

SMS INTERFACE FOR A LIBRARY MANAGEMENT PACKAGE : SOUL EXPERIENCE

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Abstract

Information sharing using wireless medium has picked up momentum in the recent years due to the huge penetration of mobile devices to the critical mass. Cellular phone, Wireless, PDA, and other Mobile Devices are increasing in number among the academic community. Sharing the information by using the latest wireless network technology such as Wi-Fi, Wi-Max, Wireless LAN, Bluetooth and cellular technology such as GSM, GPRS, CDMA, TDMA, WAP / WAP 2.0, WML, WMLScript, XHTML MP, WCSS / WAP CSS and SMS are predominantly becoming most sought after development platform now. Leveraging this development in technology, it is also important to explore the possibility of such technological advantages for the effective management of Library activities. SOUL is a software designed, developed and distributed by INFLIBNET to academic institutions in the country for Library Automation. SMS interface to such a package will be an added advantage for the timely alert for the services rendered by the software. This paper discusses the development paradigm for the SMS interface for the new SOUL software for reminder module, alert for the vendor/publisher, user service, CAS service etc. using standard solutions for information sharing using mobile devices.

Keywords : INFLIBNET/ SOUL/ Mobile Technology/ SMS/ SMSC/ SMS Gateway/ Webservices/ GSM/ GPRS/ Library Automation Package

1. Introduction

Libraries in the modern age are going through lot of changes adopting the technological advancements in various spheres of ICT. Library automation software is also getting redesigned to meet this existing challenges and explore the opportunities available. It may be noted that organizations are investing huge amount of money to make their library truly modern. INFLIBNET has developed and distributed SOUL(Software for University Libraries) for universities and academic institutions. Value added features are explored to include in the new version of SOUL in order to make it meet the challenges and serve the user community with dynamic information 'push' instead of

'pull'. With its promise of quantum leap gains in efficiency, productivity, staff comfort and customer service, new version of SOUL is expected to create great enthusiasm in the library management. It is designed for the libraries where exceptional service and maximum efficiency are priorities. SMS interface is experimented with INFLIBNET SOUL software as a case study.

INFLIBNET is an autonomous Inter-University Centre of the University Grants Commission (UGC) of India. It is a major National Program initiated by the UGC in 1991 with its Head Quarters at Gujarat University Campus, Ahmedabad and later, it became an independent Inter-University Centre in 1996. INFLIBNET is involved in modernizing university libraries in India and connecting them as well as information centers in the country through a nation-wide high speed data network using the state-of-art technologies for the optimum utilization of information. INFLIBNET is set out to be a major player in promoting scholarly communication among academicians and researchers in India.

SOUL (Software for University Libraries Software) is a state-of-art library Automation Software developed and distributed by INFLIBNET, which is an Inter University Centre of UGC under Ministry of HRD, Govt of India. This robust and secured software has been installed in more than 1200 universities/institutions all over India as on date. Serial Control Module (SCM) is an integral part of the SOUL which deals with serials, periodicals, journals and e-books and uses RDBMS based software to manage the entire collection in a client server environment. The backend database uses a tabular structure of data having a well defined relationship between each table and all the referential integrity is maintained. Two tier being the application development method; the system has tried to maintain a back ward compatibility with earlier versions. The database at the backend of serial control module insulates developers from most systems and networking giving a SCM desired performance and scalability. The reminder module of Serial Control module allow us to set the reminder to either library members regarding book renewal/issue, publisher or supplier regarding non received issues, damaged issues and also missing issues. The reminder can be sent either in the form of Printed copy, Mail as well as through SMS.

SMS stands for Short Message Service. In general, it is a technology that enables the sending and receiving of messages between mobile phones. SMS first appeared in Europe in 1992 and it was included in the GSM (Global System for Mobile Communications) standards right at the beginning. Later it was ported to wireless technologies like CDMA and TDMA. The GSM and SMS standards were originally developed by ETSI (European Telecommunications Standards Institute)

2. Methods for Sending SMS Messages from Computer

In general, there are many ways to send SMS messages from a computer to a mobile phone. They are as follows:

1. Using a mobile phone or GSM/GPRS modem connect to a computer.
2. Using SMSCs directly or via SMS Gateway
3. Using WebServices
4. Using Messenger API's (Yahoo Messenger, MSN Messenger etc.)
5. Using Email with mobile number as its id.

2.1 SMS Messages from a Computer using a Cellular Phone or GSM/GPRS Modem

The SMS specification has defined a way for a computer to send SMS messages through a mobile phone or GSM/GPRS modem. A GSM/GPRS modem is a wireless modem that works with GSM/GPRS wireless networks. A wireless modem is similar to a dial-up modem. The main difference is that a wireless modem transmits data through a wireless network whereas a dial-up modem transmits data through a copper telephone line while a wireless modem sends and receives data through radio waves (ie.GSM 900 MHz/1800 MHz). Most of the mobile phones can be used as wireless modems.

A GSM modem can be an external device or a PC Card. Typically, an external GSM modem is connected to a computer through a serial cable or a USB cable. A GSM modem in the form of a PC Card / PCMCIA Card is designed for use with a laptop computer. It should be inserted into one of the PC Card / PCMCIA Card slots of a laptop computer. Like a GSM mobile phone, a GSM modem requires a SIM (Subscriber Identification Module) card from a wireless carrier in order to operate.

Like GSM modem, GPRS (General Packet Radio Service) modem is also a GSM modem that additionally supports the GPRS technology for data transmission. The difference between GSM and GPRS is that GPRS is based on packet-switched technology with an extension to GSM, while GSM is a circuit-switched technology. A key advantage of GPRS over GSM is that GPRS has a higher data transmission speed. Due to this ability, GPRS can be used as the bearer of SMS. If SMS over GPRS is used, an SMS transmission speed of about 30 SMS messages per minute may be achieved. This is much faster than using the ordinary SMS over GSM, whose SMS transmission speed is about 6 to 10 SMS messages per minute. A GPRS modem is needed to send and receive SMS over GPRS. To send or receive MMS (Multimedia Message Service)/ LMS(Long Message Service) messages, a GPRS modem is typically needed.

2.1.1 Testing a mobile phone or GSM/GPRS modem for its support for AT commands

AT (Attention) commands are the special commands used to communicate with communication devices such as Modem, Mobile devices etc. In Windows, HyperTerminal is a communication program that comes default with almost all Windows O/S by which AT commands can be invoked. It can be invoked from the Communication pop up menu of Accessories. It can be also used successfully to send AT commands to mobile phone or GSM/GPRS modem. To invoke, select Start -> Programs -> Accessories -> Communications -> HyperTerminal. If it is not found and earlier versions of Windows are used such as 95/98, then probably it is not installed in it. It can be installed by

going to Control Panel -> Add/Remove Programs -> Windows Setup tab -> Communications list box item -> Details button to install MS HyperTerminal.

To use MS HyperTerminal to send AT commands to mobile phone or GSM/GPRS modem, the procedure given below should be followed:

1. Put a valid SIM card into the mobile phone or GSM/GPRS modem. A SIM card can be obtained by subscribing to the GSM service of a wireless network operator.
2. Connect the mobile phone or GSM/GPRS modem to a computer and set up the corresponding wireless modem driver. The wireless modem driver is found in the CD or disk that is provided by the manufacturer along with the handset. If the manufacturer does not provide such CD or disk with the mobile phone or GSM/GPRS modem, the wireless modem driver can be downloaded from the manufacturer's site. If the wireless modem driver cannot be found on the web site, Windows' standard modem driver can be used.
3. Run MS HyperTerminal by selecting Start -> Programs -> Accessories -> Communications -> HyperTerminal.
4. In the Connection Description dialog box, enter a name and choose an icon for the connection. Then click the OK button.
5. In the Connect To dialog box, choose the COM port that the mobile phone or GSM/GPRS modem is connecting to in the Connect using combo box. For example, choose COM1 if the mobile phone or GSM/GPRS modem is connecting to the COM1 port. Then click the OK button.

(Sometimes there will be more than one COM port in the Connect using combo box. To know which COM port is used by the mobile phone or GSM/GPRS modem, follow the procedure below:

In Windows 98: Go to Control Panel -> Modem. Then click the Diagnostics tab. In the list box, it can be seen which COM port the mobile phone or GSM/GPRS modem is connected to.

In Windows 2000 and Windows XP: Go to Control Panel -> Phone and Modem Options. Then click the Modems tab. In the list box, it can be seen which COM port the mobile phone or GSM/GPRS modem is connected to.)



Figure 1.
The screenshot of MS HyperTerminal's
Connection Description dialog box



Figure 2.
The screenshot of MS HyperTerminal's
Connect To dialog box

6. The Properties dialog box comes out. Enter the correct port settings for the mobile phone or GSM/GPRS modem. Then click the OK button.

(To find the correct port settings that should be used with the mobile phone or GSM/GPRS modem, one way is to consult the manual of the mobile phone or GSM/GPRS modem. Another way is to check the port settings used by the wireless modem driver that is installed earlier.

To check the port settings used by the wireless modem driver on Windows 98, the following steps should be taken:

- Go to Control Panel -> Modem.
- Select the mobile phone or GSM/GPRS modem in the list box.
- Click the Properties button.
- The Properties dialog box appears. The Maximum speeds field on the General tab corresponds to HyperTerminal's Bits per second field. Click the Connection tab and the settings for data bits, parity and stop bits can be found there. Click the Advanced button and the setting for flow control can be found.

To check the port settings used by the wireless modem driver on Windows 2000 and Windows XP, follow these steps:

- Go to Control Panel -> Phone and Modem Options -> Modems tab.
- Select the mobile phone or GSM/GPRS modem in the list box.

- Click the Properties button.
- The Properties dialog box appears. Click the Advanced tab and then click the Change Default Preferences button.
- The Change Default Preferences dialog box appears. The Port speed field on the General tab corresponds to HyperTerminal's Bits per second field. The setting for flow control on the General tab can also be found here. On the Advanced tab, the settings for data bits, parity and stop bits can be found.)

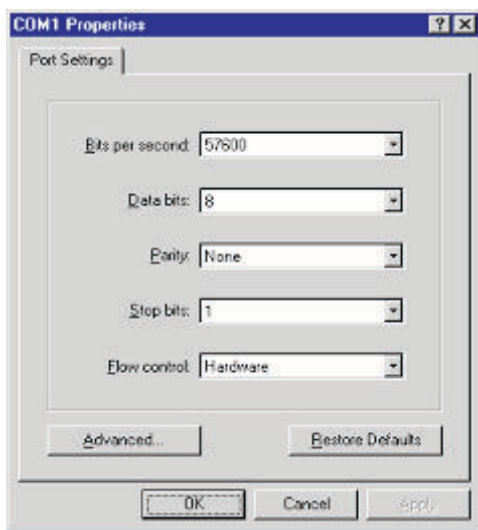


Figure 3.

The screenshot of MS HyperTerminal's Properties dialog box.

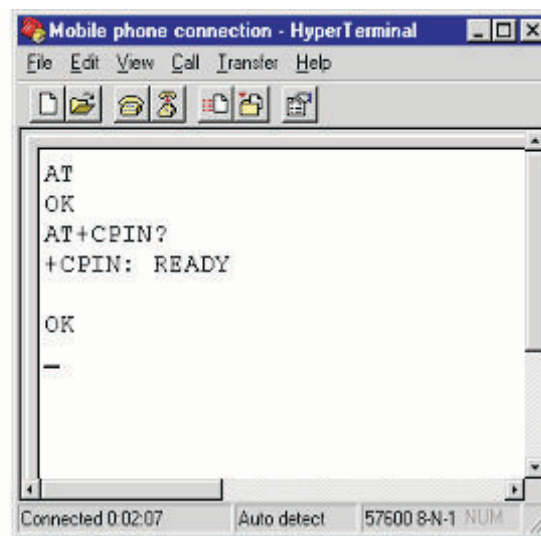


Figure 4.

The screenshot of MS HyperTerminal's main window..

7. Type "AT" in the main window. A response "OK" should be returned from the mobile phone or GSM/GPRS modem.

Type "AT+CPIN?" in the main window. The AT command "AT+CPIN?" is used to query whether the mobile phone or GSM/GPRS modem is waiting for a PIN (personal identification number, i.e. password). If the response is "+CPIN: READY", it means the SIM card does not require a PIN and it is ready for use. If the SIM card requires a PIN, then the PIN is needed to be set with the AT command "AT+CPIN=<PIN>".

If the responses above are acquired, the mobile phone or GSM/GPRS modem is working properly.

In order to send SMS, the mobile phone must support the AT+CMGF command. AT+CMGF is used to set the message format for the SMS message. The values can be either 0 (PDU message) or 1 (text message). To know if the mobile phone supports the AT+CMGF

command, issue commands directly using HyperTerminal to check the support of the command.

AT+CMGF? Returns the current message format, AT+CMGF=? Returns the supported values for your handset.

AT Commands can be used in any language like VB.NET, Java etc.

2.1.2 In VB.NET using atSMS open library source(an example) : Following devices/software are required

- Mobile phone (Nokia Model Only)
- Connecting Device (Such as: Infrared, Data Cable, or Bluetooth)
- Download the appropriate Nokia PC Connectivity SDK depends on the version or model of the Nokia Phone being used.

atSMS is a open source library available at http://lightspeedleader.com/open_source.The atSMS library supports both modes. However, in order to send Unicode SMS, PDU encoded SMS message must be used. If the mobile phone does not support PDU mode, then there is no way to send Unicode SMS.

The VB.NET Code to send SMS using the open Source atSMS library can be found at the URL :- <http://www.codeproject.com/useritems/phonesms.asp>.

Like VB.NET, in Normal VB(5.0 and 6.0) following are the steps to send SMS:

1. Install the connecting device (Such as: Infrared, Data Cable, or Bluetooth) in the pc. *(NOTE: The phone must be connected first to the pc before installing.)*
2. Install the Nokia PC Connectivity.
3. Open a Visual Studio and start new project.
4. Add the Nokia Components in it's preferences.
5. Then code is to be written for the same.

Ready made code is available at the following URL. <http://www.tutorialized.com/tutorial/Send-SMS-from-PC-to-mobile-phones-using-VB/9535>

2.2 Sending SMS Messages from a Computer Using SMSCs directly or via SMS Gateway

There are two ways to send SMS 1.Using SMSC directly 2. Using SMS gateway between the SMS messaging application and the SMSC. In the latter case, Simple protocols such as HTTP / HTTPS can be used for sending SMS messages in the application using SMS Gateway.

One problem of SMS messaging is that SMSCs developed by different companies use their own communication protocol and most of these protocols are proprietary. For example, Nokia has an SMSC protocol called CIMD(Computer Interface to Message Distribution) whereas another SMSC vendor, CMG, has an SMSC protocol called EMI(External Machine Interface). We cannot connect two SMSCs if they do not support a common SMSC protocol. Let's consider the following situation. Suppose an SMS text messaging application is to be developed. To send and receive SMS text messages on the server, one way is to connect to the SMSCs of the wireless carriers. Different wireless carriers may use SMSCs from different vendors, which mean the SMS text messaging application may need to support multiple SMSC-specific protocols. (This is illustrated in the following figure). As a result, the SMS text messaging application's complexity and development time increases

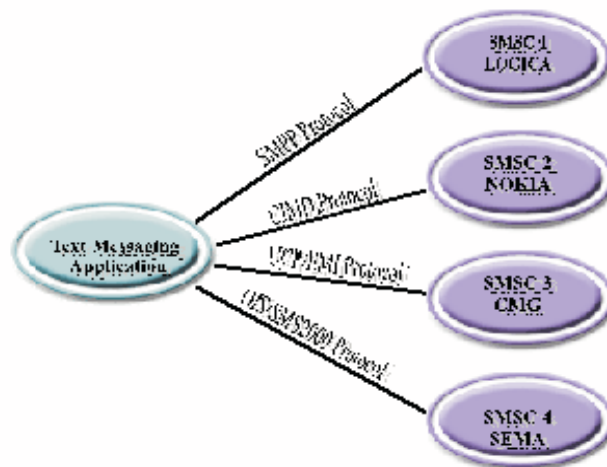


Figure 5 An SMS text messaging application connects to SMSCs without an SMS gateway.

To connect two SMSCs, an SMS gateway is placed between two SMSCs. This is illustrated in the following figure. The SMS gateway acts as a relay between the two SMSCs. It translates one SMSC protocol to another one. This way can be used by two different wireless carriers to interconnect their SMSCs for purposes such as enabling the exchange of inter-operator SMS messages.

Besides wireless carriers, content providers and SMS application developers may also find an SMS gateway useful. An SMS gateway can be set up to handle the connections to the SMSCs. Now the SMS text messaging application only needs to know how to connect to the SMS gateway. To support more SMSCs, just modify the settings of the SMS gateway



Figure 6 An SMS gateway acts as an interface between two SMS centers.

No change to the source code of the SMS text messaging application is required. The use of an SMS gateway can greatly shorten the SMS text messaging application's development time.

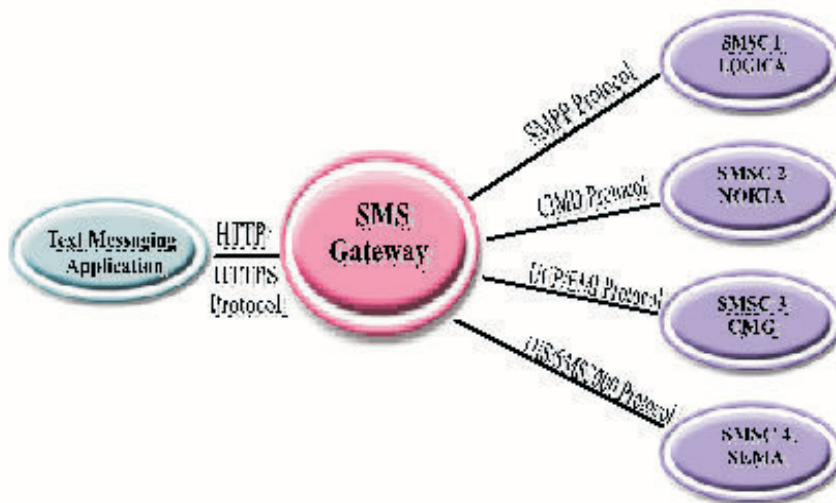


Figure 7 An SMS text messaging application connects to SMSCs through an SMS gateway.

As it can be seen in the above sections, an SMS gateway has a lot of responsibilities in an SMS messaging system. Due to these responsibilities, SMS gateway software can be very complex and complex software is usually expensive.

To connect to an SMS gateway, any SMSC protocol such as SMPP (Short Message Peer to Peer) and CIMD can be used. Some SMS gateways support an HTTP / HTTPS (Secure) interface. HTTP / HTTPS are easier to use than SMSC protocols. The drawback is that there may be fewer SMS features to use. For example, an SMS gateway may not support the sending of picture messages through the HTTP / HTTPS interface.

Information about some available SMS Gateway Providers:- (as on 29th Dec 2006)

Sr. No.	SMS Gateway Providers	Cost Per SMS in Rs.	Supporting Software Price in Rs. (One time fee)
1	www.vfirst.com	0.40	10,000/-
2	www.smscountry.com	0.95	5,500/-
3	www.gatewaysms.com	0.60	No setup cost
4	www.smsjunction.com	0.60	No setup cost

An example of sending SMS using SMS Gateway of smscountry.com is given below which is tested with existing SOUL module. The code uses a DLL(Dynamic Link Library) file created by smscountry which is to be included in the application, and it has to be purchased from the service provider.

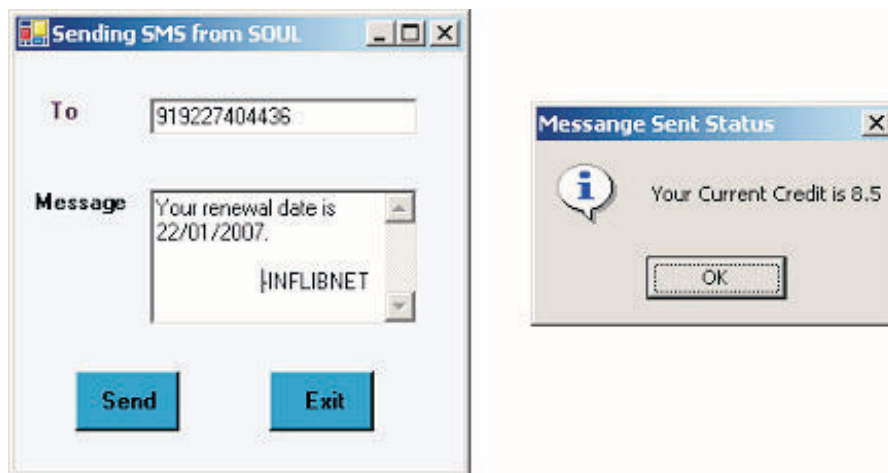


Figure 8 Sending SMS from SOUL via SMS Gateway

2.3 Method for Sending SMS using Web Services

A Web Service is used to integrate different applications that access data through the Internet. To do this, Web Methods in a Web Service are called over the Internet, which can then be accessed by applications developed on different platforms. Thus a Web Service is a reusable component. But, due to proprietary standards used by different technologies, communication between a client application and a component depends on various factors, such as programming language, hardware platform, operating system, vendor implementations and data encryption schemes. This means that to transfer data between two applications, a similar infrastructure is required at both ends. But, this is not possible for applications to interact over the Internet. This aroused necessity to develop components that can be accessed from various platforms. This is where Web Services comes into picture. Web Services allows developers to create platform independent distributed applications. Platform independence comes because of the

use of Open Standards like XML(Extensible Markup Language), HTTP, SOAP(Simple Object Access Protocol), TCP/IP, WSDL(Web Services Description Language) and UDDI(Universal Description, Discovery and Integration).

There are many available web services which can be used to send SMS from .NET desktop application. Some of them are freely available while others are payable.

The steps to include a web service in .NET Application is as follows:-

1. Open the .NET Application in which the web service is to be utilized.
2. Open the Solution Explorer, right click the References and click Add Web Reference or select Project menu and click Add Web Reference.
3. In the window Add Web Reference, type URL of web service in the address bar.
4. After entering the URL and pressing Enter, the Web Service is loaded and the XML file is shown on left hand side window. Also the Add Reference button is enabled, click Add Reference button to add this web reference to the project.
5. To test its inclusion, in the Solution Explorer Window click on the Web Reference and check for the added Web Reference

Examples of available web sites are:

- A free Web Services site: www.webservicex.net and the web services are

- Send SMS to India: <http://www.webservicex.net/SendSMS.aspx?wsdl>

- Send SMS to World: <http://www.webservicex.net/sendsmsworld.aspx?wsdl>

Please Note : Prior to using it please check out the Coverage of these Web Services as they have limited range.

- Some payable web Services are:

1. www.strikeiron.com and web service is, http://ws.strikeiron.com/globalsmspro2_5?WSDL

2. www.abctext.com and web service is, <http://www.abctext.com/webservices/SMS.aspx?WSDL>

3. www.esendex.com and web service is, <http://www.esendex.com/secure/messenger/soap/SendService.aspx?wsdl>

4. www.sms.mio.it and web service is, <http://www.sms.mio.it/webservices/sendmessages.aspx?WSDL>

5. www.info-me-sms.it and web service is, <http://www.info-me-sms.it/ws.php?wsdl>

2.4 Method for Sending SMS using Messenger API's

Use of Yahoo Messenger APIs(Application Program Interface) or MSN Messenger APIs etc can be made to send SMS from application. Please check the respective sites to download the SDKs and try with that. Note that this way of sending SMS is internet based. It may not be used for sending huge volumes of SMS from application.

2.5 Method for Sending SMS using Email with mobile number as it's id:

Usually, there is an email address of each phone on the mobile operator's network, for example [phone Number]@delhi.hutch.co.in

The only difference between GSM and Email to SMS is that GSM will show the phone number that sent the text message, Email to SMS shows the email address that sent the message.

So to send SMS using Email steps given below should be followed:

Create a very simple application that contains a simple form with these fields:
 Phone Number of recipient (textbox)
 Recipients' provider (dropdown list)
 Message (text area)
 Submit (button)

In a database , have the domain portion of the email address that will be pulled based upon what is selected in the provider box. (For example, if Hutch-Delhi is selected, application should pull: @delhi.hutch.co.in from the database and just append it to the value of the first text box)

Then, using the System.Web.Mail namespace , build an SMTP connection to mail server, build the mail object, and send it off to the recipient (e.g. [phone number]@ideacellular.net).

Note: To use this technique the most important requirement is that the recipient's phone number should be registered with mobile operator whose domain is utilized to send SMS.

3. Conclusion

Innovations in ICT are always looked up on with great expectation to enhance the services in library and information sectors. Adoption and accepting such innovation for the proper benefit of library service activities will boon the dynamic way of providing information in the right time to the right users. SMS interface to library automation package is such an experiment conducted in INFLIBNET as an add-on feature to the SOUL new version. Any technology, when it reaches the critical mass, will be gracefully embraced by the society for its merits. With lot of efforts and absorption of the right technology in Library Automation with security and networking by use of Biometrics, RFID, Electronic gate etc in the infrastructure level, tools with support of SMS will be a right choice to effective user interface for the services.

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