

Design and Implementation of Short Message Service (SMS) Banking System

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Abstract—This paper presents the design and implementation of Short Message Service (SMS) banking system. SMS banking is a technology – enabled service offered by banks to its customers, permitting them to operate banking services over their mobile phones using SMS messaging. The system was designed to eliminate the problems associated with other banking systems like queuing up to; check account balance, recharge mobile phone, obtain basic information regarding one's account, etc. To solve these problems, the project made use of a computer system running on visual basic (6.0) and General Packet Radio Service (GPRS) as its main components to develop a new technology in banking system that allows one to request and receive information to his / her mobile phone via Short Message Service (SMS), carry other banking activities "remotely" without being present at the bank. After the design, the system was used to carry out some transactions like; account balance enquiry, fund deposit / transfer, mobile phone recharge and the performance was satisfactory. At the end one can say that the (SMS) banking system is a wonderful breakthrough in banking industry developed to eliminate the inconvenience associated with other banking systems.

Index Terms—automatic teller machine (ATM), electronic Banking (E-banking), general packet radio service (GPRS), global system mobile (GSM), short message service (SMS).

I. INTRODUCTION

A. Background of Study

As the name implies, SMS banking is a mobile technology that allows one to request and receive banking information from one's bank on his / her mobile phone via Short Message Service (SMS). SMS banking allows one to receive basic information regarding his / her bank account using his / her mobile phone / GSM. For instance, one can request his / his bank to send message showing current or available balance. Banks can also provide

information about recent transaction made in the account (e.g., deposit or withdrawal) via text message [1].

With the SMS banking system, individuals and corporate bodies can manage their bank accounts, check their account balances, deposit money into their accounts, recharge their mobile phone accounts, and perform money transfer and other banking transactions using their mobile phones / GSM. The type of remote banking system (banking done outside the banking hall) that is widespread as at the time of this research/project work is the Electronic Banking System (also popularly known as E-banking). Presently the use of electronic banking is growing and as more users sign up, remote banking also increases in terms of maturity.

Electronic banking allows users to conveniently carry out banking transactions, but this convenience can not be achieved if the user does not have access to the internet. For instance, one cannot carry out a banking transaction while waiting for a bus or while having lunch in a restaurant.

The limitation in electronic banking caused by inability to access the internet at wish, calls for a banking system that is more convenient. SMS banking system provides this convenience. A customer using SMS banking system can carry out bank transactions at any time of the day and anywhere provided there is mobile telephone network coverage. This is because a user has access to his mobile phone all day and at all times.

So, to effectively achieve a truly convenient banking mode, a truly mobile mode of banking has to be explored, hence the SMS banking system [2].

B. Significance of Study

In most developing countries, internet connectivity and bandwidth are low, making realization of internet banking services not so viable. Hence the SMS banking system has a very high practicality and potential in countries where internet infrastructure hinders the access to electronic banking services and inconvenience of accessing ATM machines.

This system will be most useful and important to financial institutions and banks that aim at offering affordable remote banking services to its customers.

C. Objective of Study

The SMS banking system aims at eliminating the problems associated with electronic banking system, ATM machines and other remote banking systems, by taking full advantage of the much higher diffusion rate of mobile phones, coupled with the stability of mobile communication technology.

In order to minimize cost, complexity and time, this system aims at being able to carry out the following operations amongst others;

Account balance enquiry, Credit/Debit alerts, Opening of accounts for customers and assigning PIN codes,

Providing for minimum balance alerts and account statement enquiry, Enabling fund transfer between accounts, Recharging of mobile phone accounts.

D. Statement of Problem

Considering the low extent of development of Information and Communication Technology (ICT) in developing countries, Electronic Banking (E-banking) has not really been able to diffuse to every sector of the populace. As a result of this, fewer people in developing countries carry out transactions with their banks via the electronic banking system.

Also, the problems associated with Automatic Teller Machines (ATM), which include; inconvenience in accessing the machines due to long queues; service problems, or traveling a long distances to find a working machine, furthermore the issue of PIN theft is a problem that must be contended with.

In addition, there are problems associated with carrying cash to travel, payment of bills, loss of costly bank cheques and slow speed of transactions. This makes it an imperfect scheme of convenience banking.

II. HISTORICAL REVIEW

Prior to the introduction of computer systems into the banking sector, all transactions made in banks were strictly manual. In this system, the bank has files containing the names, account numbers, house addresses and other vital information about its clients (or customers). A customer intending to open an account with a particular bank would have to go to the bank, wait and possibly queue up before being attended to by the cashier. In those days in (Nigeria) for an example, one can spend two to three days just to open an account, but with the introduction of computer, internet, GPRS and other banking facilities to banking system, the banking industry has recorded a dramatic transformation.

A. Electronic Fund Transfer (EFT)

EFT is a system of transferring money from one bank account directly to another, without any paper money changing hands. One of the most widely used EFT program is direct deposit, in which payroll is deposited straight into an employee's bank account, although EFT

refers to any transfer of funds initiated through an electronic terminal, including credit card, ATM, etc.

B. Automated Teller Machine

An ATM allows bank customers conduct their banking transactions from almost every other ATM machine in the world. The ATM is a convenient banking system in use today but as convenient as this method seems to be, the presence of the user is still required.

C. Electronic Banking

Electronic banking refers to making transactions or delivering banking services through the internet [3]. Due to the pitfalls of the manual banking system, there is need to provide an electronic banking system which can automatically process banking orders issued by a customer for automatic processing monetary transactions, such as making electronic payments to the bank accounts or beneficiaries (i.e. payees) or transferring money between accounts, with minimal delay or human intervention, while utilizing existing hardware, software and communication components. Refer to figure 1 below for complete SMS banking system setup.

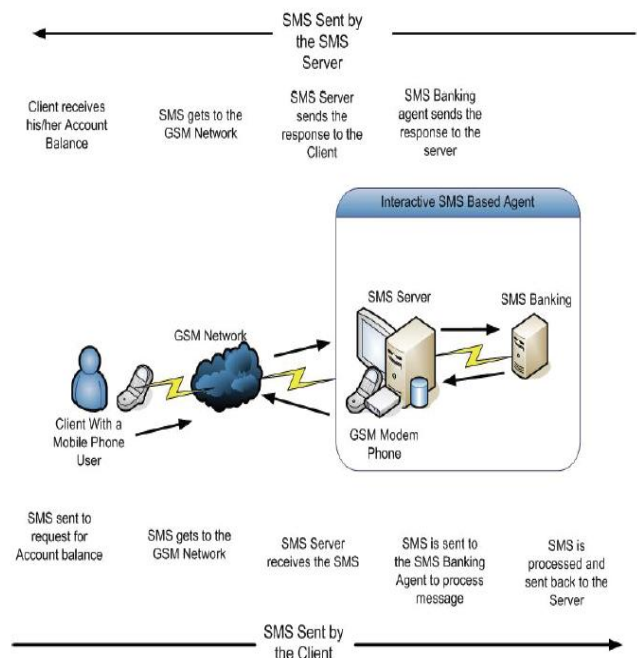


Figure 1. Complete SMS banking system setup

D. Mobile Banking

A more convenient banking system than the E-banking system is the mobile- banking (or m-banking) system. The m-banking system became feasible with the advent of mobile telephone. Mobile banking shall be defined as commercial transaction activities carried out via communication networks that interface wireless or mobile devices [4]. A mobile device is a device used to connect to a mobile service, for example cell phones and Personal Digital Assistants (PDA).

E. SMS Banking

SMS banking is a mobile technology that allows one to request and receive information from one's bank on his /

her mobile phone via Short Message Service (SMS) [5]. Individuals or corporate bodies can manage their bank accounts, check their account balances, perform check requests, money transfers, pay some bills and perform other banking transactions using their mobile phones.

F. The Need For SMS Banking

The telecommunications industry worldwide has scrambled to bring whatever is available to networked computers to mobile devices. Presently, the use of electronic banking is considerably high and as more and more users sign up for electronic banking, the maturity as regards remote banking (banking done outside the banking hall) is on the increase. With electronic banking, users can now conveniently carry out banking transactions, but this convenience cannot be achieved if the user does not have access to the internet [6].

III. SYSTEM DESIGN ANALYSIS

A. The PC Serial Port

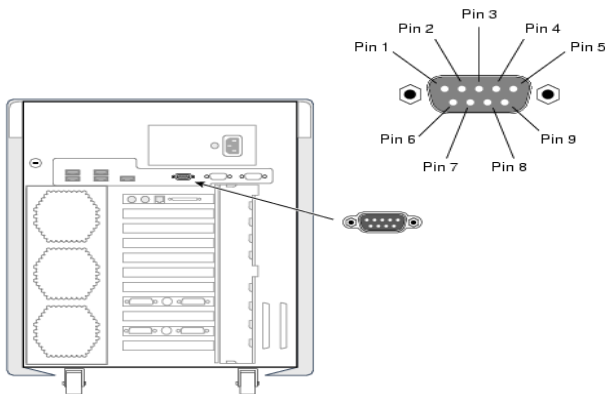


Figure 2. Diagram of a PC serial port and pin schematic

The PC serial port interface is single ended (connects only two devices with each other); the data rate is less than 20 kbps. It's a voltage loop serial interface with full-duplex communication represented by voltage levels with respect to system ground. The PC serial port is shown in Fig. 2 above while table I below shows the pin – out explanation of the serial port.

TABLE I. PIN OUT EXPLANATION OF THE SERIAL PORT

DB-9 Pin	Signal Name	Dir	Description	IDC internal (newer)*	IDC internal (older)*
1	CD	←	Carrier Detect	1	1
2	RXD	←	Receive Data	2	3
3	TXD	→	Transmit Data	3	5
4	DTR	→	Data Terminal Ready	4	7
5	GND	—	System Ground	5	9
6	DSR	←	Data Set Ready	6	2
7	RTS	→	Request to Send	7	4
8	CTS	←	Clear to Send	8	6
9	RI	←	Ring Indicator	9	8

B. General Packet Radio Service (GPRSs Module)



Figure 3. GPRS Module (F1103) used in the sms baking system

The system uses GPRS Module which is connected to the serial port of the computer to capture the message sent by the customer. On receiving the message, the corresponding operation is performed by the computer system. So the GPRS Module serves as a link between the customer and the computer system (server) that stores the database of the system.

GPRS is a new packet data communications system sprung out of today's fixed telecommunications networks. GPRS is the mainstream technology of the worldwide mobile communications transition to 3rd generation; it's a very important and indispensable approach and landmark in the migration from second generation to the third generation (3G) mobile networks.

GPRS is particularly suitable for discontinuous, unexpected or frequent, a small quantity of data transfer, and suitable for sporadic mass data transfer. With GPRS, the information is split into separate packets before being transmitted, and are coupled back at the receiving end (destination). GPRS facilitates instant connections and high immediacy whereby information can be sent or received immediately as the need arises.

The basic working principle of GPRS is: With GPRS, the information is split into separate but related packets before being transmitted and reassembled at the receiving end, instead of using present fixed data transition. This facilitates sharing network resources between users, and allows the service-providers optimize existing facilities and create new income source. The GPRS module is shown in Fig. 3 above, while Fig. 4 shows a typical connection of GPRS module between two systems.

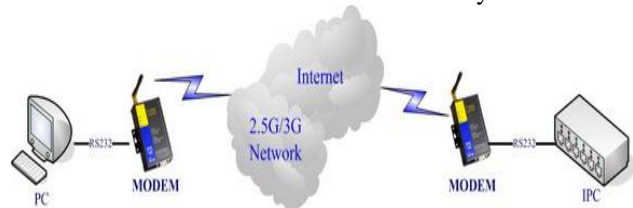


Figure 4. A Typical connection of gprs module between two systems

C. The Max232 Serial Converter

The MAX232 is an integrated circuit that converts signals from an RS-232 serial port to signals suitable for use in TTL compatible digital logic circuits [7]. Figure 5 presents a schematic of the MAX232, and shows how it connects to the microcontroller. The MAX232 is a dual driver/receiver and typically converts the RX, TX, CTS

and RTS signals. The drivers provide RS-232 voltage level outputs (approx. ± 7.5 V) from a single + 5 V supply via on-chip charge pumps and external capacitors. This makes it useful for implementing RS-232 in devices that otherwise do not need any voltages outside the 0 V to + 5 V range, as power supply design does not need to be made more complicated just for driving the RS-232 in this case.

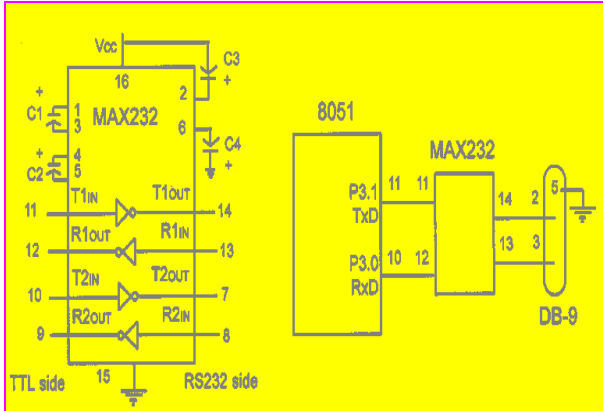


Figure 5. Schematic of MAX232 and its connection to the microcontroller

IV. OPERATING THE SMS BANKING SYSTEM

To operate the system, the GPRS Module is first connected to the PC via a USB-SERIAL cable before the system is then powered ON. At this point the system is on standby awaiting instructions from the customer's mobile phone. The information can be; "account balance enquiry", "fund transfer", "mobile phone recharge" and other transactions within the scope of this project.

Next the program is initialized on the PC and the database is then ready for customer inputs. Due to the nature of the project, there is little or no interaction between the customer and the PC, all transactions are carried out by SMS, and hence only the administrator has access to the database.

Below are the list of the formats for sending transaction SMS's:

1. **Account Balance Check: "#checkbalance (space) pin code"**

2. **To transfer funds from one's account to a particular account**

"#transfer (space) pin code (space) account number (space) amount*"

3. **Deposit cash to own account via cash code**

"#deposit (space) pin code (space) cash code*"

4. **MTN Recharge**

"#MTNRECHARGE (space) pin code (space) amount*"

The messages are then sent to a predefined mobile number assigned to the system. Other network operators can be integrated into the system as desired by the

operator, but the scope of this project work is limited to MTN. Fig. 6 below shows the administrator interface.

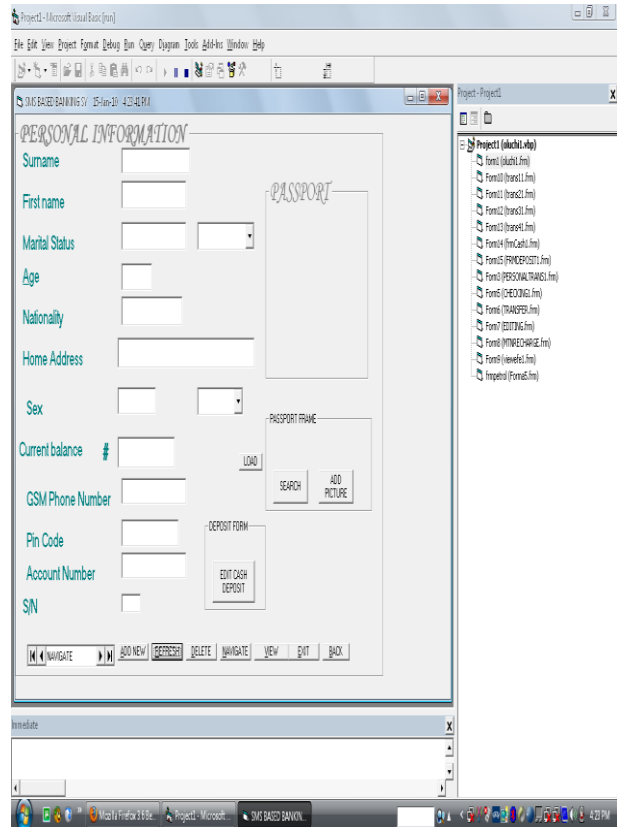


Figure 6. Picture of the administrator interface

V. CONCLUSION

In developing countries like Nigeria, SMS Banking is not yet widespread. The remote banking systems available are the electronic system and the use of ATM. As stated previously, these methods of banking have a lot of pitfalls ranging from inconvenience to high cost of operations.

With SMS banking, most of the problems associated with other banking systems are solved. For instance, instead of going to a banking hall and waiting in a queue for hours before one can deposit money, one could just buy a card equivalent to the amount intend to deposit from a retailer shop and send the PIN of the card to the banking agent and the amount will be credited to the account. With this new development in baking industry, banks can sends messages to customers informing them of account changes, financial information update and product information, also customers can send messages making financial inquiries, account information inquiries, and financial transactions. SMS banking services keep the customers readily informed of account changes, update them on the latest information, and provide them with considerate services [8]. SMS banking is a tremendous achievement in the baking industry and should be adopted in other to explore its numerous benefits. Refer to Fig. 7 for the flow chart of the SMS banking system.

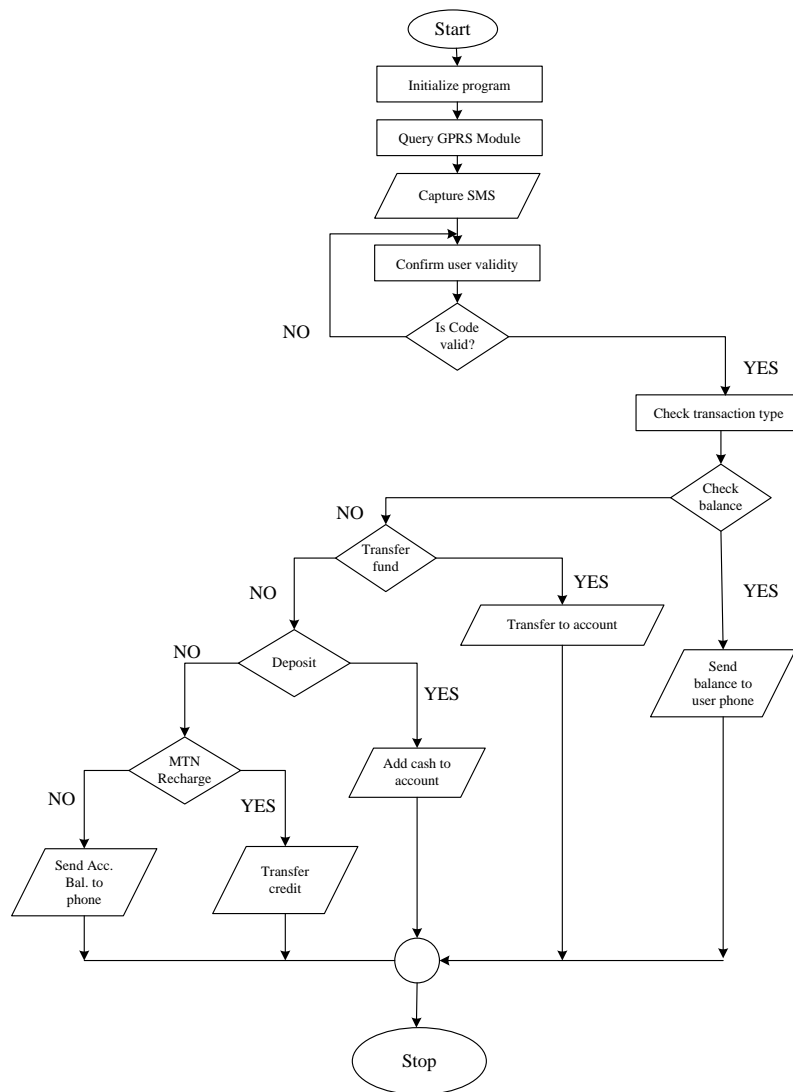


Figure 7. Flow Chart of the SMS Banking System

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