
APPLICATIONS OF GSM TECHNOLOGY FOR DOCUMENTS IDENTIFICATION IN A LIBRARY SYSTEM

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ABSTRACT:

In today's advanced world lots of innovative applications are built on mobile phone based technologies and more are being developed. Libraries in developed countries have begun using Mobile phone based technologies such as Short Message Service (SMS) and General Packet Radio Service (GPRS) to interact with members and utilize it to send alerts and notifications. With one step ahead in this paper, we have proposed a new method to get the information about the availability of a particular book and its location through an SMS. A library user can send a SMS request with the title of the book to check the availability by staying at home or any other places. As a response the library database maintained by automatic update and conveys systems send the reply SMS about the availability, number of copies available and its location. This kind of service will not only help the user to save lot of time but also help him to search the book availability in all near-by libraries. Therefore mobile pervasive technology can be used by the libraries to serve their user as well as the patrons to avail the library services in a better way. By implementing this technique the services offered by the libraries to the user will be more effective and efficient manner.

KEYWORDS: Library system, Mobile phone, SMS, GPRS, GSM

INTRODUCTION

An increasing number of libraries have adopted existing mobile technologies to provide innovative services. Generally all the libraries offer computerized Catalogue Search Services though the Online Public Access Catalog (OPAC) for their user to provide the information about a particular book. The Library Catalogue (OPAC) provides you with a great deal of useful information for finding things and is very easy to use. OPAC is also known as the catalog, PAC, Web PAC, library catalog, and online catalog. OPACs generally contain records of all the items of a library catalogs, such as books, journals, eBooks and DVDs. An OPAC is open source software that will allow the patron to search the library's collection, check course reserves, and check one's own library records. We can make a search by entering a keyword, title or author in the search box. Based on the search query the results will be displayed in the same page.

The main aim of this paper is to signify the application of SMS technology for finding the availability of any material and its location at any library which has "automated update and inform system". By means of mobile communications the user can search any library staying at home and get all the information about a particular book, magazines, journals, reports, standards, CDs, back volumes, question papers and its location.

The paper is organized as follows: Section II briefly discusses the related work carried out in the library management systems, Section III details the proposed system, Section IV explains the implementation of the proposed system and the necessary hardware/software requirements and Section V discuss the results followed by the conclusion of the paper.

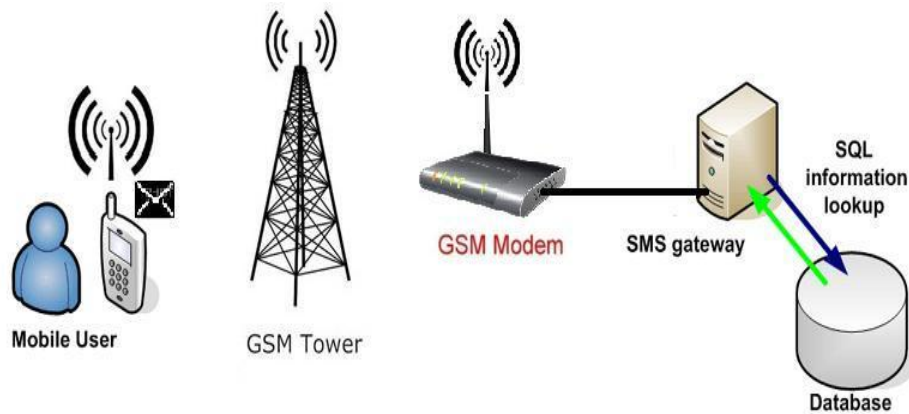


Figure 1: Block diagram of the proposed system

REVIEW OF RELATED WORKS

A brief survey of the related work in the area of library book information access system and different techniques employed are presented in this section. At present, the library management systems have the problem of the traditional manual operation which is time-consuming and inconvenient (Hao et al., 2012). The proposed library management system is designed and implemented based on the web service. In this proposed system, the stored procedure and trigger technologies are used to optimize the database performance.

The proposed system uses an integrated library management system for book search and placement tasks (Farooq et al., 2010). The user can check the availability of a particular book by title or author's name using his mobile phone. The information received by the user contains book code number and location of the book inside the shelf. MATLAB programming environment has been used in developing the system.

This paper presents a tele-monitoring and management system for inter-cities transportation vehicles such as taxis and buses (AL-Rousan et al., 2004). The system is based on GPS and GSM modems that are installed in the vehicle. A software package is developed and installed in GSM-server to read, process, analyze and store the incoming SMS messages.

Nowadays cell phones are rapidly growing in popularity. Thus in order to develop MIS applications, it is very significant to research the way of using messages to query the MIS system. A design method about universal MIS query system which is based on SMS is introduced in (Jian Ming Chen et al., 2010).

PROPOSED SYSTEM

A database is a structured collection of records or data that is stored in a computer system. Library database is an electronic catalog or index, often containing information about published items, and is searchable. All the books availability and their location are maintained in the library database. If any book is issued to user or returned to the library then the database must automatically update information about the number of books available. If the availability of book is zero, that is also noted. When any new book is added, it is entered in the proper format and order, so that it becomes a part of the database.

The proposed system mainly consists of two sections one is a mobile user unit and another is a library management system. The mobile user unit is a mobile with a network provider facility. The library management system consists of GSM modem with SMS gateway server that accesses the library database as shown in Figure1.

A Library user sends an SMS mentioning the book title through the mobile phone. An SMS is received by the GSM modem at the library. The GSM modem is connected to library database through wired connection.

Now the title is checked by the database for the details regarding the availability of the book with the rack number and rung number where the book is placed. This information will be provided through reply SMS through the GSM modem. In short we can list the sequence of operations performed by the proposed system as:

- Send an SMS from user mobile through GSM tower
- Using a computer receive an SMS message through a GSM Modem
- Access the database and collect the information about the requested book title
- Send a reply SMS about the book information from a computer using a GSM Modem
- The mobile user will receive the reply message through GSM tower

Table 1: List of AT commands for Sending SMS

AT		
S. No	Commands	Meaning
1	+CMGS	Send message
2	+CMSS	Send message from storage
3	+CMGW	Write message to memory
4	+CMGD	Delete message
5	+CMGC	Send command
6	+CMMS	More messages to send

IMPLEMENTATION

GSM Modem

The main hardware part of the proposed system is a GSM modem. A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone. When a GSM modem is connected to a computer, this allows the computer to use the GSM modem to communicate over the mobile network. While these GSM modems are most frequently used to provide mobile internet connectivity, many of them can also be used for sending and receiving SMS and MMS messages (Yan and Pan, 2009). A GSM modem could also be a standard GSM mobile phone with the appropriate cable and software driver to connect to a serial port or USB port on a computer. Any phone that supports the “extended AT command set” can be used for sending/ receiving SMS messages.

SMS Gateway & Database

The next important block is an SMS gateway placed between the SMS messaging application and the GSM modem. So we need to configure the GSM modem to send an SMS about the availability of the book to the user and also receive the SMS from the user mobile for analyzing the requested book present in the database.

To send a SMS message from computer using GSM modem, connect a GSM modem to a computer through a serial cable. Then use the computer and AT commands to instruct the GSM modem to send SMS messages. A GSM modem is a wireless modem that works with GSM wireless networks. To send SMS messages, first place a valid SIM card from a wireless carrier into a mobile phone or GSM modem, which is then connected to a computer. There are several ways to connect a mobile phone or GSM/GPRS modem to a computer. For example, they can be connected through a serial cable, a USB cable, a Bluetooth link or an infrared link.

After connecting a mobile phone or GSM modem to a computer, you can control the mobile phone or GSM modem by sending instructions to it. The instructions used for controlling the mobile phone or GSM/GPRS modem are called AT commands. In addition to this common set of standard AT commands, mobile phones and GSM modems support an extended set of AT commands. One use of the extended AT commands is to control the sending and receiving of SMS messages.

Table.1 lists the AT commands that are related to the writing and sending of SMS messages. Table.2 shows a simple example that demonstrates how to use AT commands and the HyperTerminal program of Microsoft Windows to send an SMS text message.

Line 1: "AT" is sent to the GSM / GPRS modem to test the connection.

Line 3: The AT command +CMGF is used to instruct the GSM / GPRS modem to operate in SMS text mode.

Line 5 and 6: The AT command +CMGW is used to write an SMS text message to the message storage of the GSM / GPRS modem.

Line 7: "+CMGW: 1" tells that the index assigned to the SMS text message is 1. It indicates the location of the SMS text message in the message storage.

Line 9: The result code "OK" indicates the execution of the AT command +CMGW is successful.

Line 11: "+CMSS: 20" tells that the reference number assigned to the SMS text message is 20.

To send SMS messages from an application, you have to write the source code for connecting to and sending AT commands to the mobile phone or GSM modem, just like what a terminal program does. The source code may be in C, C++, Java, Visual Basic, or other programming languages.

Receiving SMS messages through a GSM modem has a major advantage over the other ways, because wireless carriers usually do not charge any fees for receiving incoming SMS messages with their SIM cards. In terms of programming, sending and receiving SMS messages through a mobile phone or GSM/GPRS modem are similar. What is required is to send instructions (in the form of AT commands) to the mobile phone or GSM/GPRS modem.

Table 2: Program for sending SMS

```
AT
OK
AT+CMGF=1
OK
AT+CMGW="+85291234567"
> A simple demo of SMS text messaging.
+CMGW: 1

OK
AT+CMSS=1
+CMSS: 20

OK
```

Table 3: List of AT commands for receiving SMS

S.	AT	Meaning
No	Commands	
1	+CNMI	New message indications
2	+CMGL	List messages
3	+CMGR	Read messages
4	+CNMA	New message acknowledgement

Table 4: Program for Receiving SMS

```

AT
OK
AT+CMGF=1
OK
AT+CMGL="ALL"
+CMGL: 1,"REC READ", "+85291234567", "06/11/11,00:30:29+32"
Hello, welcome to our SMS tutorial.
+CMGL: 2,"REC READ", "+85291234567", "06/11/11,00:32:20+32"
A simple demo of SMS text messaging.

OK

```

Table.3 lists the AT commands that are related to the receiving and reading of SMS messages.

Table.4 shows a simple example that demonstrates how to use AT commands and the HyperTerminal program of Microsoft Windows to read SMS text messages received by a GSM / GPRS modem or mobile phone.

Line 1: "AT" is sent to the GSM / GPRS modem to test the connection.

Line 2: "OK" which means the connection between the HyperTerminal program and the GSM modem works fine?

Line 3: The AT command +CMGF is used to instruct the GSM modem to operate in SMS text mode.

Line 5-9: The AT command +CMGL is used to list all SMS text messages in the message storage of the GSM modem.

Line 11: The result code "OK" indicates the execution of the AT commands +CMGL are successful.

To enable an application to receive SMS messages, you have to write the source code for connecting

to and sending AT commands to these mobile phone or GSM modem, just like a terminal program. The source code may be in C, C++, Java, Visual Basic, or other programming languages (Bin Abdullah et al., 2011).

RESULT

SMS from SQL database

Use a database like MySQL, Microsoft SQL Server (Express), Microsoft Access, Oracle or other SQL database to send SMS messages and store received SMS messages in a database table. The proposed Library database system has been implemented using MySQL programming. Figure 2, 3 and 4 shows the procedure involved in creating a database automatically and manually for SMS gateway.

(a) Create the database automatically: If you use Microsoft SQL Server (Express), Diafaan SMS Server can automatically create the database tables.

(b). Create the database manually:

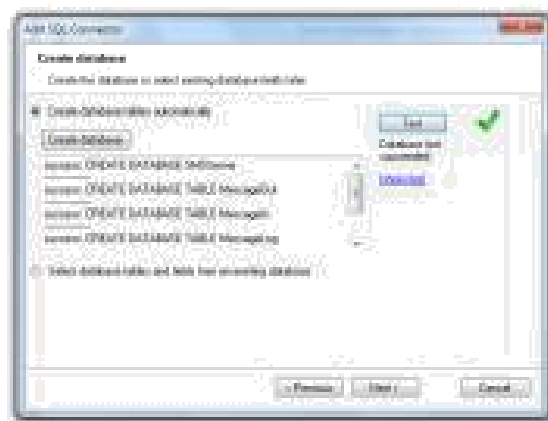


Figure 2: Create the database



Figure 3: Enter the database fields

Figure 4: Send SMS table

If you use another database platform, like MySQL, Oracle, Microsoft Access or PostgreSQL, the first step is to create the database tables manually or to use an existing database. Then instruct Diafaan SMS Server to connect to it with an ODBC or OLE DB connection string. After step (b), specify the database tables and fields Diafaan SMS Server should use.

Use MySQL to send and receive SMS messages

MySQL is one of the most popular database programs in the world. Diafaan SMS Server can use an ODBC driver to connect to MySQL. For this system MySQL version 5.0.88 was used with the MyODBC 5.1 driver. Before Diafaan SMS Server can use the database you have to make sure the MyODBC 5.1 driver is installed on the computer running Diafaan SMS Server. For creating SMS Server database we can use the MySQL command line client to create the database tables. It is also possible to use an existing database, but if you want to avail all options available in Diafaan SMS Server you may use the SQL commands given below to create the database tables to send and receive SMS messages and to keep the send log.

```
CREATE TABLE MessageOut (Id INT NOT NULL AUTO_INCREMENT PRIMARY KEY,
MessageTo VARCHAR(80),
MessageFrom VARCHAR(80),
MessageText TEXT,
MessageType VARCHAR(20),
Gateway VARCHAR(80),
UserId VARCHAR(80),
UserInfo TEXT,
Priority INT,
Scheduled DATETIME,
IsSent TINYINT(1) NOT NULL DEFAULT 0,
IsRead TINYINT(1) NOT NULL DEFAULT 0)
CHARACTER SET utf8;
```

```
CREATE TABLE MessageIn (Id INT NOT NULL AUTO_INCREMENT PRIMARY KEY,  
  
SendTime DATETIME,  
ReceiveTime DATETIME,  
MessageFrom VARCHAR(80),  
MessageTo VARCHAR(80),  
SMSC VARCHAR(80),  
MessageText TEXT,  
MessageType VARCHAR(20),  
MessagePDU TEXT,  
Gateway VARCHAR(80),  
UserId VARCHAR(80)) CHARACTER SET utf8;
```

```
CREATE TABLE MessageLog (Id INT NOT NULL AUTO_INCREMENT PRIMARY KEY,  
  
SendTime DATETIME,  
ReceiveTime DATETIME,  
StatusCode INT,  
StatusText VARCHAR(80),  
MessageTo VARCHAR(80),  
MessageFrom VARCHAR(80),  
MessageText TEXT,  
MessageType VARCHAR(20),  
MessageId VARCHAR(80),  
Gateway VARCHAR(80),  
MessagePDU TEXT,  
UserId VARCHAR(80),  
UserInfo TEXT) CHARACTER SET utf8;
```

To add the SQL connectors now add the new database to Diafaan SMS Server. First create a new SQL Connector with the connector wizard and select ODBC as the database type. On the next step provide the ODBC connection string and the following connection string should be adapted for your database installation:

```
Driver={MySQL ODBC 5.1 Driver};  
Server=myServerAddress;  
charset=UTF8;Database=myDataBase;  
User=myUsername; Password=myPassword;Option=3;
```

To select the database fields on the next wizard pages you can select the database tables and fields you want Diafaan SMS Server to use. You can only select the most used fields here. Additional database fields can be selected later on the advanced tab page in the connector properties dialog. It is a good idea to change the database flavor option on the same advanced tab page to MySQL. This will instruct Diafaan SMS Server to use a specific SQL syntax for MySQL somewhat enhancing the performance.

CONCLUSION

The application of GSM technology for documents identification was examined. The mobile pervasive technology can be used by the libraries to serve their patrons to avail the library services in an effective and efficient way.

As per the current GSM data rate only 6-10 SMS messages can be sent per minute. As SMS messaging application becoming more popular, it is worthwhile to extend this study to handle a larger amount of SMS traffic and the way to integrate more number of GSM modems with central database to maintain a SMS load balance.

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