SMS Based Offline Search Engine

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ABSTRACT

The project is GSM based search engine for low end GSM based mobile phones. It provides facilities like search query from already searched data, Google based search returns in the form of SMS for free. If no Internet is available or no answer is found from both database and internet, send the user's query to some expert. A user can send an SMS to server with any query, for example "definition of artificial intelligence". The server will first analyze the query, search it in database if found return the results in the form of text back to user through SMS. If not go for Google and reply the user after getting answer from Google, in third scenario if system failed to find answer from both internet and database then the query will be forwarded to expert of that system.

This project is consisting of four main modules sending/receiving SMS on GSM Modem connected with server, another module is API which is running on server where SMS will be received, Other module is server itself, which is capable of forwarding the request to appropriate server, database or human expert. This application is developed using Visual Studio 2017, GSM is connected with that server where user will send his requests. Web service is written to run in background all the time and address all request and navigate accordingly.

In test phase more than 50 people requested at the same time system respond these all requests in reasonable time with good accuracy. In test case the system give accuracy of 70 percent. Rest of 30% is due to user false requests or due to unpaid trail version of web service.

CERTIFICATE

Dated: _____

Final Approval

It is certified that project report titled 'SMS Based Offline Search Engine' submitted by **Abdul Rehman**, **Awais Iftikhar** and **Faizan Khalid** for the partial fulfillment of the requirement of **"Bachelor's Degree in Computer Science"** is approved.

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DECLERATION

We hereby declare that our dissertation is entirely our work and genuine / original. We understand that in case of discovery of any PLAGIARISM at any stage, our group will be assigned an F (FAIL) grade and it may result in withdrawal of our Bachelor's degree.

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CHAPTER 1

INTRODUCTION

1.0 Introduction

SMS based offline search engine is a new model for offering resources such as searching and computing. This system is the new technology with more features advantages of multi-tendency that reduces the cost of information using information technology resources. The access of Information with the help of SMS changes the approach to datacenters, networks in terms of telecommunication. The ability to control, visualize and customize the search is an important evolution to "data center in the box" approach. We can deploy this system where there is no 3G or 4G connection is available or for low specs phones who only have ability to send and receive SMS. Sending present day web application on cloud foundation empowers another dimension of ability that is hard to achieve with customer processing model. Text messages carry binary data. It is possible to send different type of data with the help of messages furthermore MMS, SMS etc.

One of the main advantage of SMS is that it is supported by hundred percent GSM phones. Almost all subscriptions are inexpensive SMS messaging service. Unlike SMS, mobile technologies such as WAP and mobile Java are not supported on many old mobile phone models

1.1 Problem domain

The problem domain of this Project is interpreting the message received from client, converting that message into search query, search that query's answer in database if found well and good reply back to the user otherwise search it on Google, it extracts the meaningful answer and before replying to client save that answer into database. The major problem is to find most relevant result and convert it back into SMS and reply the appropriate results to the same user is the major challenge.

1.2 Problem statement

There are some areas where 3G and 4G is not available. Where this facility is available its too much costly for middle class society, so this project helps in those areas where internet is not available easily.

Mobile phone is an important communication technology for people in the rural areas than the people living in urban areas as most people in the world now have mobile phones. Advanced mobile phones are also very powerful with more feature similar to personal computers of only a few years ago. However, many users cannot access or use the Internet due to financial or technical problems. And many other people who have knowledge hunger but they don't have sufficient source. Here we propose to use the mobile phone to push the contents of the Internet (more specifically, part of the Internet) to the device. Searched result will be delivered to the device by mobile phone service providers who request from this system with the help of communication services. Through this proposed system user who are in the most remote areas without access the entire static Web without the need to be connected online.

1.3 Proposed system

In this project there is GSM based search engine and services for low end GSM based mobile phones. It provides users services like Google based search returns in the form of SMS. A user can send an SMS to this server with any query, for example "definition of Machine Learning". The system analyzes the query, the server will first analyze the query, search it in database if found return the results in the form of text back to user through SMS. If not go for Google and reply the user after getting answer from Google, in third scenario if system failed to find answer from both internet and database then the query will be forwarded to expert of that system. A user can access the internet just with a free SMS query and will get an SMS back with results. Along with internet search there will be another service like community emergency alerts, free subscription and important phones number replies etc.

1.4 Aims and Objectives

The Software Requirement Specification (SRS) elaborates the nonfunctional and functional requirements for the proposed Global System for Mobile communication (GSM) Based Internet Search and Services.

The main purpose of this proposed system is to provide internet search and service to the community who don't have internet but service of SMS. Along this, this system can also be used for marketing purposes. According to research only 50% of the whole world is availing internet facility rest of 50% have oral knowledge but they don't have any practical knowledge.

SMS based offline search engine application provides this facility to people who left behind in this technological world race. Give them opportunity or give them initial step towards technology where they feel confident and use the technology like other 50% of the world is availing.

1.5 Development Methodology

Google based search returns any query requested by the user will be taken as an input in this system, interpreted (and corrected if needed) and then searched in database, if found okay reply those results back to the user otherwise the query should be searched on Google for results. Then, results should send back to user via SMS.

1.5.1 Community Emergency Alerts

The System should send alerts to all the users in case any occurrence, emergency happen in their city or specific area near to them. Along with them, guidelines and precautionary measures will also be sent to them for their safety.

1.5.2 Free Subscriptions

This system will let the users subscribe to many services like update, news, weather, definitions, hadiths etc.

1.5.3 SMS Marketing

This system gives the clients a chance to buy in to numerous facilities like news, sports update, and general's updates. This stage will likewise assist advertisers with promoting their items and markets them to the correct gathering of people with the assistance client look information. It's been the key feature because this is where we get all the financial support to provide services mentioned above for free.

1.5.4 Important Emergency Phone Number Returns

User can get police number, fire brigade or even some hospital number via text and get the number in reply.

1.5.6 Criticality

This system is critically dependent on Google based search which is the most important one of all.
Furthermore, GSM is also important one. In case of service down issue Google results

1.5.7 Technical Issues

User can search any type of query, so there is an issue that how this system will interpret that query. For example, a user search for "News" and this system interpret that user is searching for word "News" meanings but it should interpret as current news of the user's area.

1.5.8 Cost

The cost of hardware which is used is around RS 10,000 and cost of RS 0.002 per SMS from server side in monthly SMS bundle.

1.5.9 Risks

There are no such risks involved except no availability of GSM services or signals in some areas due to security situation in Pakistan.

1.6 Overview of Proposed System

We need to develop this system due to the problem as we define further by scenario. For Example, if you are someplace where there is no 3G,4G or internet services available and you instantly need to search something on internet and you only have GSM based simple mobile phone, then what to do? The Answer is yes we are providing the solution of this problem or let us say trying to overcome this issue mean accessing internet without the internet connection.
If someone want to see the update of weather and they are on the place where only he has GSM, they just simply go into their massages and simply type the keywords "weather location".
In result they found the updated result of weather or whatever they like. The arguments are not just end over here you can see the Definition of your word, Currency convert, emergency alerts, review some paper or as much as you wish you just get response from your boat chat.

1.7 Resource Requirement

1.7.1 Interface Requirements

This specifies the logical characteristics of each interface between user and this proposed system. This system is server side so interface is not so the requirement of interface is not so considerable.

1.7.2 User Interfaces

This is a description of how the system will interact with its users or clients who requested for some response. Or the user who sent the query through SMS interface.

1.7.3 GUI

As we're using only a GSM based mobile phone for the interaction between user and this system, so a message sending/reading interface, so each user will be its own mobile messages interface. As described above that this project is server side so its functionality is more important than its interface.

1.7.4 Hardware Interfaces

As this system will be interacting with Google search results so no extra hardware is required other than a GSM modem. Which only used to communicate between server and client.

1.7.5 Communication Interfaces

As this system is SMS based search engine, for receiving SMS text and sending messages GSM modem is used or sending searched results via GSM modem.

1.7.6 Software Interfaces

Microsoft Visual Studio – C#.NET Community Edition 2015 Form's application is used at backend. Postman for testing purpose, SQL server.

CHAPTER 2

BACKGROUND & EXISTING WORK

2.0 Introduction

Messaging, additionally called content informing, demonstration of sending short messages with mobile phones, by utilizing the Short Messaging Service (SMS). It's a way of sending messages and conveying your message from one mobile to another in short written form.

Text messaging is the simplest and easy way of communication. Before decades' people use letters for communication but now the same concept is implemented but with new techniques with the help of technology. There are lot of advantages of this technology where the people are able to communicate with each other. Message texting is one of the discreet method of phone conversations, communication is ideal in this era. There are many situations when people don't want or not in mood of real time communication so here the text messaging plays an important role, when you don't want to be overheard. Messaging is the shortest or easiest way of communication for the people who are busy or the people who prefer to reply second person after some time. SMS does not require you to be on your advance machine, turn it on or connect with internet, it simply allow you to type your message and simply send to anyone you want to communicate. SMS also offer to send multiple messages at one time so the sender doesn't have to take burden to call every single person just to tell a single message.

Messaging or SMS is basically a store-and-forward administration or you can say one can write save and then send it whenever its convenient for the sender; implying that when you send an instant message to a companion, the message does not go legitimately to your companion's mobile phone. The upside of this technique is that your companion's mobile phone doesn't need to be dynamic or in range for you to communicate something specific. The message is put away in the SMS for quite a long time if essential until your companion transforms his mobile phone on or moves into range, so, all things considered the message is conveyed. The message will remain put away on your companion's SIM card until he erases it. Other than this person to person message Messages can be send to a large community or in other words we can send one text to more than two three people this kind of messaging is called as Broadcasting (broadcast Messaging) which is used by a large group member to convey one message to all for example a group leader or a company leader to convey a specific information or any new scheme to their workers by just send one message which can reach to the whole company members.

2.1 Existing SMS Services

Text messaging has a few favorable circumstances. It is more circumspect than a telephone discussion, making it the perfect structure for conveying when you would prefer not to be caught by verbal arguments. Usually less tedious to send an instant message than to make a telephone call or send an email. SMS doesn't expect you to be at your PC like email and text. One really don’t need to be specially set a proper machine like once we were supposed to do in 90’s even for sending an email we on CPU first and then we switch our Monitor on enter a proper address and then password and so on. Now a days everything is different from early years of mobile inventions now everything is in our hand and it’s so much easy to send and forward email or SMS through one click and one app.

In 2004 there is a research which show that why people are using text more than voice calls… The message senders favored SMS to voice requires its accommodation just as for the capacity to survey or re-read a message before sending it. Since SMS are not overloading the service of the companies and are more convenient to convey a message more quickly than just calling and busying the lines by SMS everyone can communicate at a time while voice calls just keep one line busy and overburden the companies as well. It is also used by Televisions in order to take the public views media is connecting the whole world for those who want to share and change the views or want to contribute in talk shows through polls while sitting at home with just one click and you can poll or convey your message to the whole world. As a limited time device, remote transporters set up mammoth screens- at shows and other enormous scale occasions to show instant messages from individuals in the gathering of people.

Furthermore, you can utilize content informing membership administrations to get different forms of updates sent to your telephone, for example medicine updates alongside climate alarms, news features or even books broken into parts through two three messages. Internet web search tools, for example, Google have short informing administrations that empower clients to get data, for example, driving bearings, film show times or neighborhood professional references just by messaging a question to the web index's telephone number. Other than just a person to person communicating system this SMS can be a tool for connecting to the whole world by just one click like what we are supposed to present through this project which is giving a whole new concept to this all communication system i.e. internet and SMS

what we have done in this emerging technology and for user's convenience we established a platform which is giving access to all users from around the world whether they are living in rural area where everything is available whether its network or internet everything is accessible or if they are living in a village where internet is not that much popular as in rural areas or where even the mobile network companies are not reached. Would we be able to think about this life without SMS, I think not even in this era…? it's impossible to think about a life without SMS, which is giving us enough space for being an active agent who is always on time in communication whether we have balance or not SMS packages are giving us more space to use SMS instead of voice calls just because of pocket friendly SMS packages.

As we seen that now a day no one is talking on phone call people have their phones in their hands they simply type message and sent their message to that recipient. If we look behind when people go on PCOs where they ask dialers to dial a number so they can contact with the that particular person, but now mobile phones gives authority to everyone to read and write our messages in simple and smart way. In this chapter we see the existing work and background or history of entire work done which is related to communication until now.
SMS gives the facility to everyone who have simple GSM based mobile phone that whenever you wish to send message to someone you don't need to charge your PC, establishing internet connection, and to go on PCO, you just pick your phone type your message and send it to the recipient. How the technology minimizes all this struggle and bring humans into comfort. In the abbreviation the word short refers to the maximum characters which are 160 letters.

Do you know? What is the procedure of SMS sending and receiving on your devices? How your cell phones amplify your signal of sending text? You can understand this operation.
Cell phones are always in communication mode no matter you are on call or not, sending or receiving messages or not but your phone is busy all the time to communicate with servers, boosters and control centers. Our phones communicate with boosters in packets of data this data is transferred on different bandwidth with different frequencies also from different channels. We communicate with the help of electromagnetic waves; electromagnetic waves are incapable of traveling long distances. They lose their strength due to physical objects in their way so to overcome this issue cellular technology is used. In cellular technology a geographic area is divided into hexagonal cells these are interconnected with each other for

communication from anywhere in the world. So our phones are always busy in amplification of signals or sending and relieving of data packets.

2.2 GSM Modem

GSM basically stands for Global System for Mobile Communication it's a modem used for mobile communications, generally utilized versatile correspondence framework on the planet and an idea which was flourished by Bell Laboratories in 1970. It works for the transmitting portable voice. It's a cellular technology which uses a specific frequency band like 850MHz, 900MHz, 1800MHz and 1900MHz for transmitting the data. It was frame worked or structured as computerized framework utilizing TDM which is abbreviation of time division multiple accesses TDMA; which is a technique basically used for correspondence reason.

GSM lessen the data and then forward it with the capacity of 64 kbps to 120 Mbps for further processing in a scheduled vacancy through a channel with two different distinct surges of customer information.

There are different cell sizes in frame of GSM like macro cell used for large scale, micro used for small scale, and Umbrella and pico cell and so on. There are five diverse cell sizes in a GSM arrange large scale, small scale, pico and umbrella cells. The inclusion region of every cell fluctuates as per the execution condition. TDMA works according to a strategy and gives a specific time to each client individually without any diversion scheme it uses a strategy on allocating distinctive schedule vacancies to every client on a similar recurrence. Overall this Global system for Mobile communication is comprises of the accompanying segments.

This includes some of the highlights of GSM which it gives Improved range proficiency with Global wandering around the world for connecting all around and Backing for new administration support the upcoming future networks with the help of previous system. Moreover, its gives beneficial Similarity with coordinated administrations advanced system (ISDN) and executive to the SIM phone books and fixed time alarming system and Utilizations encryption to make telephone calls increasingly secure make phone calls more secure for the costumers for their security. And last but not the least it provides short Messaging service SMS service which is we are going to use for further development in this field.

The security procedures institutionalized for the GSM framework make it the most secure media communications standard at present available. In spite of the fact that the privacy of a

call and mystery of the GSM supporter is simply guaranteed on the radio channel, this is a noteworthy advance in accomplishing start to finish security.

2.3 SMS HISTORY

If we go back and look into the origin of SMS, its roots are from teletypewriter back from 1930's it started and evolved into today's new Touch screen technology. Initially before this wireless texting came into the popular line from 1980 to 1990's the paging system and then after paging system this two-way services system was evolved and get so much popularity in business industry as a messaging applications. The first text message via SMS was sent from United Kingdom in 1992 by NEIL PIPWORTH, who was an engineer for Airwide Solutions, he sent first text message from his computer to a mobile phone. The incorporation of messaging as an administration inside Signaling System 7, which supports the execution of contemporary wired and remote communication frameworks, empowered messaging to be coordinated into cell administrations. This started with simple 1G systems, yet manufactured critical enthusiasm with the advancement of 2G computerized frameworks, especially the Global System for Mobile Communications. Cell messaging is formally typified as SMS.

As the mobile phones technology evolved from wire to wireless, from keypads to touch screens; so that the messages and texting vocabulary does. No doubt this simple way of communication has influenced the culture of vocabulary with lots of shortenings like LOL, ASAP, and specially emojis takes place of original vocabulary words now but on the other hand it's handy and made life easier and now informative than before. Text messaging system that able to communicate with the person whose phone is turned off or out of the signals range. So when they receive the signals ultimately they receive the message without any further delay. It is confirmed by many sources that the first text message was sent in the UK in 1992. [1]
As the SMS was introduced in Europe, it's not shocking news that it takes bit longer to reach in United States. Even now days, text messages are so popular or used for enjoyment in Europe. more popularity in Europe, make it highlighted for all over the world. A study in JULY 2005 found that 37% of United States.

2.4 Overview of project

This project is letting that village person who has an urge of getting into the world and have full right to know about the whole world so that they can be part of the development of their

own country from which they are away just because of no proper mobile network access to their villages this project is Giving a chance to that village individual who might be is a student or a government worker or a freelancer to be a part of this internet world from which the whole other world is getting benefits so why they are behind !!!

As this project is GSM based search engine and services for low end GSM based mobile phones. It provides users - services like Google based search returns in the form of SMS for Free. A user can send an SMS to this server with any query, for example "definition of artificial intelligence". This system analyzes the query, search it on the Google and return the results in the form of text back to user through SMS. This service will be available to everyone who has a mobile phone with a GSM connection. There will be no 3G or 4G needed to access the basic internet. A user can access the internet just with a free SMS query and will get an SMS back with results. Along with internet search there will be another service like community emergency alerts, free subscription and important phones number replies. [2]

2.5 Scope of this document

This project is a GSM based internet search and service provider using SMS. The user can search the internet and subscribe other service free of cost via SMS. This project aims to provide more advanced services throughout Pakistan for free. Services include top 3 Google results, emergency alerts and subscriptions, etc. Our aim is to provide free basic internet access and services to the community.

If we move our steps a little backward into history and from this SMS if there wouldn't be any mobile phone there won't be any SMS or one click communication. The way mobile phones technology developed it's astonishing and was so fast but this development of mobile phones in Pakistan is not as fast as it was in other countries. Still there are lots of people living who are using keypad mobiles especially old citizen or those who are unable to afford expensive touch mobiles and as we discussed above about the weak and non-network village areas where there is no internet availability still is this era there are many cities in Pakistan where these technologies are unreachable just because of the non-access. By keeping this scenario in mind we made the technology reach easier for them by using technology is a different and needy way. Sometimes there are many ways which are invented or discovered like this technology

is, but in order to reach to a new way we need to build a new special technology for keeping that chain of technological change together. We build a bridge to touch that way which is followed by everyone but was unreachable to those who are living beyond that way. No doubt internet is very common these days but there are some gaps which needed to be filled according to the need and use. That's why this project plays an important role in this society which lacks basic needs "like of internet and uneconomical expensive tools" for the sake of development.

2.6 General Description

This describes the general description of function, characteristics, problem statement and objectives of this proposed system. It tells the product functions, features, attribute, characteristics of proposed system.

2.6.1 Product Functions

It provides users - services like Google based search returns in the form of SMS. A user can send an SMS to this server with any query, for example "definition of artificial intelligence". This proposed system will analyze the query, search it on the Google and return the results in the form of text back to user through SMS. Along with internet search there will be another service like community emergency alerts, free subscription and important phones number replies.

2.6.2 User Characteristics

User will be common person, having basic reading and SMS writing skill. Also User should know how to use a cell phone and sent a text to retrieve required information.

2.6.3 User Objectives

It will provide users - services like Google based search returns in the form of SMS for Free. Along with internet search there will be another service like community emergency alerts, free subscription and important phones number replies.

2.6.4 Limitations of this project:

As this project is useful too much but there is still some limitations in it. Some of them are as follow: Internet must be connected with server, User can't get MMS results, and User can't get videos result, Long results received in multiple texts.

2.7 Performance Requirements

This System is dependent of two major performance measures.

2.7.1 SMS sending limit

SMS quantity is remarkable factor of this proposed system. This system is capable of 200 SMS per 15 minute, following regulations by Pakistan Telecommunication Authority (PTA).

2.7.2 Internet Speed (For Google Search results.)

Speed of data connection is most valuable aspect of this system, higher the speed quicker the response to the user. It enhances the efficiency of this system. Queries requiring searches on Google will take time depending on internet speed. Other non-functional attributes Specifies any other particular non-functional attributes required by the system.

2.7.3 Security

In this system, search data of user will be secure and there will be no access to that data anyone. As far the security SMS transportation is cornered it is done by Zong Pakistan GSM services. [3]

2.7.4 Reliability

For searches results reliability, we're using Google Search results. For successful exchange of SMS – service of Zong Pakistan will be used. It's the network of well reputed telecommunication company so its reliable.

2.7.5 Extensibility

This system will be extensible to both service and marketing purposes. Its can further use for emergency alerts, personal circulars among specific society or within the organization. This system can also have deployed without using GSM modem just by using Universal Account

Number (UAN) to be allotted by EPFO. So this system receives requests through UAN number and this reduces the cost of modem.

2.7.6 Serviceability

Current services include Google search results, Offline data base searching, consulting to expert in case of no reply from Google and database. SMS alerts. However, more service can be added later on. Advancement in this project is possible in many terms.

2.8 Web Service Google API

2.8.1 Introduction

In this advance technology era, there are web services serves on the internet without any application. Multiple services are provided by the web services so the whole community of the world relay on it and use it without hesitation. Services have characteristics which are service dependent, But the quality or good aspect of service is that they must function independently. So it's proved that responsibility of operation of each service is its own. Due to independent domain this web service is not bound for any platform because it is programmable. Applications like web Services that can be invoked to give result of searched content. Components of web service application can be like: currency conversion, weather reports, or even dictionary as service or give the definition of something related to any subject. So they are increasingly achieving preference as a technology among stakeholders, investors business mans and developers.

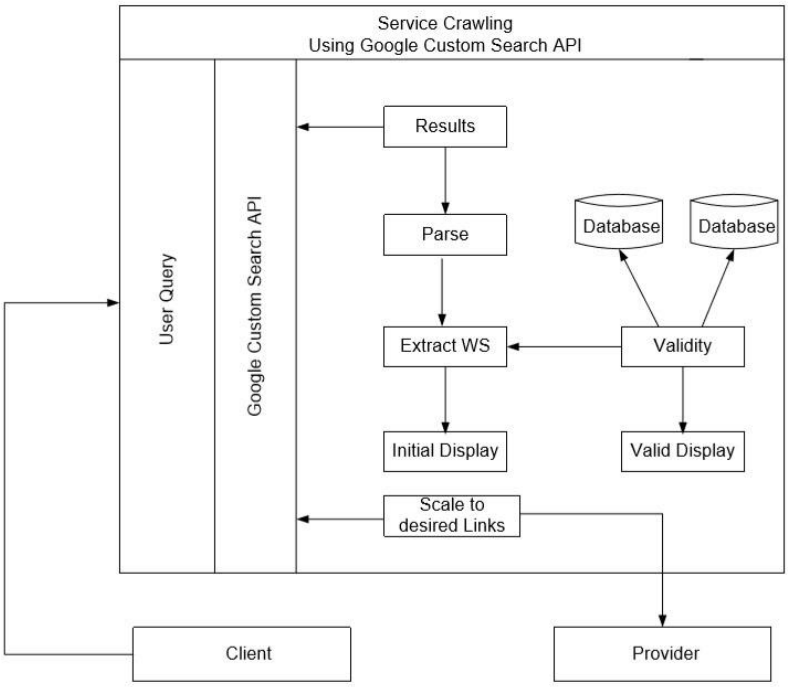

Fig 1. Framework for Service Crawling using Google Custom search API

2.8.2 Limitations of CSE

In SMS based offline search engine an API which is Google Custom Search is used to answer the user's desired result against any query. This API is not specific for web service search but we customized to get results that which are only gathered from web services. There are some limitations in this custom searching service: -

1. Some of special characters sometime create hurdles in searching.

2. Retrieving the data which is most updated against client's query.

3. In case of searching from Google service sometime delay is required.

4. Meaningful query/request is helpful for retrieving meaningful data otherwise delay may occur.

5. A lot of current approaches, whose reliability is less, they are unstable and no efficient.

6. The web services carries a lot of information against one function this so whenever the query is processed system might understand the totally different type and give answer against that query which is not meaningful for user. Web services in UDDI discovered keywords are used.

The main advantage of UDDI is ranking and filtration also. It searches on basis of metadata which is the major drawback and search criteria is limited just because of this.

We programmed to retrieve only most related data or wsdl files that are available and valid up to dated. One constraint of UDDI search is that for the user's query word all of the web data is searched for answer, so no need for further more specification which delay in time only. In comparison of usual browser less time is taken in this because browser reads and surf every word of each child link one by one and parent of that link in desktop. It offers reliable search discovery to enhance the exposure of the user. Moreover, it provides up dated information and related content.

2.8.3 RELATED WORK

A web Search service has its own responsibilities to maintain the updated info and all the functions that may be invoked by the users any time. It's possible when sometime there is no sufficient service search and the keyword need to be searched does not provide meaning full results or search responses or may not provide full matching requirements for user query. In starting the focused is on crawling for WSDL. They figured out that the information provided in WSDL. In second step they developed the results which are figured out from user's clear feedback which is experienced from users. Then they used Heritrix Web robot with additional rules to browse only related content or pages. In last step they decrease the duplication in fetched data or results. But, to achieve accuracy they were failed in the meaningful information retrieval. After long analysis the said that WSDL document does not contain semantic descriptions of the service. In discovery of service UDDI they highlighted an issue that narrow space to searching of any query is provided in this. It only provides service name and searching category. They also discovered that most of the public UDDI's have been turned off. As UDDI is not accredited where you check the stability and its reliability. While there are some people who challenges that WDSL files contain many tags, due to which for the agent it is difficult to retrieve the information. And some anomalies occur like, they found the result that web services functional requirements handled by WSDL. There are many analysis of multiple and different techniques is implemented by some of search engines like Yahoo, Google, Opera and Mozilla has been offered their limitations to find out. Google is also a web service search engine. extraction of information has been done about functionality descriptions of WSDL,

outputs and inputs. Clustering of parameters, input output and operational similarity or matching, and database saves the results. They compared their different method with Func and Comb. Contrast of words with multiple operation names is done by method named as func. On the other hand, in Comb method web service names, they used, for matching the different parametric names and descriptions; in distinction to Woggle, mentioned keywords are used in both of these. [4]

2.8.4 FRAMEWORK OF API

The working of API is quite complex but the framework of this web service is quite easy and learnable. Some of the following steps are as follows

1. User can send any keyword to the system. The input requested from user's end is anything in user's mind. The engine compares the keyword not only with the web service interface but with the functions and methods.

2. The request which need to be searched first goes to Custom Search Engine of Google with the help of API of Google Custom Search.

3. This engine has been appointed to search the keyword. Alteration can be done anytime in this system.

4. Engine check out all of the top rated links for results.

5. Results which are directly extracted from Google are not in easily understandable format. then the application parses produced results. And make in understandable format.

6. Web based Engine Mines the WSDL files from the different sets of results.

7. Server displayed the results to the user.

8. To verify the availability of server is, in time or not. System had to executed the soundness check.

9. Results are shown and then sent back to database.

10. To achieve reliability backup of data base is retained.

2.8.5 Snippet Ranking Algorithm

If answer of a query is a is too short in term of words, then the SMS based offline search engine give the output of all the top rated or updated n-grams links related with a query of the client. Though, in query, the answer is included in a single n-gram or is really a mixture of various n-grams, it is difficult to decide. In that case the best snippet which received as output in the expectation that the answer is implanted in the snippets and the user can easily interpret the answer. The system snippets two things from all the Googled information first one is link and the other one is text. This ranking algorithm cannot snippets since all of snippets content are unique, and have one measured frequency. The snipping allows us to choose specific attributes among multiple links so that the accuracy can only be achieved. In addition, different number of attributes are contained by snippets which may produce a biasness in the function of ranking. For removal of biasness Top K n grams based function of ranking is introduced.

Snippet rank: A snippet S with a set of n grams T = {t1,... tm} with resultant n-gram ranks rank(t1),. ..rank(tm). Let ti1,. ..tiK represent the top K ranked n-grams in T.

Then the rank of snippet S is:

$$\text{rank(S)} = \sum_{j=1}^{j=k} rank(ti_j)$$

We defined it as the collective rank of the top-K ranked n-grams within the snippet. In practice, we choose K = 10. And further more among these 10 snippet links are top five snippets are selected. In the snippet ranking level/process, we cumulate the highest ranked snippet is the most relevant results query. Remember these snippets were advanced to keep less than 140 bytes, but sometime snippet tiles go longer consisting on overlaps during the process of merging. For finding the best snippet, first split snippet each tile into snippets with the help of 140 byte sliding window across each snippet tile that respects word boundaries. We then score each snippet based on the sum of the top K n-grams and return the top scoring snippet as the final result. In the evaluation, we show that ranking n-grams first before ranking snippets is critical for better accuracy; in other words, directly scoring snippets from the web page results without using n-grams performs very poorly in practice. [5]

CHAPTER 3

SOFTWARE REQUIREMENT SPECIFICATION

3.0 Introduction

For our third chapter; it's about the prerequisites of our Project with brief in order to know about the basics about the destinations of this framework which is used here. Unmistakably necessity recognizable proof is a troublesome assignment on the grounds that in definite stage item could have inconsistencies which are also called as Bugs in our computer language and these inconsistencies can bring irreparable errors which can lead to an unaccomplished task. Once any inconsistency is found in any of the system code it can be solved according to the proper examination which is held for the system clearance surety. For this purpose of finding out the error or bug and other insistencies a frame work which is used; must be an efficient one so that it can be able to find even a single minor error which can affect our system badly because of a single bugged code. For this purpose and all examinational things, we do it by making it divided into parts. A framework is used which works on division structural rule. By keeping this all in under observation this section of report covers insights concerning, actualities, figure, highlights, execution or functionalities of given system. The software Requirement specification will be discussed under section 3.3, section 3.5 and 3.6 will be about detail discussions about different given parts. The general inspiration driving this file is to demonstrate, portray and delineate each component of the framework to urge a customer to know the reason and use of the framework.

3.1 Requirement Definition

Requirement specification is about connections. This connection is about contraption equipment with programming or software system among various bundles. This communication is between hardware and software equipment; hardware, software compatibility on both end developer as well as user or client furthermore clients in broad type of genuine world situation. These all comprises of the unusual prerequisites with useful necessities and characterizes client's connection of programming. In different scenarios this functioning depends upon the framework working the more it requires the availability the more it is functional; defines that what are the key functions that must be done by software.

3.2 Functional Requirements Purpose

We here discuss the framework's practical necessities, about useful capacity prerequisite in system. Developers help to give a responsive functional system which allow its user to be in more ease for the functionalities. Main necessities; involved reasonability of machine work that how it is working and carrying the system load according to necessity of system. Furthermore, product program prerequisites which are used for the system work and about the whole procedure have all information about every little work which is under observation of that software which is working for functioning of the gadget.

3.3 Functional Requirements

The execution of the system started or let we say system starts its execution when the server receives the request. Requirements are characterized in requirement analysis phase where the functional requirements are analyzed to make the efficient system. When the system starts execution functional and nonfunctional requirement performed their vital role. There are some main functionalities which ought to be performed are listed in functional requirement and some of the requirements which only start functioned when some special case is requested that’s why they are called nonfunctional requirements.

3.4 Software Requirement Specification

There is most essential and dominant document named as Software Requirement Specification which helps in the software’s enhancement and development. This document helps both developer as well as user to communicate and understand the user’s requirement so the effectiveness of the software may have increased. Gathering information from user with keeping all aspects in mind in term of future development of software. This chapter elaborates the basic requirement, necessities of resources and space for features which may have enhanced in future. This chapter tells the working and flow of each single as well as whole modules so the user can understand their basic requirements and extra features which are available in SMS Based Offline Search Engine. Description of software requirement is pure and clear of the product which is under development. This describes all the functional requirements which include the overall description, criticality, technical issues, costs, schedule and risks involved in us proposes system.

3.4.1 Description

3.4.1.1 Google Based Search Returns

Any Query requested by the user will be taken as an input from this system, interpreted (and corrected if needed) by this system and then should be searched on Google for results. Then, the results should send back to the user via SMS.

3.4.1.2 Database

When the text received on server side the query sent by user first checked in database if already exist there then the reply sent to the user through server side otherwise Google service called for further proceeding. Google searched result stored in database and before replying to user the query first stored in database for again use in future and then reply back to client.

3.4.1.3 Community Emergency Alerts

This System should send alerts to all the users in case any event, emergency happen in their city or specific area near them. Along with them, guidelines and safety measures will also be sent to them for their safety.

3.4.1.4 Criticality

This system is critically dependent on above described requirements – Google based search is one of the most important one.

3.4.1.5 Technical Issues

User can search any type of query, so there is issue how this system will interpret this query. For-example, a user search for “weather” and this system interpret, is as user is searching for weather meaning but it should interpret as weather condition of the user’s area.

3.4.1.6 Cost and Schedule

Cost for an individual module also matters just like cost of whole project. Project is done successfully within budget and within scheduled time. The only cost in this system is GSM Modem which is around RS 10,000 and cost of RS 0.002 per SMS. Project is expected to be complete by first week of May 2019.

3.4.1.7 Risks

Risks are one of the most highlighted issue of any project because there are some projects in which you cannot compromise on risk that's why risk analysis are also done before deployment of software, in this project risk factor is not so remarkable because we cover every risk aspect with different co independent modules. There are no such risks involved except no availability of GSM services in some events due to security situation in Pakistan.

3.4.1.8 Importance Emergency Phone Number Returns

User can ask for police number, fire brigade or even some hospital number via text and get the exact number in return.

3.5 Data extraction form Google

Meaningful Data extraction from Google is one of the major challenge accomplished in this task. The procedure followed by as per sequence is, when the text is send from user which is simple text for user but when the text received on server side the system received it as a search query and with the help of an API useful and appropriate results extracted from Google and again converted back to simple text which material is affordable on user mobile and sent it back to the same number from the text received previously.

3.6 Functional Requirements

Some of the functional requirement are there which are highly required or necessary for the function of this system. To perform the system more accurately and efficiently these functional requirements must be fulfilled otherwise the system unable to give accurate or user desired response. These all responses depend on the behaviors of the module. Each module has its individual efficiency so for good response efficiency of all modules are highly required.

3.6.1 GSM Connectivity

Sr.No	Description
R1.0	Modem must be unlocked.
R1.1	SIM Should be activated
R1.2	SMS should be activated on SIM
R1.3	Modem Drivers should be installed in system

3.6.2 Web Service

Sr.No	Description
R1.0	Interface must be in working form.
R1.1	Internet Should be connected with system.
R1.2	API key should not be expired.
R1.3	Search browser should be installed in system.

3.6.3 Data Base

Sr.No	Description
R1.0	Database should be connected .
R1.1	Searched results should be added in Database.
R1.2	It must make sure that the information is transferred in minimum time required.
R1.3	It must give accurate results.

3.6.4 Transfer of Information

Sr.No	Description
R1.0	System ought to be in working form.
R1.1	System must be smart and fast enough to transfer information in time.
R1.2	It must make sure that the information is transferred in minimum time required.
R1.3	It must give accurate results

3.6.5 SMS Send Receive Communication Module

Communication module must be active and accurate so that it can generate timely and accurate message and alerts.

Sr.No	Description
R3.0	GSM Must be working
R3.1	SIM Must be active
R3.2	Syntax should be accurate
R3.3	Must be smart enough to generate timely message alerts

3.6.6 Expert System

Expert system is another module of this project, it deals with the worst scenario of whole system. We assign an expert for this system to response in case when the user's query is not found from database as well as internet or let we say when the service is down due to any issue, the query with client's number forwarded to the expert for further assistance.

Sr.No	Description
R3.0	Expert must be registered in this system
R3.1	Query should be understandable for expert.
R3.2	Expert should bound for reply.
R3.3	Must be smart enough to generate timely response.

CHAPTER 4

SYSTEM MODELING AND WORK DETAIL

4.0 Work Detail

This work detail is to show a complete picture of this working project and the techniques which are used. For telling or deliberating all the working and different phases of the project which are very important for user to know about this project or final product. If any company and user or client wanted to buy this project they need every information and complete knowledge related to this project so we provided the work details of this project. The flow of information or work details we provided is very easy to understand about this project to maintain the all the understanding about all the phases and working of this project. This system's work details are easy to understand if any coder or developer wanted to examine this project working details they easily understand all the working of project or all the phases which have been done. All the phases or work is done separately so coders or developers can easily understand all the working of this project. In this chapter of the report we defined the working and processing of each phase, and this project tell the user a lot of things related to project which are help full and accurate for use, so we made different work flow diagrams, flow charts and work flow tables to show all the working and processing of this project.

This product "SMS Based Offline Search Engine" every phase is defining and shown separate to make easy understanding for user.

4.1 Mission

The mission of this system is to answer the user accurately after getting meaningful results with the help of Google independently. The developed system is artificially intelligent so it can extract the results from Google and replied meaningful results to the user. In this chapter we will elaborate this system's functionality through graphical diagrams

4.2 Class Diagram

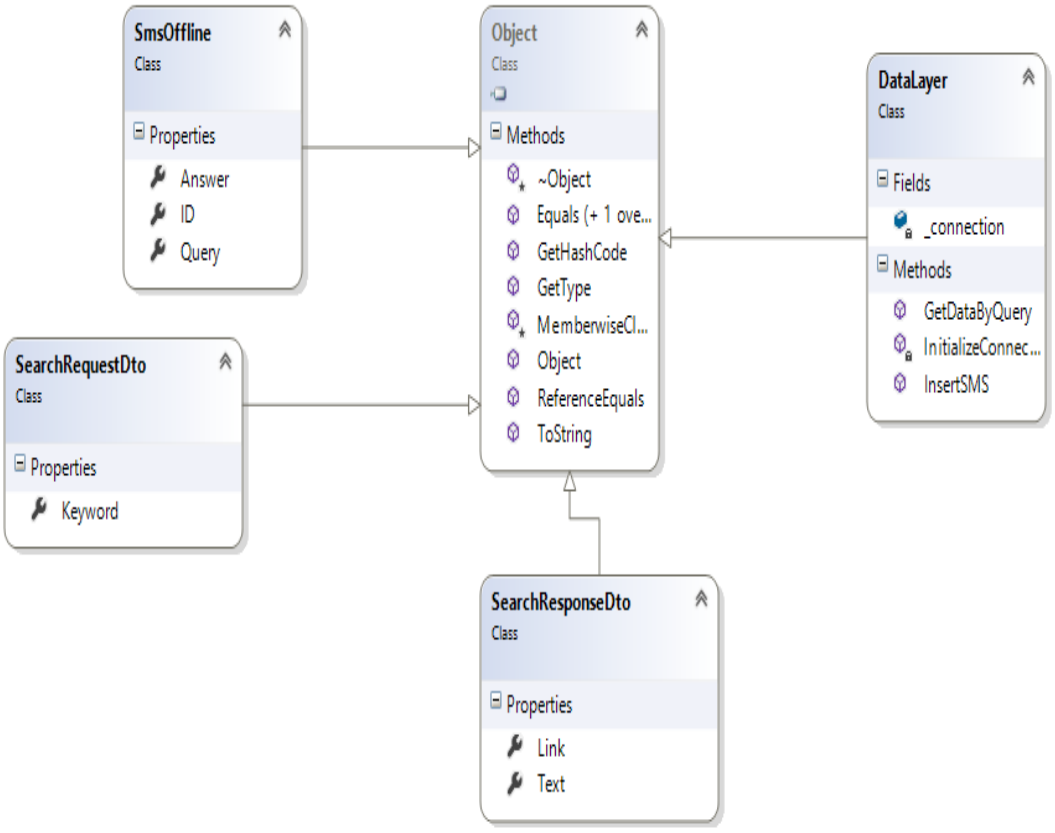

Figure 4.2 Class Diagram

4.3 System Flow Diagram

System flow diagram tells the flow of the system to enhance the learnability of project. System flow also helps the naive user to understand the system to they can easily use software with understandable behavior of the system.

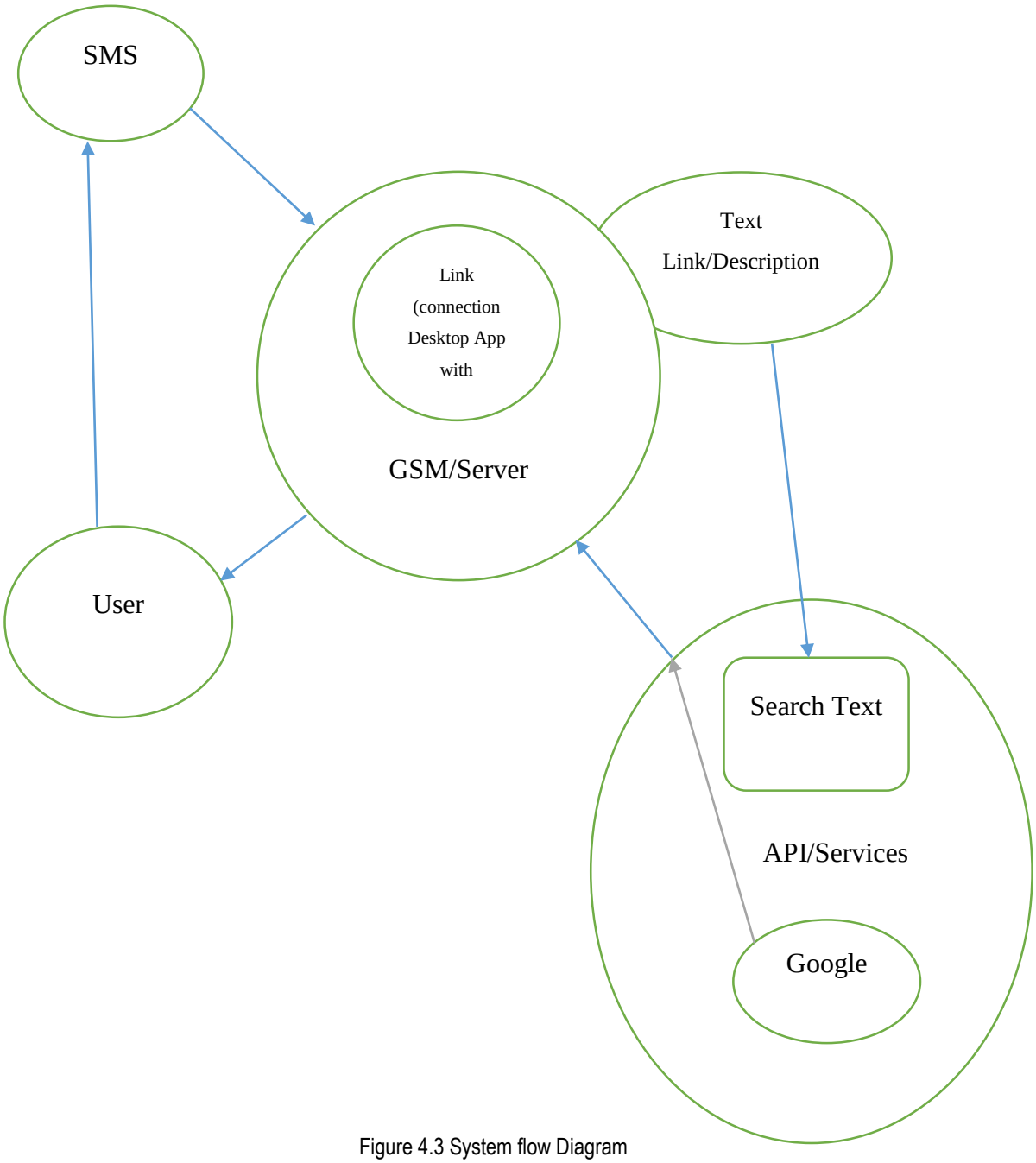

Figure 4.3 System flow Diagram

4.4 Use Case Diagram

This use case diagram shows every step or phase of this project for representation of all the work flow and make diagram of user entity who send the Query (SMS) to system. The system receives the Query (SMS) and start its further processing or working so different diagrams are made to clear the relationship between user and system. All the phases and work flow of the project is shown in the diagram. How user can interact with the system and how system can response to the user after getting results from Google or database. The technicality of this project is the interaction of system to Google service because the user query process through system and the system approach to the Google to search data. When related content is searched the result is received on the system then system again process this result to store it on database for future use and response. Expert is involved when system is down or unable to Google the query.

This use case diagram explains all the work phase and functionality to provide easy and better information to all.

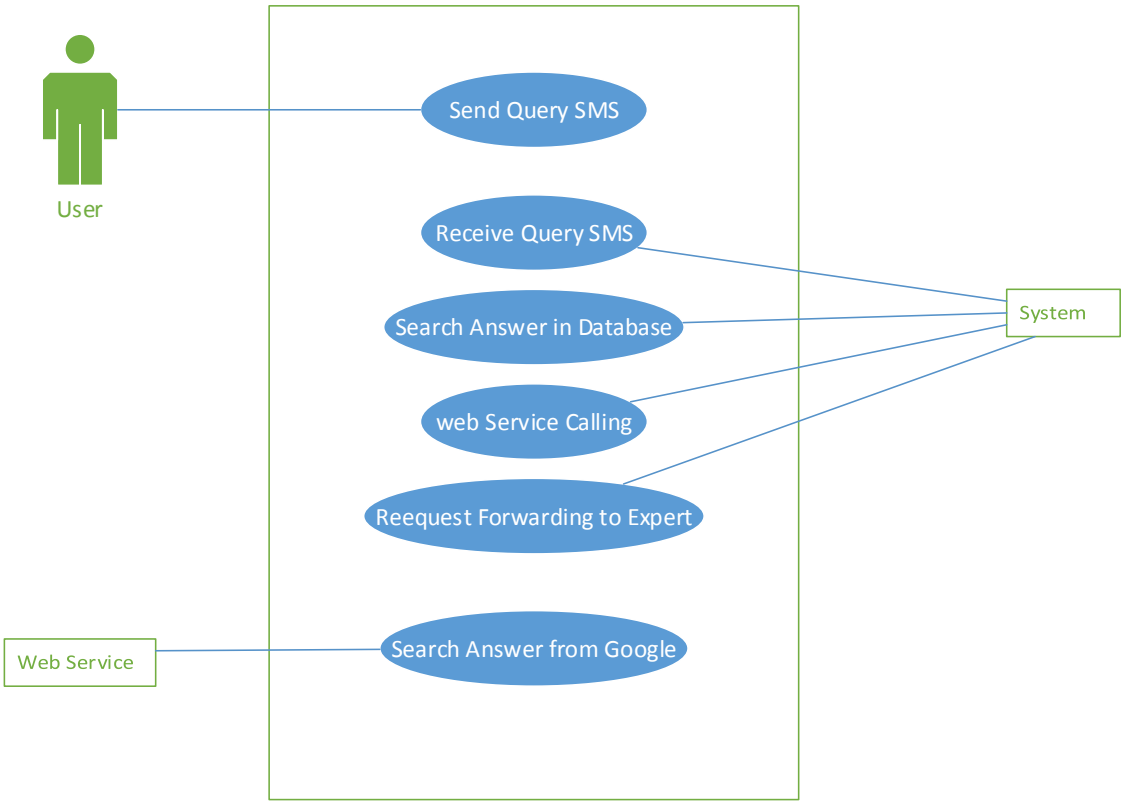

Figure 4.4 Use Case Diagram

4.5 Main Architectural Diagram

The architectural diagram is basically for the interactive representation of system for novice user this elaborate the entities used in the project and sequence of system in good looking form.

In First step is signal verified

In Second step SMS will be sent containing some query

In third step SMS read by system through GSM modem

In forth step query will be searched and system found some results

In fifth step SMS will be send back to the user

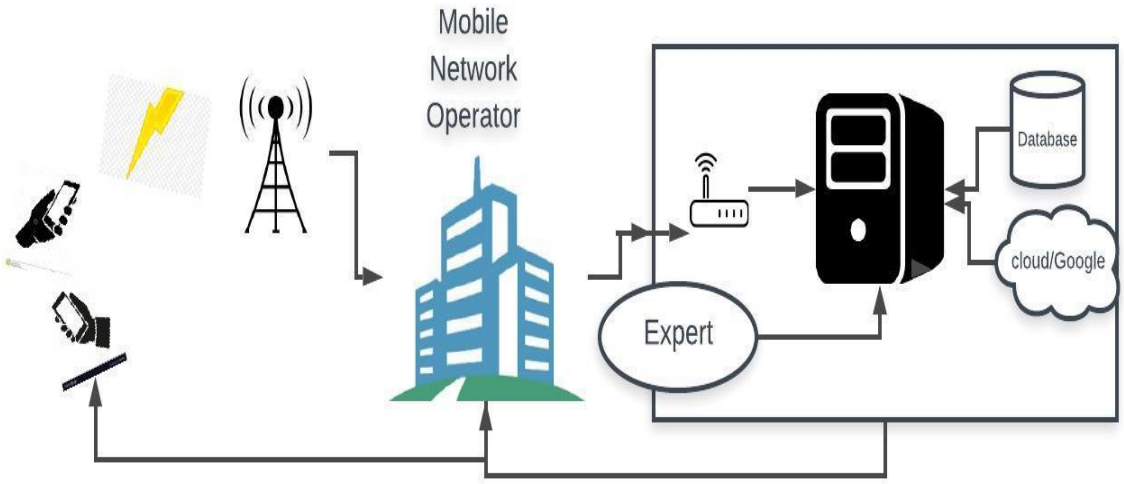

Figure 4.5 Architectural Diagram

4.6 System Sequence Diagram

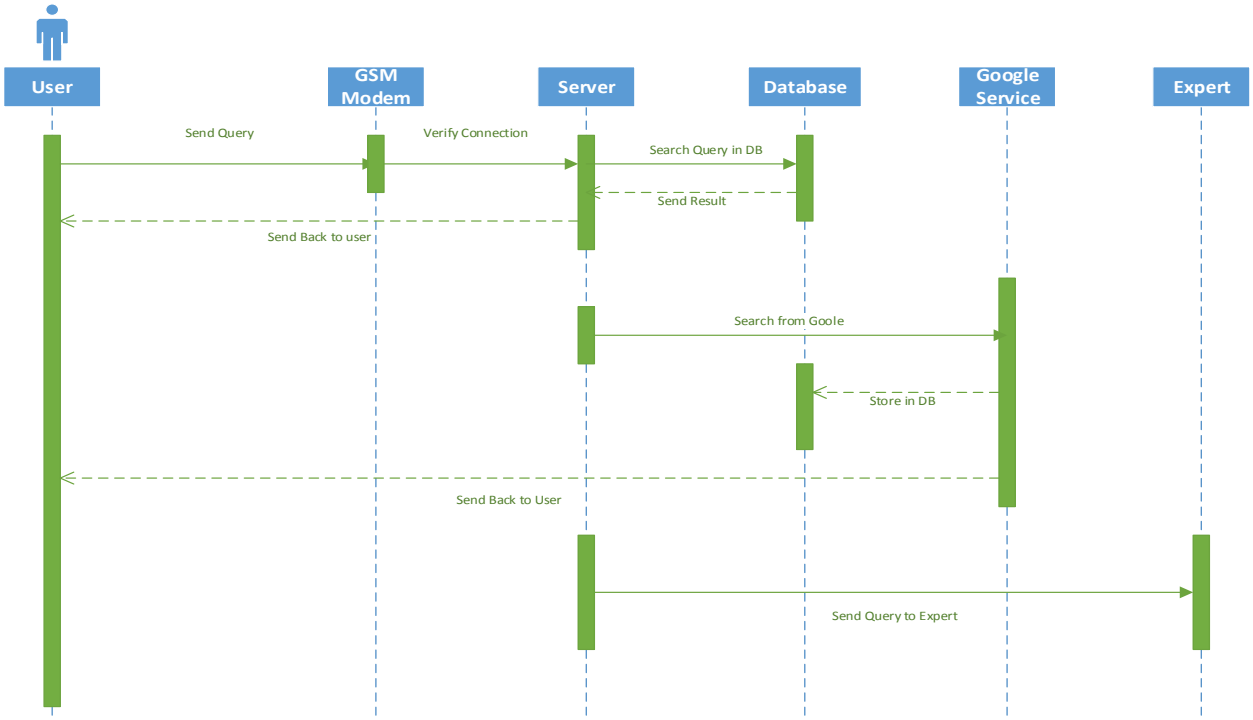

Figure 4.6 System Sequence Diagram

4.6.1 Sequence Diagram of SMS sent

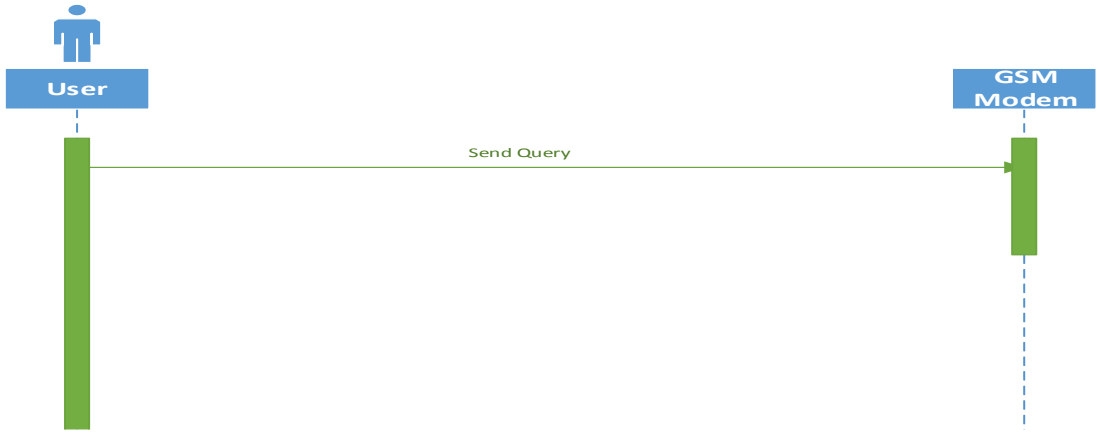

Figure 4.6.1 Sequence Diagram of SMS sent

4.6.2 Sequence Diagram of GSM connectivity

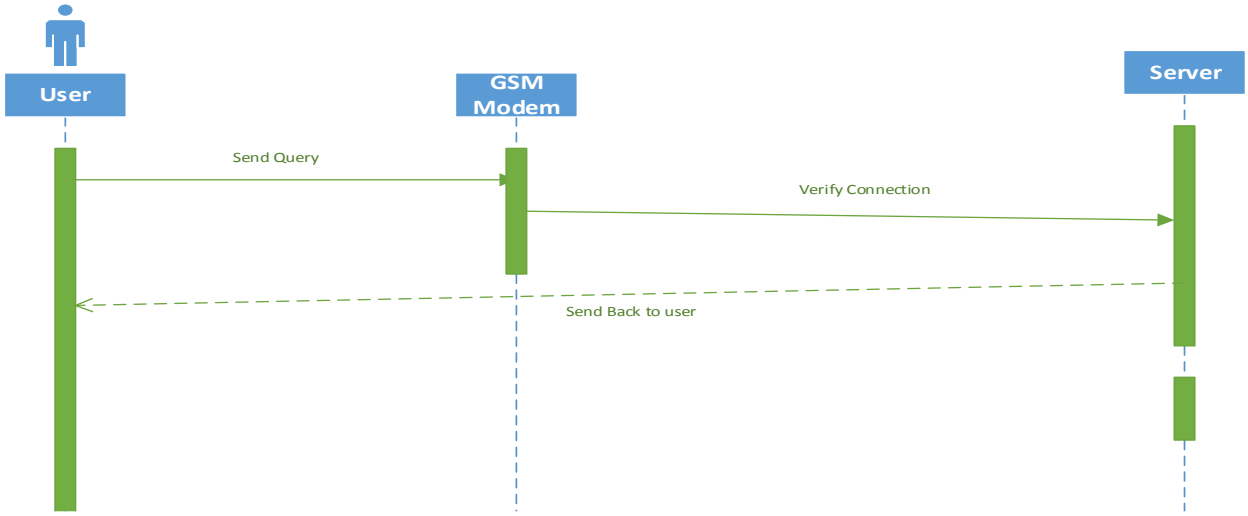

Figure 4.6.2 Sequence Diagram GSM Connectivity

4.6.3 Sequence Diagram of Searching query form Database

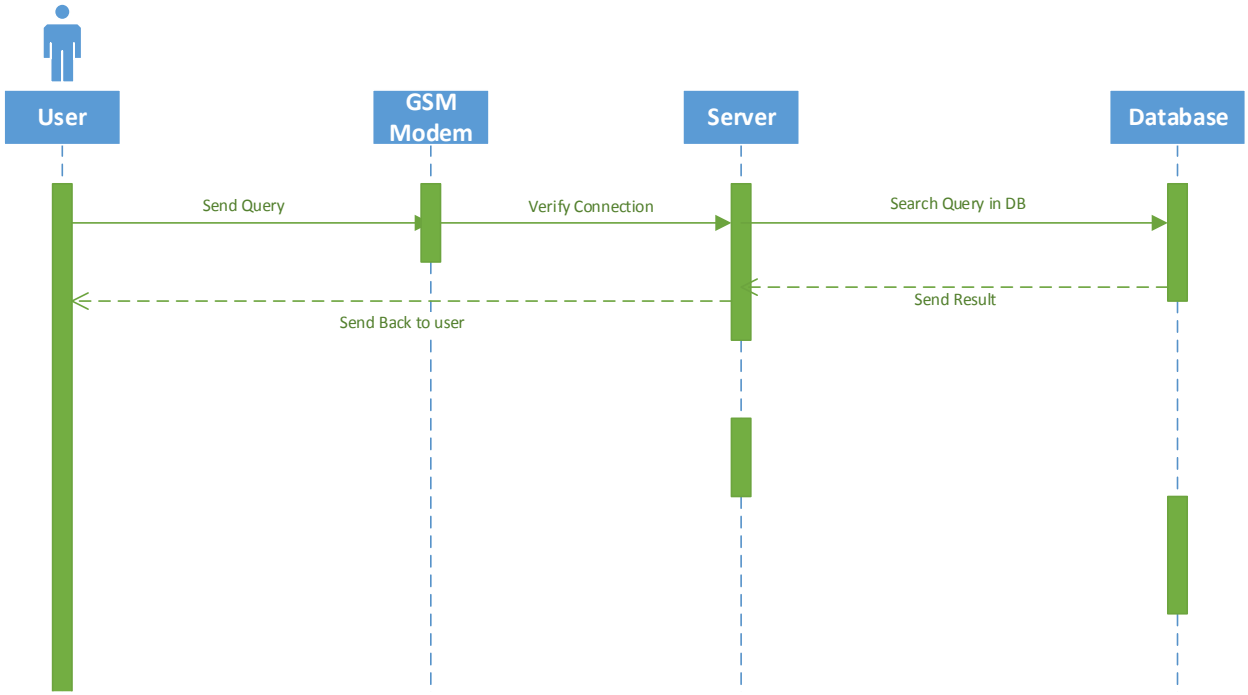

Figure 4.6.3 Sequence Diagram of query from db

4.6.4 Sequence Diagram of Searching from Google

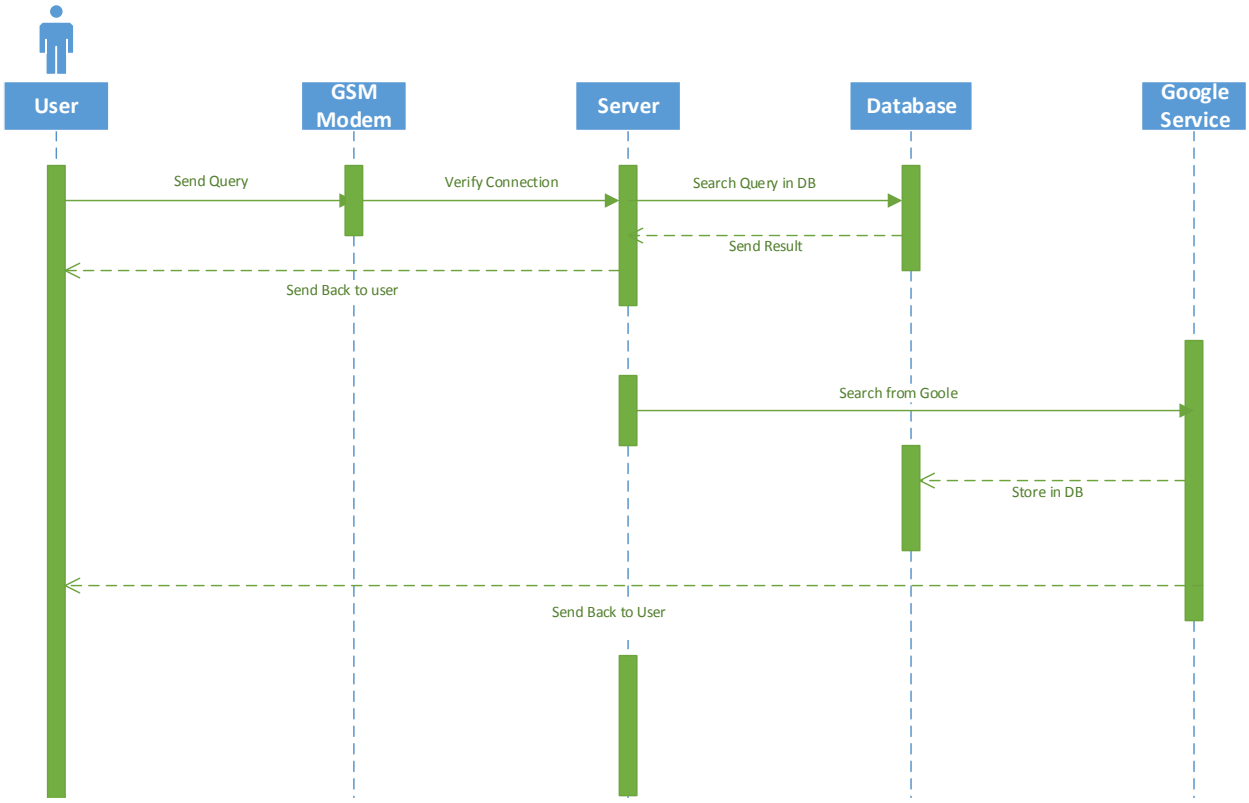

Figure 4.6.4 Sequence Diagram Searching from Google

4.6.5 Sequence Diagram of Expert Consulting

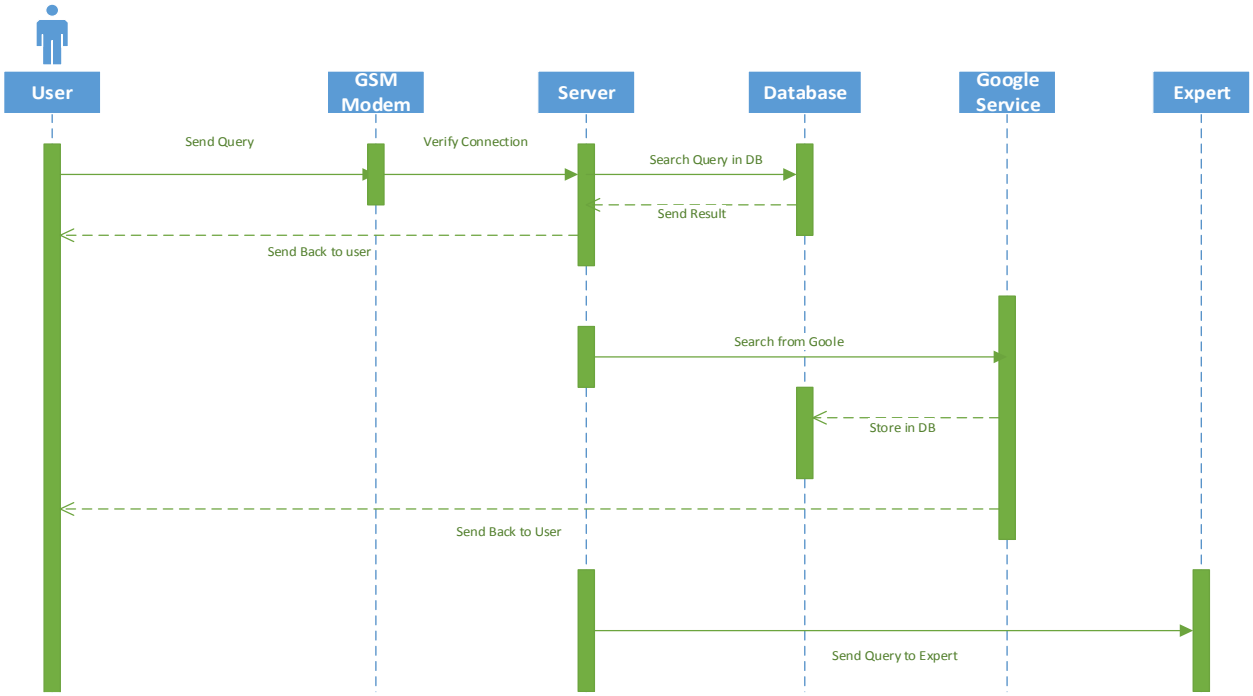

Figure 4.6.5 Sequence Diagram of Expert

4.8 Automatic Text Summarization

In text summarization phase the snippet text need to be summarized in order to facilitate the client who have low end mobile in which a single SMS only contains 160 words, so that the system before replying summarizes the text into readable form or into some legal grammar discipline. The relevant material is only kept for user and rest of the content is ignored by the system.

4.8.1 Google Searches

When you write any word on Google there are multiple results come against that query same like that when this system receives any query Google it with the help of POST method, many results found in this case system choosing top ten most updated links and among those top ten updated ten links again we choose top five links this two-time filtration help the system to analyze the result and get the appropriate result for the user.

CHAPTER 5

TESTING, ANALYSIS, AND VALIDATION

5.0 Introduction

This chapter elaborates about the phases of testing through which we measured this project's efficiency. Multiple techniques of testing are used to confirm the reliability, in time response of this system. All the projects who give response on real time are very sensitive to the validation is so important for them to check the reliablity of that system to avoid the bugs which may occur after the deployment, the application is bugs free. The system or application is not delivered to customer without validation because it's about trust between the user and the developer. So no one takes any risk to deliver or deploy the project without passing testing phases. Some of the tests were taken within the development phase and rest of them are when the project is completely ready to face any challenge.

5.1 Test Case

In test cases some of the necessary conditions which are essential to validate each module of system, working of each function is fine, accurate or not or free from errors or not. Sometime when we apply only one test on any one of the module may be it checks the functionality of the module but after integration with other modules many of anonymous errors come across which only checked in integration testing phase where after checking the individual working of each module, again tested in during integration or after the integration because many times modules are working fine individually but when they are integrated with other modules they create problem in working. Each test case is designed for the examination of individual module so we scored module on some criteria. Testing basically focuses on nonfunctional and functional requirements. Some of the test cases are developed which are as follow.

5.2 Test Bed

A testbed is a function which is used basically to test an individual module and its functionality. Testbed actually is not a tool, mainly it offers an atmosphere where different tests are performed to test the efficiency. Whenever we talked about the test bed its mean settings, or settings of hardware configuration, operating system functions, software configuration, network configuration, trial stations, the product is in the phase of multiple configurational tests. "SMS Based Offline Search Engine" an application which is actually for desktop that is

been tested on 4GB RAM with Windows OS, through an internet connection. Or also without internet connection. Unlocked GSM modem is also the most important tool of this project.

5.3 Unit Test

This unit testing phase is most important and formal phase of testing which actually examine each module's functionality. The unit test offers the testimony documented phase which tells each module individually also functionality of modules among themselves. There are some errors which occur at the time of integration and these errors are not easily traceable so unit testing phase facilitate here in testing of individual module to trace that error and remove it before deployment and before integration phase, so the integration phase does not waste time in errors and done with its own criteria. In unit testing single module of texting in which SMS sending and receiving is examine then module of Google searching validated for reliability, same like module of database searching in which same like query's answer matching made possible and in the last step expert consultation module also verified where consulting to the registered expert is ensured. For example, GSM working test, Internet Connection, Service working, Database working. Expert Response.

5.4 Integration Testing

In this phase of testing integration testing is applied, in which different modules are integrated to see the functionality is affected or not. This phase examine the issues related to integration whether the performance of each individual module is still same like in unit testing phase, does the software gives accurate results or cleared from all errors or bugs? Is the reliability still existing in every module or not?

5.5 User Testing/Acceptance testing

This phase of testing is related to the end user acceptability test whether the system is fulfilling the user's hopes or not. The product is ready to deliver or might need some changes, it is used for finalizing the test phase. In this phase we provide real life test cases to check the systems capability of response. This test is done in simulators or with real entities.

5.1.0 Test Case: GSM Connectivity:

Table 5.1.0 – Test Case

Test Case ID	TC-01
Test Date	12/09/2018
Tested By	Awais, Faizan
Actor	User
Functional Area	GSM connectivity.
Objective	To connect GSM with SYSTEM.
Pre-requisite	Its drivers should installed properly
Expected result	GSM modem connected successful. Drivers is installed.
Test Result	Successful.

5.1.1 Test Case: SMS Send Receive:

Table 5.1.1 – Test Case

Test Case ID	TC-01
Test Date	10/10/2018
Tested By	Rehman,Faizan
Actor	Developer
Functional Area	SMS send to user or receive form user, on System.
Objective	Send/Receive SMS successful.
Pre-requisite	GSM Connected.
Expected result	SMS sent successful and SMS receive successful.
Test Result	Successful.

5.1.2 Test Case: Working of Web Service API

Table 5.1.2 – Test Case

Test Case ID	TC-01
Test Date	25/11/2018
Tested By	Rehman, Awais
Actor	User, Developer
Functional Area	Get most updated links from Google..
Objective	Google the keyword received from user.
Pre-requisite	Internet Connected.
Expected result	API get accurate results from Google.
Test Result	Successful.

5.1.3 Test Case: Database Searching:

Table 5.1.3 – Test Case

Test Case ID	TC-01
Test Date	10/12/2018
Tested By	Faizan, Awais
Actor	User, Developer
Functional Area	Get already searched query from database.
Objective	Get searched response from database.
Pre-requisite	SQL Database connected to the system.
Expected result	Most relevant data is picked from database and replay to user.
Test Result	Successful.

5.1.4 Test Case: Expert System

Table 5.1.4 – Test Case

Test Case ID	TC-01
Test Date	2/1/2019
Tested By	Faizan, Awais
Actor	User
Functional Area	If service is down and no answer is connected to the database.
Objective	Forward the user's request to expert with user's phone number.
Pre-requisite	Expert must be registered in this system.
Expected result	Expert should reply to the user.
Test Result	Successful.

CHAPTER 6

CONCLUSION LIMITATIONS AND FUTURE WORK

6.0 Conclusion and Future Work

This chapter, gives the whole picture of this project is explained and the future of this project is also explained. Technology is taking over the world day by day. With the help of present tools that's all we have done. This project is expandable in much more you think. The steps we have taken to complete this project all are defined in above study. In this chapter we study about the scope of this project in present as well as in future. Up till now that's all we have done but its is expected with the passage of time this project can be improved with many features so the user can get more benefits with this software. Due to limitations in CSE (Custom Search Engine) there are some limitations in this project. So in future it is expected that this service will be free in full version.

6.1 Conclusion

Now a day some people are using advance PDAs (Personal Data Assistant), so they think the rest of users are also using this technology but with sad reality it's not true. According to research there are only 3.2 billion people in the world out of 6.4 billion people are availing internet facility, its mean only 50% of the world is availing internet or in journey of technology. Rest of 50% of world need some step towards technology and it's the philosophy that human never learn anything so much advanced in the beginning. Its human nature that they need some ascending steps to grow up in the society. So our focus on that 50% for the world who live in urban areas or there where people left way more behind from technology, so our focus is not on the society who are growing with day by day in this technological world but the society who have only the knowledge of single SMS writing and reading. These are those who have just oral knowledge of technology but not practical.

The purpose of choosing this project is that after searching a lot on internet we concluded that there is no open source code is available on these modules. And after thoroughly studying the research papers related to Offline Searching or Search through SMS we finally come this conclusion that offline searching is possible but we need some more advance tools and tricks to overcome the issue which is related to the accuracy or many other issues. There are many related searches we find through internet but for practical implementation there is no source

code or authenticated material is provided but we over all the issues we face in searching and make a validated and authenticated product.

So the users who only have the knowledge of single SMS can avail this technology and stand with the technological world in this century. A user who have low end or only GSM based cell phone want some query to search on internet. They simply need system GSM modem number and have to send that query on this artificially intelligent machine who automatically done all these steps and reply results back to the user which are discussed further, when the query received on this server. The first feature of the system that first search related queries which already stored in data base if found well and good system reply the results back to the user. Else second feature of this system is that the query is sent in second phase where the query is Googled with the help of browser and extracted word is stored in keyword and before replying back to user that results are stored in the data base it's because in future if same request is receiving, system will reply back to user without wasting of time. The third feature deals with the third scenario in which no result is found form database as well as internet is also down due to some issue then the system forwarded that query along with user's phone number to the expert who is registered in this system.

So the people only have the oral knowledge of technology now they are not dependent on any newspaper, dictionary, or any other external source they can avail this facility of internet searching with their only knowledge of texting. They will feel themselves more independent and confident. When they understand the interface of this searching they will not hesitate to migrate toward advance technology.

6.1.1 Achievements

This system is successful in achieving multiple goals like accuracy in searching, in time response, offline searching, consulting with the expert in case of no internet and no results from data base. This system is also tested for multiple search requests at a time, system reply correct results to each individual with the help of threading. Searched requests with different languages also requested to server and the server gives the accurate results against any query because Google can understand any language with the help of NLP (Natural Language Processing). System can deal more than hundred searches in few minutes. Search responses

from Google also dependent on internet speed more the speed reduces the response time and made system much more efficient.

6.2 Limitations

Due to some external factors there are some limitations of this system. Like no doubt web service is our own custom build but every searched for an individual is paid in the world and her we are offering multiple searches free of cost only with the help of single SMS through one internet facility paid server here this system is using the unpaid version of restful Google search API because searching from Google we need some permission and due to unpaid service there are some limitations in this API like 1000 searches per 12 hour, or sometime accuracy factor come across. But in paid API there is no such anomaly which compromises the quality factor. Somehow it's the prototype system so on industrial level it can be much more refined. Where you insert more filtration for accuracy and much more.

6.3 Future Work

This project is not just a project it is motivational tool to bring the rest of 50% population of the world towards future and technology. To make the people aware with technology, trends, and advancement in routine life. This project is much more useful for telecom industry to use this software subscribe the user on their search engine and give them facility of offline searching through internet with the help of just a single SMS. Project can enhance the ability of users with low budget but have courage to gain knowledge and walk with the society. In future we make the expert consultancy system automatic means the expert sent result back to server and server maintain the record of requested user and when expert reply client's query answer, the answer first store on data base and then this system automatically replies to that particular client who was requested that query. Further amendment we will do in this project is that we filter the results more and extract the most meaningful data with the query.

REFERENCES

[1] [GSM working] "ELPROCUS" https://www.elprocus.com/gsm-architecture-features-working/

[2] O. Pandithurai, N. suganya, S. Naresh, "Accessing the Required Information from an Applications in Cloud Through SMS" Research Journal, March 2010, pp 1-3.

[3] Bhaskar P., Admela J., Dimitrios K., Yves G.: Architectural Requirements for Cloud Computing Systems: An Enterprise Cloud Approach. J. Grid Computing 9(1), 3- 26 (2011), pp 1-3.

[4] Maria Allauddin, Farooque Azam "Service Crawling using Google Custom Search API" International Journal of Computer Applications (0975 – 8887) Volume 34– No.7, November 2011.

[5] J. Chen, L. Subramanian, E. Brewer "SMS-Based Web Search for Low-end Mobile Devices" Conference Paper · September 2010, pp 3-8.

[6] Jinglan Zhang, Shlomo Geva, Andrew Trotman "Using Mobile Phones to Improve Offline Access to Online Information" Conference Paper · June 2013, pp 1-4.

[7] M. Hofmann, L. R. Beaumont, Content Networking: Architecture, Protocols, and Practice: Morgan Kaufmann, 2005.

[8] Holger Lausen and Thomas Haselwanter, "Finding Web Services" 2007.

[9] [Search Engine] "the next web", https://thenextweb.com/insider/2013/10/24/welcome-worlds-largest-offline-search-engine/