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Research paper

Getting parents involved in child's school: using attendance application system based on SMS gateway

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Abstract

Along with the development of communication technology, and information system, more and more also made the attendance system, and academic information. The development of a more modern absentee system with respect to the honesty side needs to be built as a substitute for manual absence using paper. Attendance system is at once can be a new standard on attendance system in Education environment. The choice of fingerprint attendance system based on communication technology in the form of SMS is because it is more practical, cheap, and efficient to convey information. Parents do not have to bother anymore come to school just to know the presence or absence of his son / daughter. In the implementation of this application, in the early stages of the user must register their identity by using the application program absenteeism built with PHP programming language, to further stored the absence data into the database My SQL which has integrated SMS Gateway through the SMS sending software that is Gammu. In addition with SMS Gateway technology, parents will be easier to obtain information on the presence of his son / daughter. From the student side, it is hoped that it will foster discipline attitude in time because indirectly this application will grow the mental attitude on time to the students, and it is expected that this application can fix any deficiencies in attendance application that has been implemented earlier.

Keywords: *Student; Parent; School; SMS Gateway; Attendance.*

1. Introduction

The development of computer technology is very instrumental and it can help man work in all fields so that it requires man to understand and master it in order to achieve the desired goal [1-3]. Educational Institutions is one of the vital areas that utilize Computer Technology [4-6]. With pointing out the computer technology educational institutions, there can be said not enough to support a good teaching and learning process [7-9].

Student attendance activity in a school is generally done every day with the aim to know whether the student is present, sick, permit, or negligent for every class which later this data will go into student attendance data recap, student data such as Student Number (NIS), Name, and Class. From the student attendance data, school can assess discipline level for each student [10-12]. It also serves to get attendance data for each student at the end of the semester [13-15]. Student attendance data can not meet the needs of users when conducting student attendance as officers in the sense which can still be expanded through the attendance manually [16-18].

The previous research conducted by Isnawati Mulyani with the result of research is make SMP YPPT Garut become international school [19-21]. Dini Kristianti with the result of the research is an application that provides academic information that is expected to help students [22-24]. The problem faced by SMK Muhammadiyah Pringsewu is high student absence rate, in the last 3 years the average percentage of student absence reached 75.64%.

Table 1: Student and Attendance Level in the Last Three Years

Year	The Number of Student (class 1+2+3)	Attendance (A+I+S)	Attendance percentage per year
2014	179	61	65,92 %
2015	178	42	76,40 %
2016	185	29	84,32 %

Another obstacle faced is the lack of communication and information between the school parties with student parent. This may result in the student being able to lie to the parent by reporting being in a teaching and learning activity but in fact the student plays with his or her friends. This will lead to the condition where parents do not to know the development of their children who are in school.

Based on the questionnaires, not almost all parents of students generally know the presence of their children in school, due to the business of parents who do not have time to check the presence of children at school [25-27]. The attendance system in SMK Muhammadiyah is the same as in most other schools, with attendance system in the class still using manual system.

To overcome this problem, the school designs attendance system based on SMS Gateway that can monitor student attendance in school by involving student parents [28-30].

Student attendance system is done to improve student discipline. Streamline time and energy while at the same time cultivate computer technology to share users, especially teachers [31-33]. The

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manual attendance system applied by the school is by using a letter, so when the students do not follow the lesson without reason then school will send a letter to the parents [34][35][36]. In this information system, the time required is faster, because the SMS system will send SMS directly to the parents and only takes less than an hour with cost IDR 100. Objectives and benefits of the implementation of SMS Gateway based information system is to facilitate the process of attendance to a student, whether the student is present from the beginning of the lesson until the end of the lesson [37][38][39]. With the SMS Gateway based Information System, it is expected to assist the process of student attendance at SMK Muhammadiyah Pringsewu and other expectations with the existence of this system then the supervision of students is also easier, because parents can find details of student's attendance via SMS.

1.1. Problem formulation

Based on the description on the background, it can be formulated in SMK Muhammadiyah Pringsewu there is a problem in relaying the data of student attendance to student parents so that with the problem the parents of the students find difficulties in obtaining information data of student's attendance.

1.2. Problem limitation

1) The research was conducted at SMK Muhammadiyah Pringsewu.
2) The software used was XAMPP1.7.2 software package which includes PHP 5.3.4 programming language, MySQL 5.1.41 server database, and Aphace 2.0 web server, for SMS hardware useing Telkomsel modem and for SMS Gateway using Gammu smsdrc [1]
3) This study was limited only from the design, manufacture and internal testing.

1.3. Research purpose

Produce an information system application that allows the SMK Muhammadiyah Pringsewu to deliver school attendance information to student parents.

2. Literature review

2.1. Main concept of system

The system is the set of interrelated elements to form a unified whole and integrated [4]

2.2. The characteristic

A system has certain characteristics in example components, boundaries, environment systems (environments), interfaces, inputs, outputs, processors (eg, process), and objectives (goals).

2.3. Definition of information

Information is data that have been processed into a form that has meaning to the recipient and can be a fact, a useful value. Therefore, there is a process of transforming data into information through input, process and output [40-42].
Data is raw material for an information. The difference in information and data is very relative depende on the value of use for management in need [43][44][45]. An information for a given level of management may be data for the management of the above levels, or vice versa.

2.4. Quality of information

The quality of an information depends on 3 things, the information must be :

1) Accurate it means information must be free from errors and not biased or misleading. Accurate also means that information must clearly reflect the intent.
2) On time, it means that information coming to the recipient should not be too late.
3) Relevant, it means that information has benefits for the user. The relevance of information for each person to others is different [47-49].

2.5. Main concept of information system

Information system is an integrated system which is capable of providing useful information for its users. Physical Components of Information Systems:

1) Computer hardware: CPU, Storage, Input / Output devices, Terminal for interaction, Data communication media.
2) Computer software: system software (operation system and its utilities), general software applications (programming language), application software (accounting applications etc.).

2.6. Attendance concept

Attendance is a data-making for attendance lists commonly used for an institution or agency that is in desperate need of such a system. Attendance is to adjust a system that must be in use as the concept of attendance system, when the system requires a data system will be used as an application capable of running and create data attendance [50-52].
The basics contained in the concept of attendance system are among others:

1) The main job of an institution or agency is to utilize this attendance system facility as a better amenity than before.
2) Attendance system user is able to run procedural program to be able to use so on, there will be no Human Error problem.
3) User needs to handle the features of a more in-depth attendance system [53-55].

2.7. Database concept

A database is a set of data arranged in the form of (multiple) tables that are interconnected and stand-alone. For example a teacher has student data that must be managed in such a way that is easy to process [56-58]. The data when compiled and in the select based on certain categories, will become a database. Preparation of the data base can be done simply by writing the data in a special book [59-61]. Or it could be in a modern way by utilizing computer technology. Any way used to facilitate the preparation and appearance of data, then used the form table [62-64].

2.8. SMS gateway

The term of gateway, in English – Bahasa Indonesia means the gate. But in the computer term, the gateway can be interpreted as a bridge connecting between one system with another different system, so that there can be data exchange between the system [65][66][67]. Thus the SMS gateway can be interpreted as a link for SMS data traffic, whether delivered or received.
SMS (Short Messaging Services) SMS data (Short Messaging Services) that we send or receive is actually a separate format to be translated by a mobile phone. The format or mode used to send and receive SMS there are actually two modes of text and mode PDU (Protocol Data Unit). However, the text mode system is not supported by all GSM operators or terminals

1) This mode is the easiest way to send a message. In text mode the message we send is not converted. The sent text remains in its original form with a length of 160 (7 bits of default alphabet) or 140 (8 bits) characters. In fact, text mode is the encoded result that is represented in the PDU

format. The Weaknesses is we can not insert images and ringtones into to be sent messages and limited type of encoding.

2) PDU (Protocol Data Unit) Mode PDU mode is a message format in octet and semi-decimal octet hexadecimal with length reaching 160 (7 bits alphabet default) or 140 (8 bit) characters. The advantage of using PDU mode is we can do our own encoding which of course must also be supported by GSM hardware and operators, compress data, add ringtones and images on the messages sent. Some commonly used encoding types are "PCCP437", "PCDN", "8859-1", "IRA" and "GSM". With this SMSC can know the status of SMS messages that has been sent, whether it has been received or failed to be received by the destination phone. If the destination phone is active and can receive SMS messages sent, it will send back a confirmation message to the SMSC stating that the message has been received. Then the SMSC sends the status back to the sender. If the phone is off, the transmitted messages will be stored on the SMSC until the period-validity is met [68].

Using aid software Today in many telecom vendors offer aid software to connect to SMSC, from freeware, open source to commercial ones. Selection of the connection to the SMSC is usually adjusted by the number of SMS messages to be sent. The figure 1 below shows the type of connection scheme to SMSC.

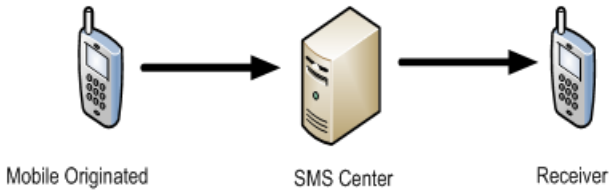


Fig. 1: SMS Sending and Receiving Mode with PDU.

2.9. PHP

PHP is a scripting language that integrates with HTML and runs on serverside. This means that all the syntax that we provide will be fully executed on the server while sent to the browser only the result only. When an Internet user opens a site that uses server side scripting PHP facilities, then the first server will process all PHP commands on the server then send the results in HTML format to the Internet user's web server earlier. So the original code written with PHP is not visible in the user's browser. PHP is a free open source software. So you can change the source code and distribute it freely and for free. PHP can also run cross-platform, which can be used with any operating system (Windows and Linux) and any web server (eg: PWS, IIS, Apache etc) [4].

2.10. MySQL

MySQL is a database server program which is capable of receiving and sending data very quickly, multi-user, and using SQL standard (structured query language) [3].

3. Research method

3.1. Data collection

The authors obtained data by conducting research directly to relevant agencies in a systematic and standardized procedure so as to obtain good and correct data with the data collection as follows:

3.1.1. Data sources

Sources of data collected in this study:

1) Primary data is in the form of student data.
2) Secondary data is the source of information from the literature, reference books and the Internet, among others: the basic theory of artificial intelligence, expert systems, websites, and information.

3.1.2. Methods in data collection

Data collection methods to be used in this study are as follows:

1) Documentation

Documentation here could be determined into searching in collecting data on some particular features of certain objects in the form of notes, transcripts, books, newspapers, magazines, minutes, reports, and agenda and so on This method is intended to collect data and documents from SMK Muhammadiyah Pringsewu.

2) Theoretical review

Literature study is an important step where after a researcher sets the topic of research, the next step is to conduct a study related to the theory related to the research topic. In theory search, the researcher will collect as much information from the related literature. Literary sources can be obtained from: books, journals, magazines, research results (thesis and dissertation), and other appropriate sources (Internet, newspapers etc.). If we have obtained the relevant literature, then immediately to be arranged regularly for use in research. Search for supportive materials in problem solving through books, journals, Internet, and other information media related to the issues under discussion.

3) Literature study

The author tries to compare with similar studies from several writings in several scientific papers.

3.2. System overview

The system to be built is a system of software that helps parents to access easily and efficiently in delivering attendance to the school using mobile media (SMS). At the same time the system will reply with SMS in the form of information that the message has been received by the system [9].

The built applications require data cables to access the phone so that communication and data transfer between phone and computer can be performed. Data cable connected to USB. The data cable used must match with the type of mobile phone that will be used. The author used Siemens C55 mobile phone with DKU 5 data cable as its connector, and SMS application by using Java software as the developer. It is expected to be able to process the data into useful information in a relatively short time.

3.3. Model design

3.3.1. Use case diagram

In the information system for this school, use case diagram describes the actor (user) system is the parent who interacts with the system by making a request in the form of request data or change phone data, ask for attendance data, and receive activity data info. TU user can process student data, attendance data, activity data and delete SMS data. Admin user can process data in the form of user data, activity data, attendance data, student data and SMS data [2].

The format to send SMS is

1) SIAKAD<space>PSB

To find out the new student admission information.

2) SIAKAD<space>RAPORT

To know the learning report for one semester.

3) SIAKAD<space>ABSENSI<space>NIS<space>KELAS<space>TGL

To know the absence of students every day.

4) SIAKAD<space> UJIAN

To find out the exam schedule.

5) SIAKAD<space>NILAI<space>NIS<space>MATA_PELAJARAN

To know the student's daily score.

6) SIAKAD<space>KELAS<space>NIS

To know the class of students.

The SMS format can be sent to a certain number, in this experiment used the author's number.

3.3.2. Context diagram

According to Jogiyanto, context diagram is a diagram that consists of a process and describes the scope of a system [12]. Context diagram is the highest level of PDF that describes all inputs to the system. It will give you an idea of the whole system. The system is limited by the boundary (can be drawn with a broken line). In the context diagram there is one process. There should be no store in the context diagram [5].

1) Student has student number, name, address, photo, etc. Student number on the ID card is in the form of barcode so that it can be used for attendance during school hours.
2) Each student has a different student number with another student. Each student number is taken from date, academic year, serial number. Students when entering school hours have to fill the absent first by attaching their ID cards on the barcode scanner.
3) If there are students who come late they also must attach the ID card because later will get the results of data that the student come late to school.
4) If there are students who were present then ask permission to go home when school hours have not finished, the students have to attach the ID card back because later it will get the last data that students have permission to leave school.
5) After school, hours are completed, before returning home, students are required to attach ID Card back, which will get the actual attendance information data, whether present, alpha, late or permit.

3.3.3. Program menu structure

Program menu structure consists of five subsystems, namely data master subsystem, attendance subsystem, message subsystem, value subsystem, and report subsystem.

4. Design and implementation

4.1. Database design

To run the attendance system application at SMK Muhammadiyah Pringsewu that has been made, the user needs to understand the program manual described below. Program manual is a guide for users to operate the system so that later can be achieved in accordance with what is desired by all parties.

1) Subject Data Table

This table 2 is used to store subject data.

Table 2: Subject Data Table

Field	Type
kd_mapel	varchar (12)
nm_mapel	varchar (30)

2) Teacher Data Table

This table 3 is used to store teacher data.

Table 3: Teacher Data Table

Field	Type
kd_nip	varchar (12)
nama_guru	varchar (30)
pendidikan_terakhi	varchar (30)
jurusan	varchar (30)
no_telp	varchar (12)

3) Student Data Table

This table 4 is used to store student data.

Table 4: Student Data Table

Field	Type
nis	varchar (6)
nama	varchar (30)
alamat	varchar (30)
jenis kelamin	varchar (12)
kelas	varchar (12)
jurusan	varchar (30)

4) Class Data Table

This table 5 is used to store class data.

Table 5: Class Data Table

Field	Type
kd_kelas	varchar (12)
thn_ajaran	date
jmlh_siswa	int (4)

5) Parent Data Table

This table 6 is used to store parent data.

Table 6: Parent Data Table

Field	Type
kd_nama	int (12)
kd_alamat	varchar (12)
pekerjaan	varchar (6)
data_umur	varchar (12)
no_telp	varchar (12)
nama_siswa	varchar (12)

6) Score Data Table

This table 7 is used to store student's score data.

Table 7: Student's Score Data Table

Field	Type
kd_nilai	int (12)
kd_mapel	varchar (12)
nis	varchar (6)
nilai_tugas	varchar (12)
nilai_harian	varchar (12)
nilai_keterampilan	varchar (12)
thn_ajaran	date
semester	int (2)

7) Attendance Table

This table 8 is used to store attendance data.

Table 8: Attendance Data Table

Field	Type
kd_absensi	varchar (12)
nis	varchar (6)
tgl	date
thn_ajaran	date
semester	int (12)

4.2. System implementation

4.2.1. Login page

Login page serves as a gateway to be able to use Student Attendance Information System Application of SMK Muhammadiyah, especially for Admin. To access the program and use as well as possible. If the user does not know the username and password,

then the user will not be able to enter the program. To use this login form just enter the password and username that has been created before, then log in. Figure 2 shows admin login.

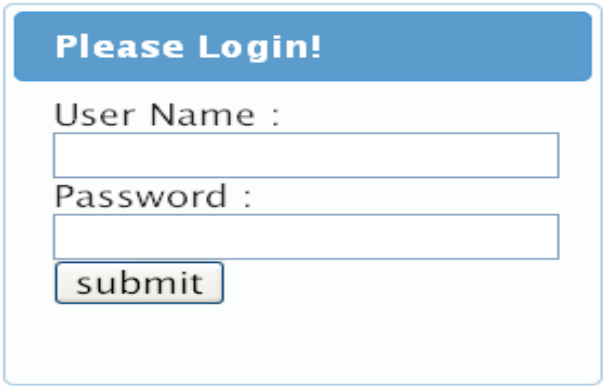


Fig. 2: Display of Admin Login.

Description :

a) Before entering the main menu of student attendance application. Users must pass through the login menu to access the contents of all application menus
b) This login menu is only for administrators who can manage the application.

4.2.2. Main menu page

The main page in use for this application's control panel, consists of the Student Data menu, Attendance Data, Teacher Data, Send SMS, New User. There is also a Menu bar to make it easier to use application. The main page is also equipped with a clock for the hour time clock to make it easier for users to see the time and date. Each of the above menu uses will be explained in the next discussion. Figure 3 shows main menu page.



Fig. 3: Main Menu Page.

Description:

a) In Tab HOME there are submenus namely Student, Parent, Class, Major and Change theme to change the application theme display
b) In the INFO Tab there are submenus namely Inbox SMS, Outbox SMS and Attendance.

4.2.3. Data input page

On each page of data input will be explained one example of some points above that is about student data. Student Data Page is used to input student data starting from academic year, student number, gender, place of birth date, religion, class, address and name of parents. The parent's name is used to find the name responsible for the student's phone number. To use the Student Data Form is as follows: School Year used to enter data, year of the student entering school at the first grade. Nis is the Student Number to mark student's membership and may not be the same among student one after another, after all form in column filled, please select Save to save in database [14]. Figure 4 shows data input page.



Fig. 4: Data Input Page.

Description :

a) To add student data, click (+) sign on left corner below.
b) To edit data click Edit and to delete data click Delete
c) Then appear student data form

4.2.3. Sms gateway page

This form serves to receive SMS from parents and serves to send SMS to parents of each student. Port is an indication of the connection from the computer to the mobile phone, before using this application the user must select to connect and to disconnect from phone to computer. Search in use to search for files or data that has been entered into the database so as to facilitate the user in finding the data. Figure 5 shows SMS gateway page.

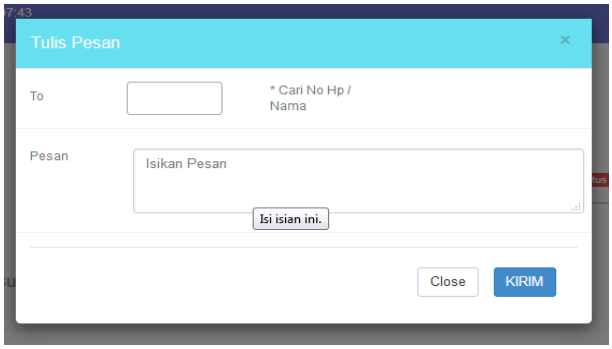


Fig. 5: Sms Gateway Page.

Description :

a) On the writing page there is data to fill in the phone number. The destination number is used to fill in the number to be sent SMS
b) On the message compose page, it is used to fill in the message to be delivered to the student's parent

Implementation of SMS format for parents used to interact with the system that functioned according to their respective functions.

1) To know a guide in order to see the phone number, format SMS: TELP?
2) SMS format to be absent due to permission, (classs#student number #name#serial number#information)
   Example: 6#4111#Cahyo#Ijin#Dikarenakan ikut Bapak ke Bali.
3) SMS format to be absent due to sick, (classs#student number #name#serial number#information) Example: 6#4111#Cahyo#Sakit#Dikarenakan terserang penyakit Demam Berdarah.
4) Format to change phone number, (Name #Student Number#Class#Last Number #New Number)

Example: Cahyo#4111#6#085642006872#085647052004

4.2.4. Broadcast

One of the implementation of this system, that is broadcast messages from school that contain important announcements like in the figure 6 below.

a) Trial of SMS reply

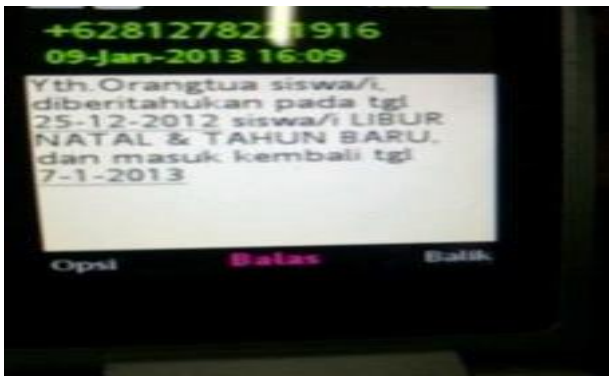


Fig. 6: Broadcast Message Format.

Then the implementation of parents who tell about the development of their children at home, as in the figure 7 below.

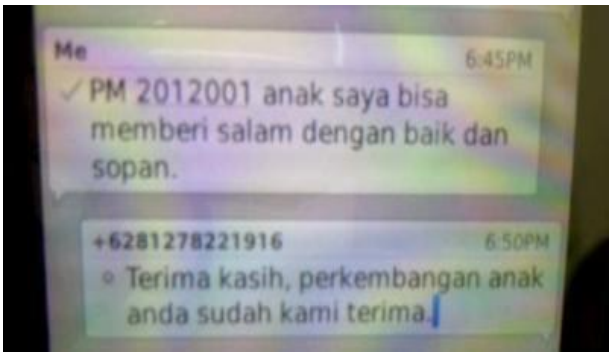


Fig. 7: SMS Notification Format from Parents.

5. Conclusion

Based on the discussion that has been done by the authors about application design of SMS gateway based attendance system of SMK Muhammadiyah Pringsewu, the authors can give some conclusions, with more computerized attendance system of school students, it is helpful to simplify and accelerate parents in obtaining student information in school. Beside can simplify the process of obtaining student information this system is also very helpful in reporting the activities of students in schools that are efficient and appropriate. SMS-based School information system is a capable of sending SMS attendance data according to the requirements, broadcast SMS about activities to all parents, access student data, activity data, attendance data and change phone data via SMS.

In addition it can be concluded some conclusions and also proposed suggestions that might be taken into account in the development of the system, among others: 1) Specifiy the need of program must be met so that the application works correctly and with a fast processing time. 2) Without maintenance and supervision from resposible party for maintaining the system, the system will not run properly. 3) It is needed to add more complete features, so as to meet the needs of a more complex. 4) Information accessed via SMS is still limited to students, it is necessary to add more accesible information for students and parents. 5) To support the smoothness of administrative activities and data collection of students, it should be computerized thoroughly against existing systems for the benefit of administration as well as supported by the existing cooperation between divisions of course.

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