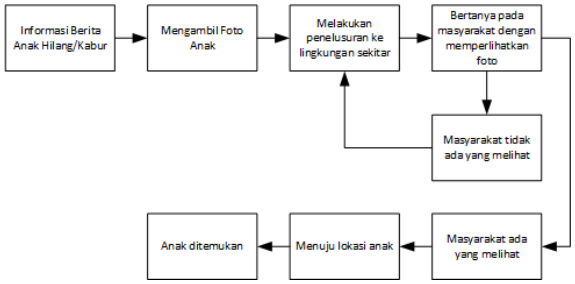


Figure 3. Child Location Search Procedure

2.7 School Plan Analysis

School floor analysis discusses the plan from SLB C Sukapura Kiaracondong Bandung which is used as a measure to be applied in geofencing. The following is the SLB C Kiaracondong Bandung plan can be seen in Figure 4.

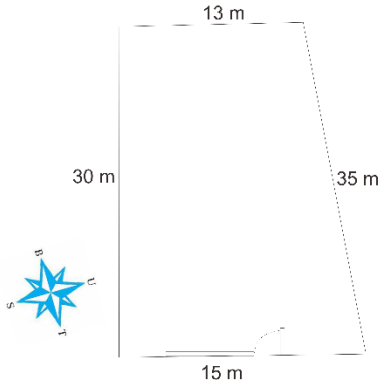


Figure 4. Plan of SLB C Sukapura Kiaracondong

2.8 Analysis of School Coordinates

School coordinate analysis is made to determine the polygon to be made. The following is a picture of the coordinates of the Sukapura Kiaracondong SLB C school in Bandung which can be seen in Figure 5.



Figure 5. School Coordinates

The coordinates in Figure 6 show the following school coordinates:

1. The right upper limit of the school is indicated by the coordinates (-6,930459, 107.654261).
2. The lower right limit of the school is shown by the coordinates (-6.930484, 107.654659).
3. The upper left limit of the school is shown by the coordinates (-6.930580, 107.654265).
4. The lower left limit of the school is shown by the coordinates (-6,930609, 107.654528).

2.9 Smartwatch Usage Analysis

Based on the results of interviews with three Sukapura SLB C teachers, data was obtained that the application of smartwatch in the hands of children was less effective because the use of a smartwatch on the hands would attract people's attention so that it would cause fears of a bad person. This is known because the average child with special needs cannot defend themselves.

Therefore, the researchers took the solution to apply smartwatch to the modified belt, later the smartwatch will be inserted into a pocket located on the modified belt. With this kind of application, it is effective to use smartwatch as a child detection tool, because on the application of using this belt the smartwatch will look like it does not exist so that it will minimize crime.

2.10 System Workflow

The system to be built aims to make it easier for schools and parents to monitor students in SLB C Sukapura. The workings of the system built are as follows in Figure 6.

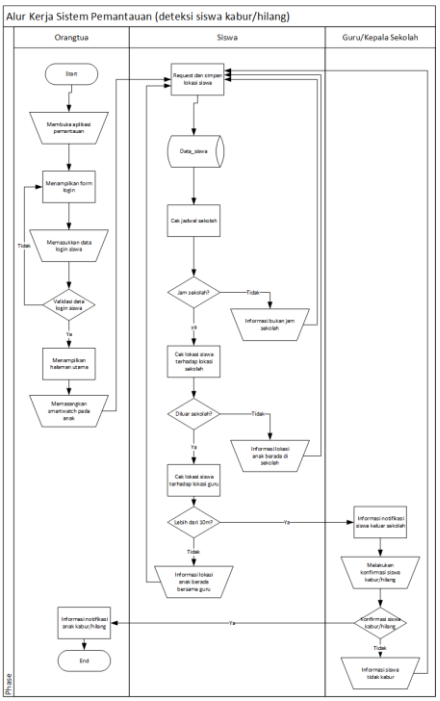


Figure 6. System Workflow

2.11 System Architecture

System architecture analysis aims to identify the architecture that will be built based on two subsystems, namely the web and mobile subsystems.

2.11.1 System Architecture on a Web Platform

The web platform is one of the subsystems chosen in the development of this software. Software users on this platform are teachers, parents, principals and student affairs. Here is the Image of Software Architecture on the Web Platform can be seen in Figure 7. This picture illustrates the overall system architecture that exists on the web platform.

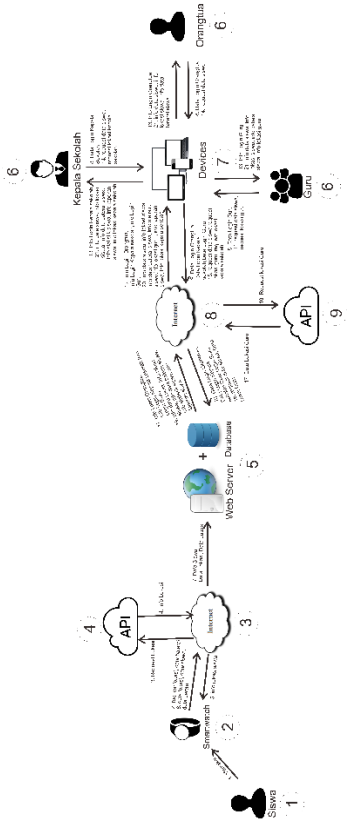


Figure 7. System Architecture on a Web Platform

The following is an explanation of Figure 7 as follows:

1. Students use an Android-based smartwatch that has a monitoring application installed.
2. Smartwatch requests location data to Google Maps API via the internet.
3. Google maps API accepts location requests and sends the smartwatch location to the smartwatch via the internet.
4. Smartwatch receives location information.
5. Smartwatch sends student NIM data, location data, and battery data to the web server via the internet.
6. Principals / parents / teachers do log in to the web server by entering user login data, through devices that must be connected to the internet.
7. A device connected to the internet sends the user's login data to the web server.
8. The web server receives the user's login data (Principal / Parent / Teacher) then validates the user's login data to the database.
9. The web server sends the user's login info (Principal / Parent / Teacher) via the internet.
10. Login information of the user (Principal / Parent / Teacher) received by the user's device.
11. Login information of the user (Principal / Parent / Teacher) is received by the Headmaster / Parent / Teacher from the user's device (Principal / Parent / Teacher).
12. School Principals / Parents / Teachers request student data through the device.
13. Device requests student data to the web server via the internet.
14. Web server accepts student data requests and displays child / student data contained in the database.
15. Student info, student location info, student battery info, student statistics info, student report info sent web server via the internet to the user's device.
16. Device Headmaster or parent receives student info, student location info, student battery info (principal and parents), student statistics info, student report info (principal).
17. student info, student location info, student battery info, student statistics info, student report info received by the principal through the device used, student info, student location info, student battery info received by parents of students / teachers through the device used.

2.11.2 System Architecture on Mobile Platform (Smartwatch)

The mobile platform is one of the subsystems chosen in the development of this software. The architecture of mobile software describes the interaction of mobile software (smartwatch). The description of Smatrtwatch architecture is shown in Figure 8 as follows.

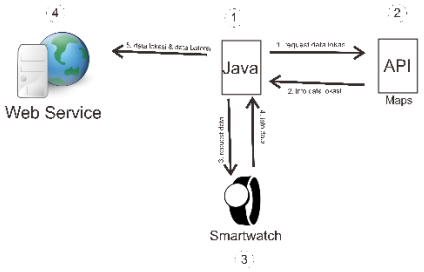


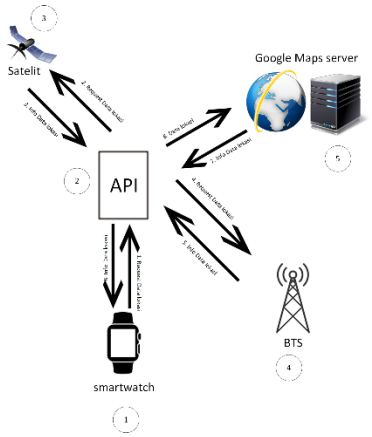
Figure 8. System Architecture on Mobile Platform (Smartwatch)

The following is an explanation in Figure 8 as follows.

1. The Java programming language requests location data to the Google Maps API every 10 seconds.
2. Google Maps API receives location data requests from the Java programming language and then sends location data in the form of latitude and longitude to the Java programming language.
3. The Java programming language asks for battery data on the smartwatch system, then the smartwatch system sends battery data to the Java programming language.
4. The Java programming language sends location data and battery data through a web service.

2.11.3 Google Maps System Architecture

Google maps system architecture describes how Google maps works. The following Google Maps architecture can be seen in Figure 9.



Gambar 9. Google Maps System Architecture

The explanation of google maps architecture is as follows.

1. Smartwatch requests location data using the google maps API.
2. The API requests location data to the satellite.
3. Satellite sends location data to the API.
4. API requests location data to BTS around the user.
5. BTS sends location data to the API.
6. The API sends location data to the google maps webserver.
7. The google maps server sends location data to the API.
8. The API sends location data to the smartwatch.

2.12 Entity Relational Diagram (ERD)

Entity Relationship Diagram (ERD) is a way to describe data created based on real-world data called entities and relationships between entities with several notations. ERD is divided into two, namely ERD on the backend program and ERD in the fontend program. Following this, the design of the ERD backend from the system is as follows in Figure 10.

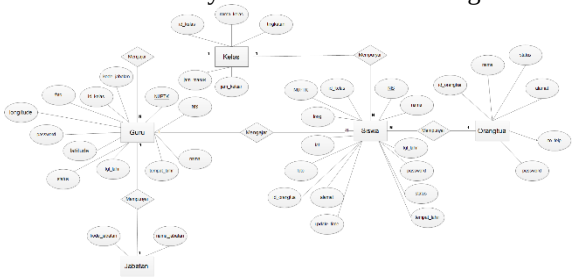


Figure 10. Entity Relational Diagram (ERD) Backend

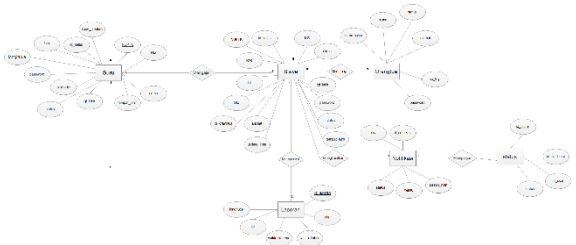


Figure 11. Entity Relational Diagram (ERD) Frontend

2.13 Context Diagram

Context diagram is a flow chart that describes the flow of data entry and exit from a system and its relation to external entities. Following is Figure 12 Context Diagram for the software to be built.

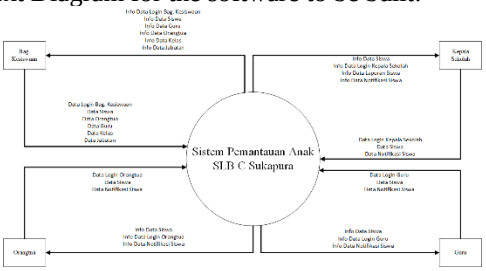


Figure 12. Context Diagram

2.13.1 DFD Level 2 Monitoring

The following are DFD Level 2 Monitoring of the built system is shown in Figure 13.

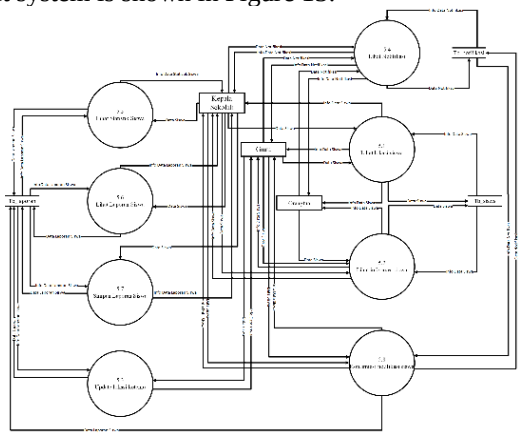


Figure 13. DFD Level 2 Monitoring

2.14 Use Case Diagram

Use Case Diagram is used to describe the functionalities of the system to be built. The following is a use case diagram for monitoring SLB C Sukapura Kiaracondong children found in figure 14.

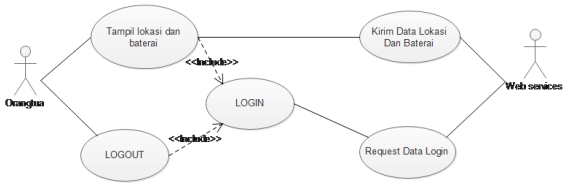


Figure 14. Use Case Diagram

2.15 Relationship Scheme

The relation scheme is a series of relationships between two tables or more in a database system. As well as combining attributes that have a primary key. So that each attribute becomes a connected entity. The following is the relation scheme of the SLB C Sukapura Kiaracondong children monitoring system

in Bandung City, which is shown in Figure 15 below.

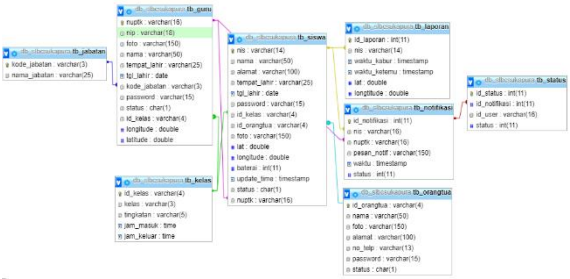


Figure 15. Relationship Scheme

2.16 Implementation and Testing

The system implementation phase is the stage of applying the analysis that has been carried out into a programming language, as well as the application of a system that will be built in a real environment.

2.17 Implementation of School Coordinates

The coordinates that have been analyzed in the analysis phase are implemented as the geofencing area of SLB C Sukapura. Following is the implementation of the coordinates of the Sukapura SLB C school can be seen in Figure 16.



Figure 16. Implementation of School Coordinates

2.18 Implementation of Smartwatch Implementation

In the analysis phase it is known that the application of smartwatch in children with normal application (on hand) is less effective, so the application of smartwatch is used on modified belts. Following this, the implementation of smartwatch is shown in Figure 17 below.



Figure 17. Implementation of Smartwatch Implementation

2.19 System Testing

System testing is an important part, with this test developers can find out errors from applications that were previously not visible so they can be fixed. The following is a system testing on the development of a child monitoring system at SLB C Sukapura Kiaracondong, Bandung which consists of Alpha testing using blackbox and beta testing..

2.19.1 Alpha Testing Results

1. Test results of the teacher's web sub-system

a. Tests View Student Locations can be seen in table 1 as follows.

Table 1. Testing See Student Locations

Cases and Test Results (Data True)			
Input Data	**Which are expected**	**Observation**	**Conclusion**
The teacher successfully logged in	Display student location	Show student location	[✓] Accepted [ ] Rejected

b. Testing See Student Notification can be seen in table 2 as follows.

Table 2. See Student Notification

Cases and Test Results (Data True)			
Input Data	**Input Data**	**Input Data**	**Input Data**
The teacher presses the notification button	Display student notification data	Show student notification data	[✓] Accepted [ ] Rejected

c. Student View History Test can be seen in table 3 as follows.

Table 3. Testing View Student History

Cases and Test Results (Data True)			
Input Data	**Input Data**	**Input Data**	**Input Data**
The teacher chooses students who want to see their history	Display student history data	Student location history	[✓] Accepted [ ] Rejected

d. Student Confirmation Testing (missing) can be seen in table 4 as follows.

Table 4. Student Confirmation Testing (missing)

Cases and Test Results (Data True)			
Input Data	**Input Data**	**Input Data**	**Input Data**
The teacher presses the missing student confirmation button	Confirm missing students and display notifications to parents	Notification appears to parents of student locations	[✓] Accepted [ ] Rejected

2. Test results of the child's mobile sub system

a. Child Login Test can be seen in table 5 as follows.

Table 5. Testing of Child Login

Cases and Test Results (Data True)			
Input Data	**Input Data**	**Input Data**	**Input Data**
NIS : 111 Password : 111	Enter login data in the form of NIS and password	The NIS data and password are correct, and enter the child interface	[✓] Accepted [ ] Rejected
Cases and Test Results (Incorrect Data)			
Input Data	**Input Data**	**Input Data**	**Input Data**
Username : O1112 Password : O123	Display the message "NIS or Incorrect Password"	Shown message "NIS or Incorrect Password"	[✓] Accepted [ ] Rejected

b. Testing the Child's Page View can be seen in table 6 as follows.

Table 6. Testing Child's Page View

Cases and Test Results (Data True)			
Input Data	**Input Data**	**Input Data**	**Input Data**
User successfully logged in	Display the main page	Show main page	[✓] Accepted [ ] Rejected

c. Child Logout Testing can be seen in table 7 as follows.

Table 7. Testing Child's Page View

Cases and Test Results (Data True)			
Input Data	**Input Data**	**Input Data**	**Input Data**
Parents press the logout button	Display the "Succesfully Logout" message then display the login interface	A message appears "logout succesfully" and displays the interface	[✓] Accepted [ ] Rejected

2.19.2 Beta Test Results

This test is carried out directly to teachers, principals, students and parents as users of the software by using data collection methods, namely questionnaires to SLB C Sukapura Kiaracondong City of Bandung, namely Principals, Teachers, Student Affairs and parents of student in SLB C Sukapura Kiaracondong Kota Bandung.

Questionnaires were distributed to 32 respondents. That is 15 teachers including the headmaster and student affairs and 17 parents of the Sukapura Kiaracondong students. From the results of the questionnaire it was concluded that the application can help parents and teachers to supervise children / students.

3. CLOSING

5.1. Conclusion

Based on the results of testing on the monitoring application Nak in SLB C Sukapura Kiaracondong, Bandung City, the following conclusions can be drawn:

1. The child monitoring application has succeeded in making it easier for teachers to supervise and search students when students are lost.
2. The child monitoring application has succeeded in making the parents watch over the child when the child is not at home.

5.2. Suggestion

The child monitoring application that is built focuses on finding the location of the child, therefore some suggestions can be used for the development of subsequent applications, as follows:

1. Improve the accuracy of the location of the child monitoring application.
2. Add chat feature between parents and teachers. Making it easier for teachers and parents to communicate.
3. Add features to make geofencing.

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