Mobile Oriented System for Prescription in Herbal Medicine

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Abstract- The sporadic influx of mobile phones has posed new opportunities for the proliferation of robust user-centric applications for mobile users. Review of existing research works in herbal medicine reveals that the potential of mobile platforms has not been exploited to aid herbal medicine survival. In light of this, a mobile-oriented decision support system for herbal medicine prescription is proposed in this paper. The proposed system was evaluated based on the users' assessment to determine the efficiency of the proposed system in terms of ease of usage, reliability and relevance of the system. Questionnaire and oral interview were tools used to gather relevant data to measure the performance of the system. Results of the analysis of the respondents' data revealed that the proposed system offers high degree of ease of usage and reliability while the SMS feature allows it to be highly emergency-compliant. The proposed system is self diagnostic and does not only have a role to play in enhancing decision making but also in the study of diagnostic protocol, self-assessment and quality control in the domain of herbal prescription.

Index Term- Mobile, Herbal Medicine, Prescription, Decision Support System (DSS)

1 INTRODUCTION

Medication is an important aspect of human life which deals with the administration of ethical drugs on a health practitioner's advice. In our society today, the rate of poverty is so high that it is almost impossible for people to afford modern medications. The issues of fake drugs, drug abuse and excessive side effect of drugs are other major problems in modern medicine [1]. In recent times, herbal medicine has found its way as an alternative to orthodox medicine, it is the oldest and still the most widely used system of medicine in the world today. It is medicine made exclusively from plant, used in all societies and common to all cultures due to its affordability [2]. Herbal medicine is increasingly being validated by scientific investigation which seeks to understand the active chemistry of the plant; many modern pharmaceuticals have been modeled on, or derived from chemicals found in plants [3]. The therapeutic activity of plant is due to its complex chemical nature with different part of the plant providing certain therapeutic effects [4]. Ancient wisdom has always known the roles herbs have played in the intricate balance of well-being of the human species. They have little or no side effect as a result of their preparation from natural herbs [5].

The problem of herbal medication observed over the years was that their portions are not standardized, nor are they dispensed to patients in specific doses or in strictly regulated quantities. Inadequate information about the drugs and the herbalist may also die with the knowledge of the herbs which may lead to misinformation about the herbs in generations to come

[6]. Sequel to this, this paper proposes a mobile-oriented decision support system for herbal medicine prescription [7]. This is because mobile devices are increasingly making provision for the tools and knowledge needed to improve health care, enabling solutions that benefit patients as well as healthcare professionals and institutions in both the private and public sectors worldwide [8]. The proposed system provides easier way to get herbal prescription without the intervention of herbal practitioners; it is self diagnostic and an alternative medication to orthodox medication [7].

2 REVIEW OF RELATED WORKS

According to [9] compared electronic prescribing systems. The authors argued that commercially available electronic prescribing systems may differ in their effects on patients' health outcomes and on patients' ability to manage costs. They convened experts' panel to recommend specific features that would enable electronic prescribing systems to advance these goals. The panel authored sixty recommendations and rated each using a modified Delphi process. Ratings identified fifty-two recommendations as clearly positive for patient safety and health outcomes and forty-three recommendations as achievable in the average clinician's office within three years. Overall, these recommendations offer a synthesis of evidence and expert opinion that can help guide the development of electronic prescribing policy.

The medication errors panel [10] studied and reported on prescription for improving patient safety and how medication errors could be addressed. The panel suggested a systems approach to managing medication errors resulting from prescriptions. After spending considerable time examining each part of the medication-use, process–prescribing, dispensing, using (administering/self-administering), monitoring and the inter-relationships of each component, the Panel identified four key medication-use systems/processes and three key stakeholder groups which served as the focus of its recommendations.

The four key processes which the Panel believes could be better designed to reduce and prevent medication errors are those related to the transcription and transmission of prescriptions (i.e. the methods prescribers use to document a prescription order and communicate that order to the pharmacy where it will be filled); the education of the consumer regarding the purpose of the treatment, the effective use of the medication, and the monitoring of signs and symptoms that may indicate efficacy or toxicity; healthcare provider payments and incentives which can directly or indirectly influence providers to pursue behaviors designed to reduce medication errors and healthcare provider training and licensure which could foster a better understanding among providers about the seriousness of medication errors and the behaviors to adopt that will reduce them.

According to [11], the group worked on E-Prescribing as a micro-organizational network in search of an analysis framework. He suggested that the organizational form of e-prescribing is a temporal ad-hoc micro-organizational network (MON) centred on the e-script (engineered artifact) transaction between a single prescriber and a single pharmacy. The group claimed that each transaction requires a MON so the structural form of e-prescribing is a network of MONs. A synthesis approach was used to explore both the e-prescribing reference design and available theoretical frameworks to further understand the design of the network. He later concluded that studying the MON for e-prescribing as an organizational form is essential as future care coordination among healthcare organizations will become increasingly computer-mediated.

As observed from existing research works on e-prescription, little or nothing has been done on the mobile-oriented prescription in herbal medicine which is the focus of this paper.

3 MATERIALS AND METHOD

The methodology and approach adopted in this paper are described below.

3.1 Architectural Framework of the Mobile DSS for Herbal Medicine Prescription

In this paper, an architectural framework for a mobile-based decision support system for herbal medicine prescription is proposed and presented in Figure 1. The architectural framework defines the components of the developed system together with the interactions between each component. During the design stage, the architecture of the system was developed taking into account the constraints imposed by the user requirements and the available technology.

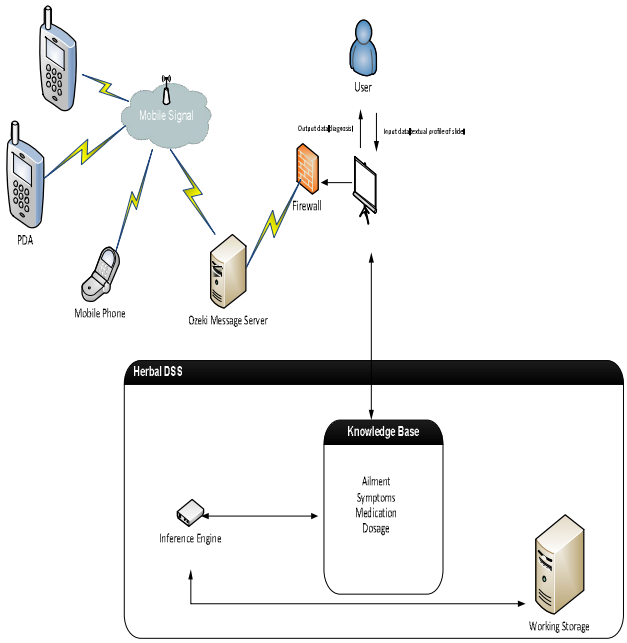

Figure 1: Architectural Framework of the Mobile DSS for Herbal Medicine Prescription

The components of the Framework are explained as follows.

1. Mobile Devices (Smart phones, PDAs, mobile phones)
2. User Interface for Herbal Medicine Prescription
3. DSS SMS Message Server
4. Firewall
5. Herbal Medicine Knowledge base
6. DSS Inference engine
7. Database Server

Mobile Terminals / Devices: Users mobile phone send message to the dedicated mobile phone connected to the application server where the application resides with the help of SMS protocol provided by the mobile operator and got the information from the server by using the SMS protocol as well. This enables the client to send information to the server and to be able to receive information back from the server.

User Interface: User input data (diagnosis request) through the user interface, which consequently calls the knowledge base, feeding the user input data, the knowledge base is being consulted then the inference engine comes to a final diagnosis, which is displayed by the user interface to the user.

Ozeki Message Server: SMS gateway is a flexible Gateway application that enables applications to be sent/received SMS messages to mobile devices with dedicated computer. It has an easy to use user interface, and an excellent internal architecture. The application can use a GSM mobile phone attached to the PC with a phone-to-PC data cable or IP SMS technology to transmit and receive the messages.

Firewall: Firewall is software that checks information coming from the internet or a network, and then either blocks it or allows it to pass through to the attempted system depending on the firewall settings. Allowing information through the firewall, sometimes called unblocking, is when an exception is created to enable a particular program to send information back and forth through the firewall.

Knowledge Base: Knowledge base consists of some encoding of the domain of expertise for the system. This can be in the form of semantic nets, procedural representations, production rules, or frames. These rules occur in sequences when the rules are examined by the inference engine, actions are executed if the information supplied by the user satisfies the conditions in the rules.

Inference Engine: Inference engine is the dialogue conducted by the user interface between the user and the system. The user provides information about the problem to be solved and the system then attempts to provide insights derived or inferred from the knowledge base. These insights are provided by the inference engine after examining the knowledge base.

Database Server: Database server is a fundamental part of the system. It is also called the working storage; it works hand in hand with both the knowledge base and the inference engine as a means of data storage. It stores all important and detailed information about Herbal medications. Besides, it stores the detailed set of prerecorded SMS, which are suitable for different guidance cases. In addition, the database server has both temporal validity and precise timing constrains which allow it to store the most recent data and effect instant changes as soon as they occur.

3.2 Components of the DSS SMS architecture using Ozeki Message Server for Herbal Medicine Prescription

The developed herbal medicine prescription system in this paper is characterized by SMS feature and thus a SMS architecture using Ozeki message server as shown in Figure 2.

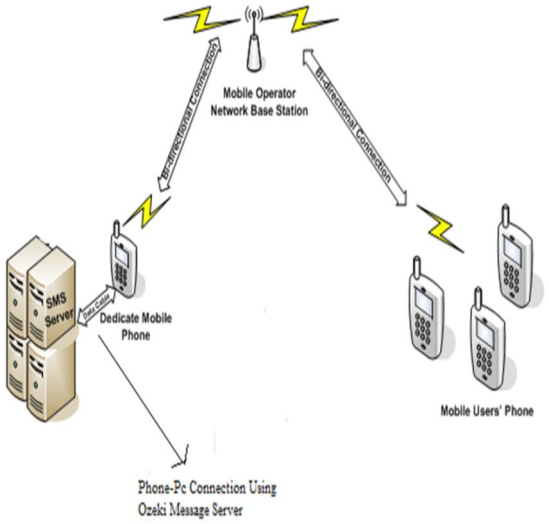

Figure 2: SMS Architecture using Ozeki message server

The components of the SMS architecture include:

1. Mobile Terminal / Device
2. Mobile Operator
3. DSS SMS Message Server

4. Data Cable

Mobile Terminal/Device: The users mobile phone send message to the dedicated mobile phone connected to the application server where the application resides with the help of SMS protocol provided by the mobile operator and get the information from the server by using the SMS protocol as well. This enables the client to send information to the server and to be able to receive information back from the server.

Mobile Operator: The mobile operator is responsible for providing mobile network through its base station which the mobile terminal uses in transferring its data.

SMS Server: This resides on the Ozeki server. It is responsible for making the phone to interact with the server by collecting the SMS on the mobile phone connected to the server to perform necessary action that is specified by the SMS on the phone. It also sends information to users' mobile phone through the server phone base on the action it performs and the information retrieved from the database. In this case Ozeki message server is used. This help in the delivery of all the text messages between the system and the mobile phone user.

Data Cable: This is used to connect the phone to the server. It enables the server to connect the modem of the phone. Other means can also be used such as Bluetooth but cable is considered better.

3.3 The DSS Design for the developed system

The system design Figure 3 and Figure 4 depict the sequential flowchart of activities of use and the actions that will be performed when an operation is being executed. Figures 5 shows the structure of the database and its relational.

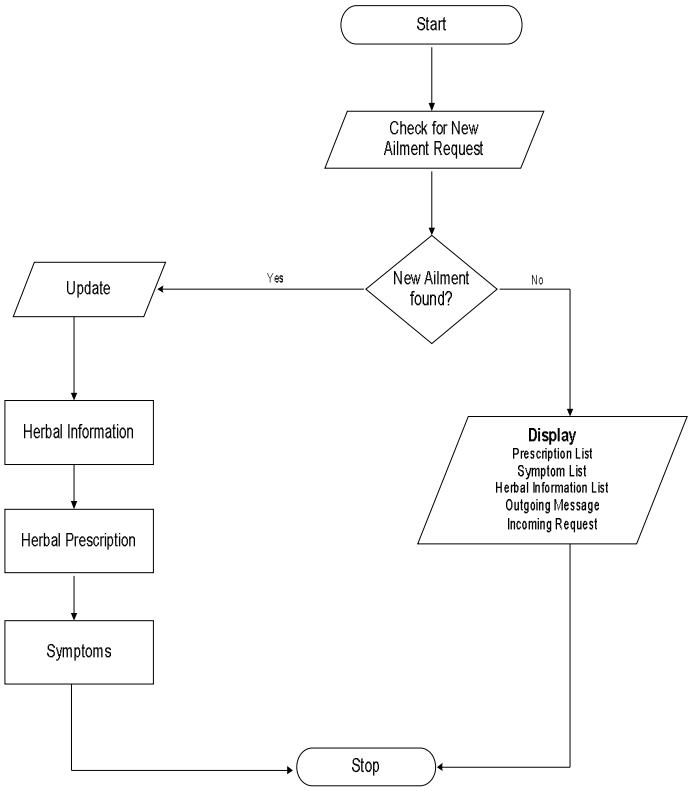

Figure 3: Admin Server of the developed system.

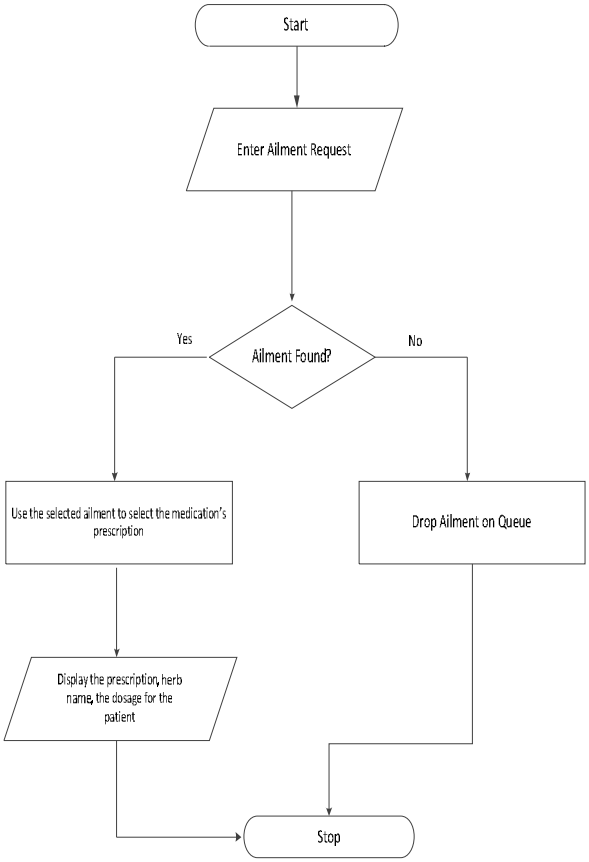

Figure 4: User Server of the developed system

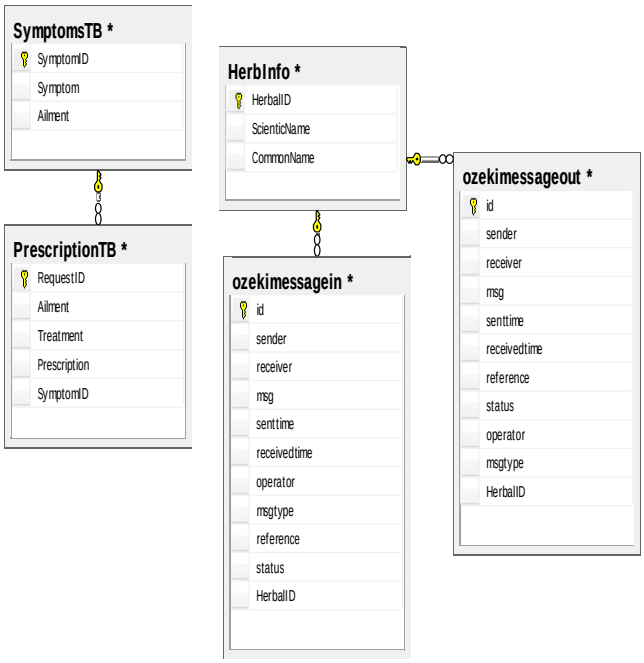

Figure 5: The structure knowledge of herbs database

3.4 Implementation Tools

The programming tool used to implement the design is C# using Microsoft Visual Studio 2008 integrated development environment (IDE). Visual Studio .*NET* is Microsoft's integrated development environment (IDE) for creating, running and debugging programs for the development of the designed system.

3.5 Performance Evaluation of the developed System

The evaluation carried out in this work was based on users' assessment to determine the efficacy of the developed system in terms of ease of usage, reliability and relevance of the system. This is accomplished by administering a questionnaire developed on a 5-point Likert rating scale. A Likert rating scale is a psychometric scale commonly used in questionnaire, and is the most widely used scale in survey research [12] and [13]. When responding to a Likert questionnaire item, respondents specify their level of agreement to a statement. The most common scale is 1

to 5. Often the scale will be 1 = strongly disagree, 2 = disagree, 3 = not sure, 4 = agree and 5 = strongly agree. Similarly Likert items were combined using the Likert summing analysis to formulate the three parameters used for the evaluation. One hundred (100) copies of the questionnaire were administered to collect user's assessment of the developed system. Ninety-five (95) out of one hundred (100) copies of the questionnaire were received from users of diverse educational backgrounds indicating a response rate of 95% and data retrieved from the duly-filled questionnaire were captured and analyzed using Microsoft Excel.

4 RESULTS AND DISCUSSION

The results obtained from the analysis of the respondents' data revealed that the developed system offers high degree of ease of usage and reliability. The fact that it has SMS feature allowed for most respondents to ascertain it as a highly efficient emergency system with high relevance to realizing immediate response to health symptoms and challenges of individuals. The system's knowledge base was evaluated by some experts who tested the system to query the diseases and the corresponding medications. Based on the result obtained, the system is capable of assisting herbal practioner to make an accurate and timely decision taking, substantial eliminating error in wrong medication and thereby increasing the efficiency of diagnostic skills. Figure 6 shows the user's request for herbal prescription by sending the request to the dedicated mobile phone number with the identity of the ailment. Figure 7 shows the feedback of herbal medication for the requested ailment with the dosage prescription. Figure 8 provide the administrative user interface for updating and Viewing Herb information, Figure 9 shows the tabular highlights of ailment, medication and the dosage prescription , Figure 10 shows Incoming message request from clients, Figure 11 showing outgoing message for Herbal prescription, Figure 12 depicts Herbal Administrative Interface and Figure 13 table show Herbs Common and Scientific Names

Figure 6: SMS acknowledgement of user's request

Figure 7: System response to SMS user's request for herbal medication

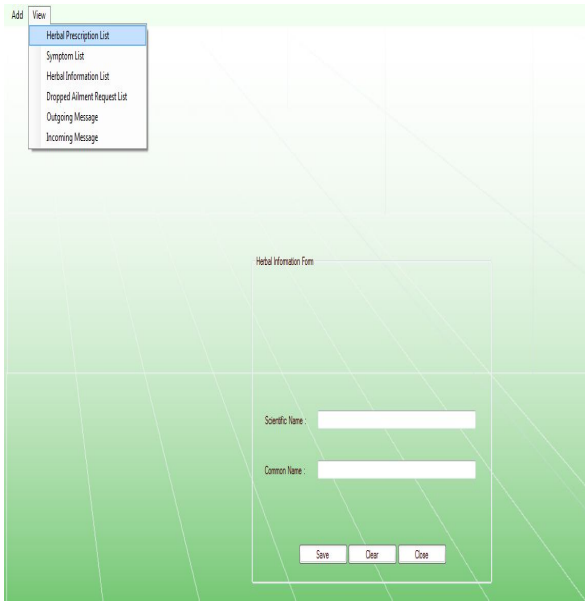

Figure 8: Update and Viewing Herb information

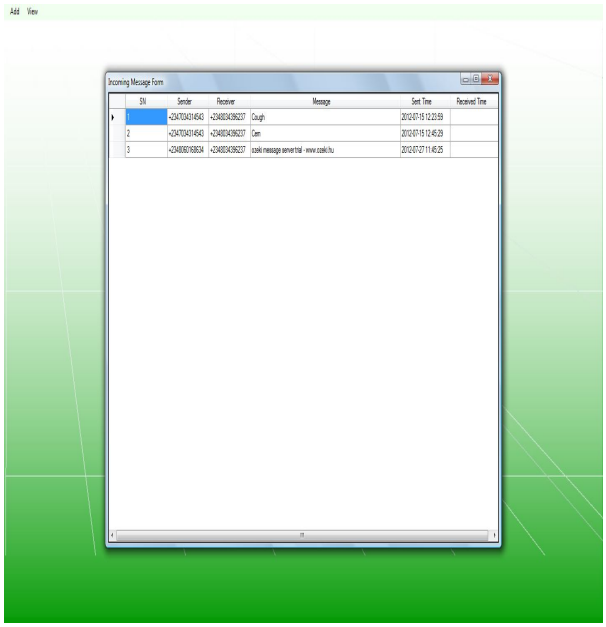

Figure 10: Incoming message request from clients

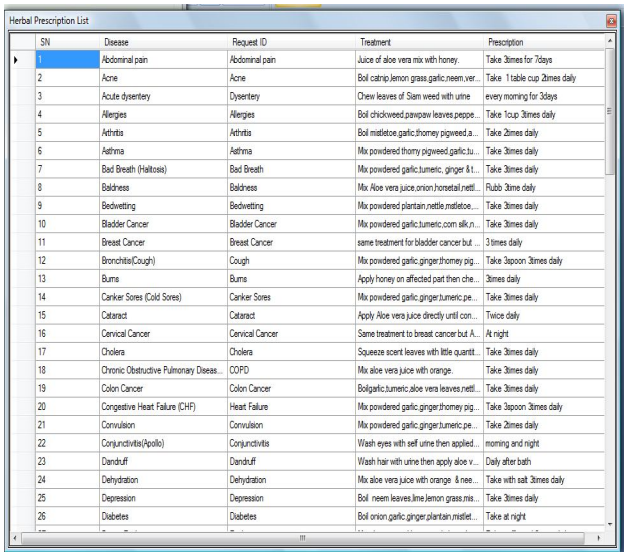

Figure 9: Ailment, medication and prescription

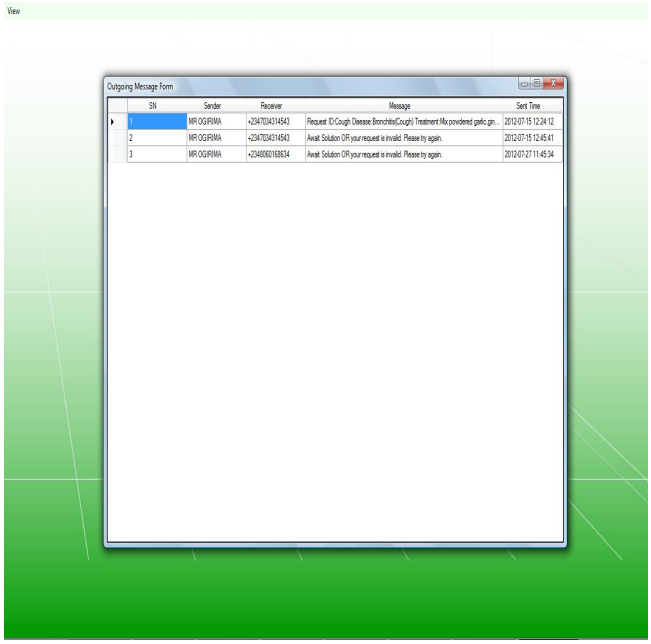

Figure 11: Outgoing message for Herbal prescription

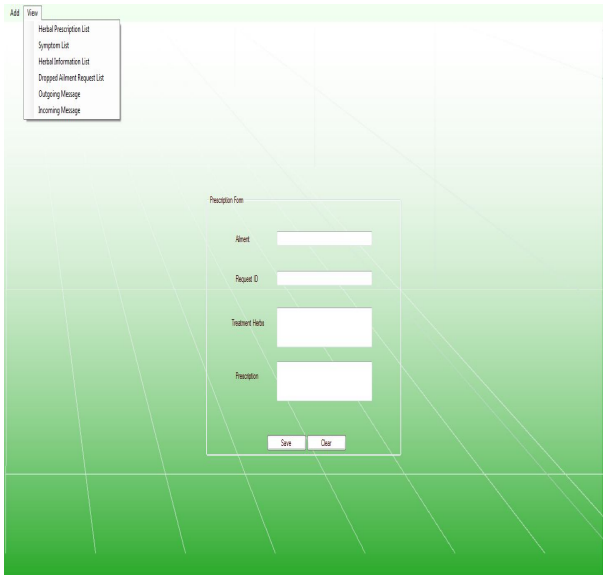

Figure 12: Herbal Administrative Interface

Figure 13: Herbs Common and Scientific Names

This developed system was developed for mobile phone users who cannot access the internet. The user's mobile phone will send message to the dedicated mobile phone connected to the application server where the application resides with the help of the SMS protocol provided by the mobile operator and get the information from the server by using the SMS protocol as well. It also sends information to users' mobile phone through the server phone based on the action it performs and the information retrieved from the database. In this case Ozeki message server is used. This helps in the delivery of all the text messages between the system and the mobile phone user.

5 CONCLUSION

The developed system was not intended to replace orthodox medication but rather to pave way for the usage of herbal medication through the use of mobile phones. The system attempts to enhance the effectiveness of herbal medication which has its information in the knowledge base that improves efficiency in decision making. Therefore, the diagnosis made by the user of the system is at least as good as those of human herbal practioners', since at each point or step the user makes request for medication, the system gives a feedback cure for the ailment. Also, DSS, such as this, does not only have a role to play in enhancing decision making but also in the study of diagnostic protocol, self-assessment and quality control in the domain of herbal prescription. It will also assist people in the remote area without internet facilities to use their phones to obtain herbal prescriptions on their relative health challenges. Hopefully, the proposed system would boost the courageous effort of pioneer health practitioner players like Yoyo Bitters, Yemkem, Oko Oloyun, Ayodele slimmer, etc based in Nigeria.

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