

Smart Voice Assistant: a universal voice control solution for non-visual access to the Android operating system

Aditi Bhalerao¹, Samira Bhilare², Anagha Bondade³, Monal Shingade⁴,

Aradhana Deshmukh⁵ (Assistant prof.)

Department of Computer Engineering,

Smt. KashibaiNavale College of Engineering,

Pune, India.

-----***-----

Abstract–In this paper we introduce Voice Command Device (VCD), a universal voice control solution for non-visual access to the Android operating system. VCD offers two contributions as compared to existing systems. First, it enables system wide Voice Control on Android that can accommodate any application. VCD constructs the set of available voice commands based on application context; these commands are directly synthesized from on-screen labels and accessibility metadata, and require no further intervention from the application developer. Second, it provides more efficient and natural interaction with support of multiple voice commands in the same utterance. We present the system design of VCD and describe its utility in significantly improving experience of graphic interface interaction for blind and motion-impaired users

The reader, which transforms digital information to text and then to voice by TTS (Text-To-Speech), is widely used to help visually impaired persons to operate devices. The system, integrates open sources and also enhances many functions of them. It includes the message reader, text file reader, OCR reader, voice dialer. In addition, it provides the Navigation Reader for walking and riding, which is based on Google Maps and supports more detailed voice guidance for the distance to a destination and directions

of moving. **Key words:** Voice command, android, TTS, Bluetooth, client-server, VCD.

1. INTRODUCTION

1.1 Problem Statement

graphical user interfaces (GUI), objects, such as buttons, menus and documents, are presented for users to manipulate in ways that are similar to the way they are manipulated in the real work space, only that they are displayed on the screen as icons. The first and most essential step of interaction with GUI is target locating, sighted people can intuitively and the target object with a quick visual scan. But without visual access to the screen, this simple task is often very hard to finish, which is the main cause of difficulties in non-visual interaction. A Voice Command Device (VCD) is a device controlled by means of the human voice. Google created a speech recognition engine called Pico TTS and Apple has released Siri for this a billion dollar industry. These also apply to anyone unable to look at and touch their device, leaving voice commands their only option. We notice that most of people use phone while driving bike/2 wheeler. This is very dangerous so people avoid this but remain with no other options. Today Android Wear is a booming industry. There is a need of Voice Command based application to because it has no keyboard and mouse. Also we notice that most of people use phone

while driving bike/2 wheeler. This is very dangerous so people avoid this but remain with no other options.

2. LITERATURE SURVEY

SRN	REFERENCES	TECHNIQUES	COMMENTS
0.			
1	Android Based Automated Smart Wheel Chair[1]	Android voice command used to move Wheel Chair.	It works over Wi-Fi and use extra HW to control Wheel Chair, No Concept of Call/SMS handling.
2	Optimal Driving System For Two Wheelers[2]	Implementation of an optimal driving system by using wireless helmet.	Focused on Driver safety, Voice commands not used.
3.	Speech-to-Text-Based Life Log System for Smartphones [15]	Microphone of Smartphone, STT (Speech-To-Text).	User are able to search life log sound files using Text.
4.	Voice control of home appliances using Android[4]	Voice command are used to ON/OFF home appliance	Need extra HW to ON/OFF electrical appliance
5.	Voice Helper: A Mobile Assistive System for Visually Impaired	Support of voice command for Visually Impaired Persons	Call and SMS are not handled through voice

	Persons [16]		
6.	Android phone controlled voice gesture and touch screen operated wheel chair.[6]	Voice and Gesture recognition through Android, Motor control through Signal conditioning.	Control the rotation of wheelchair based upon voice and gesture movements
7.	Enabling universal voice control on android[17]	Used to launch android application via voice commands	Call/SMS is not handled through voice.
8.	A Remote Computer control system using speech recognition technologies of mobile devices.[18]	TTS(text to speech)	Functions through google server.
9.	Smart phone environment control and monitoring system for android OS based robot platform.[19]	Cortex A8 series, S5PV210 embedded processor	Android OS based robot platform and smart phone operated control and monitoring system
10.	Implementation of Malayalam text to speech using Concatenative based TTS for	PSOLA, TDPSOLA, EMBROLA for speech generation.	Displaying characters and designed for news reader.

	android platform.[5]		
11.	ISee:- An android application for the assistance of visually impaired.[7]	Android application (ISee).	Serves as virtual eye by providing sense of seeing to blind person.

3. PROJECT SCOPE

3.1 Introduction

In this application user is able to access the services of smart phone with their voice command. User can easily send a message to the recipient available in their contact list as well as to the mobile number by voice command. In this Project physically disable person or the person having less knowledge about smart phone or how to access the smart phone can easily access the phone with their voice or speech command. This application includes the functions and services such as: calling services, text message transformation, mail exchange, alarm, event handler, location services, music player service, checking weather, Google search, Wikipedia search, camera, Bluetooth headset support and help menu. The list below indicates the information and the requirements of each individual function.

3.2 The Aim:

- To develop an Android application which will interact user with voice command to perform some emergency option.

- To help bike rider to use phone in a very secure way so that he/she can primary concentrate on road.

3.3 The Objective:

- To handle incoming as well as outgoing call using voice command
- To handle incoming as well as outgoing SMS using voice command
- To perform some basic operations using voice commands.

4. SYSTEM DESIGN

4.1 Proposed System: The following figure gives a brief idea about the system architecture. The following figure gives a brief idea about the proposed system.

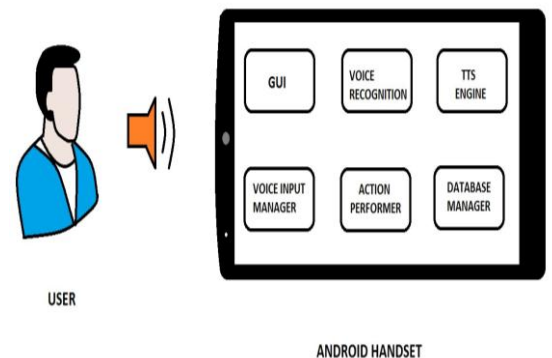


Fig 4.1.1 Proposed System

4.2 Main Modules:

GUI: It is used to interact with the user. GUI reflects the basic appearance of the application.

Voice Recognition: For intelligent voice assistant application is done using Google Server. This process involves the conversion of acoustic speech into a set of words and is performed by software component. Accuracy of speech recognition systems differ in vocabulary size and confusability, modality of speech (isolated, discontinuous, or continuous speech, read or spontaneous speech), task and language constraints. The system consists of five modules: feature extraction, phone model training, dictionary preparation, grammar estimation, and sentence decoding.

TTS Engine: A **text-to-speech (TTS)** system converts normal language text into speech. Synthesized speech can be created by concatenating pieces of recorded speech that are stored in a database. The output is given in the form of speech

Voice Input Manager: It manages the command given by user. It sends the Input given by user to the database manager,**Database Manager:** It compares Input given by user that is in the form of voice with the database which contains vocabulary of words .It sends response to the action performer.

Action Performer: It takes response from the database manager as Input and decides which action should be performed. Action can be in the form of text message or call.

1. Text message: Users are able to send the SMS to a specific person in the phonebook as well by giving a correct command which contains the messaging request keywords. The message should be sent to the destination immediately.

2. Calling service: The application should allow the users to make a call to the person in the contacts or by saying mobile number of the person to whom user wants to call. By giving a correct command with the calling request to a stored person, the Android phone should successfully direct to the number of the person requested.

5. SYSTEM ANALYSIS

5.1 Data flow diagram:

A data flow diagram (DFD) is a graphical representation of the "flow" of data through an information system, modelling its process aspects. A DFD is often used as a preliminary step to create an overview of the system, which can later be elaborated.

Level 0:-

User gives the input into the form of voice, this voice command is recognized by the application. Then action is performed as per the command given. Command given is compared with the database.

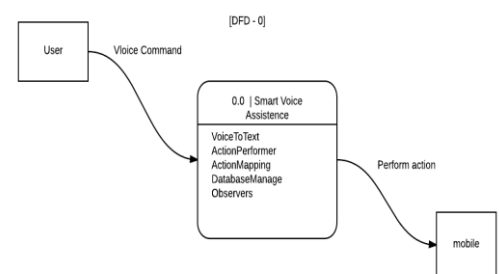


Fig 5.1.

Level 1:-

Input is given by user in the form of voice. Using microphone, voice is converted in binary. GoogleVoiceAPI will convert this voice data in text form and then the action is performed according to the command given by the user by comparing with the database.

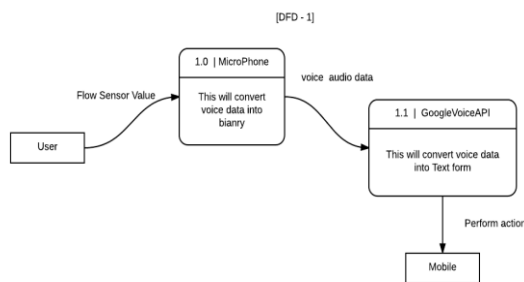


Fig 5.1.2

5.2 Use Case Diagram

This diagram consists of Actors. Our system consists of only 1 Actor. Following functionalities are handled by application: Login, Speak, Call handling, Sms, Logout.

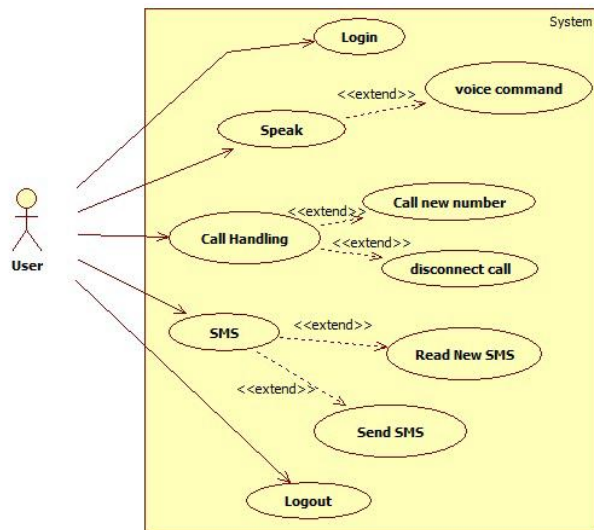


Fig 5.2

This diagram helps us to understand the sequence in which the activities are performed.

Login: - We **verify** the user by login id and password and if it is correct then its logins **successfully**.

After the successful login the mic starts and it waits for user to speak, when the mic receives the data it converts the data into the text format.

The text is then matched with the action which is to be performed. Action is performed.

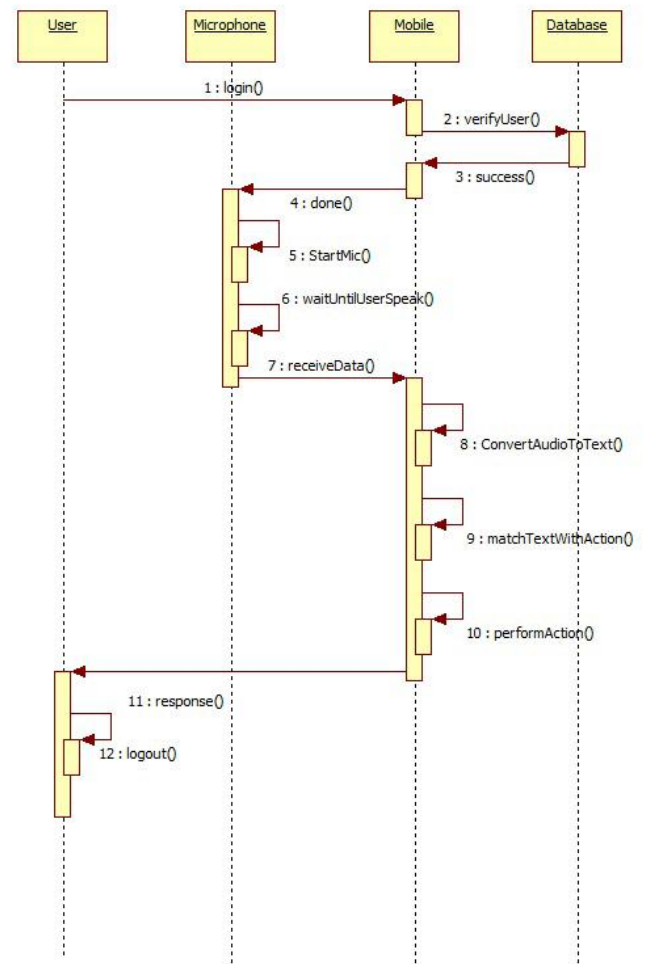


Fig 5.3.1

5.4 Entity Relational Diagram

5.3 Sequence Diagram

Proposed System contains of 2 entities *user* and *action*. User entity consists of following attributes: id, name, address, contact, username, and password. Action entity consists attributes: action_id, action_name, action_status, voice_text, user_id. *Perform* is a relation between user and action this relation defines the set of activities performed.

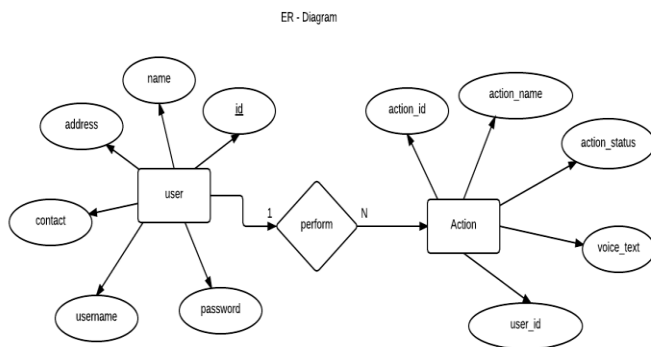


Fig 5.4.1

6. FEASIBILITY AND MATHEMATICAL MODEL

Android Based Smart Voice Assistant: Given a failure case viz. Q, invalid http request detection, or voice command not working, we devise an algorithm for this problem as follows:

For a Problem P1 to be NP-Hard, Satisfiability problem (SAT) must be reducible to P1; SAT P;

Let the propositional formula be: $G = X1 \wedge X2$

Where X1: True if input HTTP Request is invalid

X2: True if Voice Command is not available

Algosati ()

For i: 1 to 2

$Xi = \text{Choice}(\text{True}, \text{False});$

If $G(x1, x2)$ then

Success ();

Else

Failure ();

Therefore, since the problem becomes a decision problem, it is NP. Satisfiability and

Reducibility:

3SAT problem is NP Complete. The system can be reduced to 3SAT problem. A 3SAT problem takes a Boolean formula S that is in CNF in which each clause has exactly three literals. 3SAT is a restricted form of CNF-SAT problem.

X1- Input Voice Handler

X2- Action Performer

X3- TTS Engines = $(x1 \wedge x2 \wedge x3)$

Algosat ()

For i= 1 to 3

$Xi = \text{Choice}(\text{true}, \text{false})$

If $(S(x1, x2, x3) = \text{true})$

Success ()

Else

Failure ()

As it is polynomial time. It is NP-Complete.

7. CONCLUSION

In this paper, we have presented the system designs and use cases of Smart Voice Assistant, a universal voice control assistant on Android operating system. The contributions of Smart Voice Assistant are twofold. First, it is the voice control application that provides enhancements

to all applications running on a mobile system by synthesizing commands set from on-screen context. Secondly, it supports chaining of multiple commands in the

same utterance which enables more natural and seamless interaction experience. Smart Voice Assistant can benefit large number of users with universal eyes free and hands-free voice control of their mobile devices. Its framework may help to shape future voice control devices. Speech recognition technology is a key technology which will provide a new way of human interaction with machine or tools. The advantage of voice commands over multi-touch when interacting with a screen non-visually is that it does not require targets to be located and thus avoids the problems with pointing. It saves time. This system provides the blind people with a function text to speech if they want to receive contents of the document stored in a mobile .Android operating system based robot platform and smart phone operated control and monitoring system are introduced. This provides ease of operation .As the system uses Smart phone so that the accuracy is increased. The Reading of SMS, E-mail, and News can be possible by the blind people also.

8. REFERENCES

- [1] Prof.Rakhi Bhardwaj, Poonam Gupta, PoojaJadhav, BhagyashreeKadam, AmrutaKedari, "Android Based Automated Smart Wheel Chair", International Journal of Innovative Research in Computer and Communication Engineering, vol 4, Issue 3, March 2016.
- [2] Kiran N.V, Madhan Mohan Reddy, Deepika Yadav, Babitha K.M, "Optimal driving system for two wheelers", Proceedings of IRF International Conference, 05th April-2014
- [3] Yu Zhong, T. V. Raman, Casey Burkhardt, FadiBiadsy and Jerrey P. Bigham, "JustSpeak: Enabling Universal Voice Control on Android", April 2014
- [4] NorhazahbtAripin, M. B. Othman, "Voice control of home appliances using Android", Electrical Power, Electronics, Communications, Controls, and Informatics Seminar (EECCIS), 2014
- [5] ArunGopi, Shobana Devi P, Sajini T, Bhadran V K, "Implementation of Malayalam Text to Speech Using Concatenative Based TTS for Android Platform", International Conference on Control Communication and Computing (ICCC), 2013
- [6]ShraddhaUddhavkhadilkar, NarendraWagdarikar, "Android phone controlled Voice Gesture and Touch screen operated Smart Wheelchair", International Conference on Pervasive Computing (ICPC), 2015
- [7] Maya Rida, Michel Nahas, MiladGhantous, "iSee: An Android Application for the Assistance of the Visually Impaired", Springer International Publication, 2014
- [8] Chin-Tuan Tan and Brian C. J. Moore, Perception of nonlinear distortion by hearing impaired people, International Journal of Ideology 2008, Vol. 47, No. 5, Pages 246-256.
- [9] Oberle, S., and Kaelin, A. "Recognition of acoustical alarm signals for the profoundly deaf using hidden Markov models," in IEEE International symposium on Circuits and Systems (Hong Kong), pp. 2285-2288, 1995.
- [10] A. Shawki and Z. J., A smart reconfigurable visual system for the blind, Proceedings of the Tunisian-German Conference on: Smart Systems and Devices, 2001.
- [11] C. M. Higgins and V. Pant, Biomimetic VLSI sensor for visual tracking of small moving targets, IEEE Transactions on Circuits an Systems, vol. 51, pp. 2384–2394, 2004.
- [12] F. Daerden and D. Lefeber, The concept and design of pleated pneumatic artificial muscles. International Journal of Fluid Power, vol. 2, no. 3, 2001, pp. 41–45
- [13] K. R. Castle man, Digital Image Processing, Pearson Education, 1996.
- [14] M. A. Maziddi, AVR micro controller and Embedded Systems, 2008.
- [15] Dongmahn SEO, Suhyun KIM, Gyuwon SONG, Seung-gil, "Speech-to-Text-based Life Log System for Smartphones" , IEEE International Conference on Consumer Electronics (ICCE), 2014
- [16] Kuei-Chun Liu, Ching-Hung Wu, Shau-Yin Tseng, Yin-Te Tsai," Voice Helper: A Mobile Assistive System for Visually Impaired Persons", IEEE International Conference on Computer and Information Technology; Ubiquitous Computing and Communications, Dependable, Autonomic and Secure Computing; Pervasive Intelligence and Computing, 2015

[17] Yu Zhong, T.V. Raman, Casey Burkhardt, Fadi Biadsy and Jeffrey P. Bigham, "JustSpeak: Enabling Universal Voice Control on Android"

[18] Hae-Duck J. Jeong, Sang-Kug Ye, Jiyoung Lim, Ilsun You, and WooSeok Hyun, "A Computer Remote Control System Based on Speech Recognition Technologies of Mobile Devices and Wireless Communication Technologies", *Computer Science and Information Systems* 11(3):1001–1016 DOI: 10.2298/CSIS130915061

[19] SungWook Moon, Young Jin Kim, Ho Jun Myeong, Chang Soo Kim, Nam Ju Cha and Dong Hwan Kim, "Implementation of smartphone environment remote control and monitoring system for Android operating system-based robot platform", *8th International Conference on Ubiquitous Robots and Ambient Intelligence (URAI)*, 2011.