

Consort Chat-Bot for Alzheimer Patients

¹Vaishnavi. N, ¹Vaishnavi. M, ¹Bahjath Zulaiha M. S, ² R. Ahila

¹UG Scholar, Department of CSE, School of Engineering, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, Tamil Nadu, India

²Assistant Professor, Department of CSE, School of Engineering, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, Tamil Nadu, India

ABSTRACT

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Artificial Intelligence (AI) is increasingly being used in various healthcare fields. AI-based chatbot systems can act as automated conversational agents and capable of promoting health by potentially prompting behavior change. Alzheimer's is a chronic neurodegenerative disease, the cause of which is poorly understood. Since there is no known treatment management consists largely of providing a familiar environment for the patient and support for the care givers. In the proposed system, the companion chatbot for Alzheimer's patient has been designed to assist the patients, to manage their daily living by themselves without the guidance from the care takers. The system is also provides the location tracking to monitor the mobility activity of the patient. The primary function of the system is to perform the memory training operation which includes the names and details of known people, places and events which can be created dynamically. The performance log about the patient is maintained in the cloud server which can easily accessed by the physician and caretakers.

Keywords: Artificial Intelligence, Chatbot, Deep Learning, Neural Network, GPS, Speech Recognition

I. INTRODUCTION

Alzheimer's is the most common cause of dementia, a general term for memory loss and other cognitive abilities serious enough to interfere with daily life. Despite that there is no known cure for Alzheimer's, treatment [1] that involves memory practice has been proven to greatly reduce its progression. Memory is the major ability of a human being, which is lost with Dementia. In order to overcome these issues, Consort Chat-Bot [2, 3] has to be designed, to manage their daily living by themselves without the guidance from

the caretakers. Replacing humans are chatbots which are faster and seemingly intelligent. They provide commensurate help to both healthcare professionals and patients. The primary objective of this system is to assist the patients by providing them basic information about their surroundings and events. In addition, it also guides the patient to identify their near and dear ones.

Artificial intelligence is an area of computer Science which means development of machines that works like humans. Artificial intelligence is achieved by analyzing how human brain thinks, learn, decide and

work while trying to solve any problem. AI [6] refers to a computer mimicking “intellectual processes characteristic of humans, such as the ability to reason, discover meaning, generalize, or learn from past experience” to achieve goals without being explicitly programmed for specific action. AI and related technologies are increasingly prevalent in business and society, and are beginning to be applied to healthcare. Artificial intelligence is not one technology, but rather a collection of them. Most of these technologies have immediate relevance to the healthcare field, but the specific processes and tasks they support vary widely.

The deployment of AI in healthcare [7] is extremely promising and although AI is no panacea, harnessing patient data will lead to precision medicine, help detect disease before they manifest and support independent living for the elderly, amongst many other things. However, this progress will not be without challenges from both an ethical and privacy standpoint. These issues need understanding from policy makers and developers alike for AI to be embraced responsibly. The research and development in the field of Artificial intelligence has given rise to chatbots. Chatbot is a software domain in artificial intelligence that deals with the study of creating intelligent and efficient chatbot interface. The power of computer systems has been developed by humans in terms of their diverse working domains and thereby it increases speed, and reduces size.

Service oriented chatbot systems are designed [4] to help users' access information from a website more easily. The system uses natural language responses to deliver the relevant information, acting like a customer service representative. The chatbot is the computer program anybody can talk to with normal language. No matter what type of chatbot it is, they all have a similar purpose -- to take regular human language input, understand what is being said and to provide a relevant, correct answer based on the knowledge it has. Under the categories of

Conversational Chatbots and Button Bots, there are sub-variants of chatbot. Although how they work might change radically, all chatbots have two basic high-level functions: "understanding" and "answering".

The chatbot system primarily uses the Human-machine interaction (HMI) that refers to the communication and interaction [5] between a human and a machine via a user interface. A HMI is a user interface or dashboard that connects a person to a machine, system, or device. While the term can technically be applied to any screen that allows a user to interact with a device, HMI is most commonly used in the context of an industrial process. Although HMI is the most common term for this technology, it is sometimes referred to as Man-Machine Interface (MMI), Operator Interface Terminal (OIT), Local Operator Interface (LOI), or Operator Terminal (OT). HMI and Graphical User Interface (GUI) are similar but not synonymous: GUIs are often leveraged within HMIs for visualization capabilities.

AI provides the various applications in healthcare domain [11, 14] by introducing the various assistive technologies. The companion chatbot has the significant impact in the assistive and interactive computing model which is used to support the patients and healthcare physicians. And also assist the patients by providing them basic information about their surroundings and events. In addition, it also guides the patient to identify their known people, places and events in the proposed system.

II. RELATED WORK

Cloud computing has been empowered with the introduction of Software-Defined Networking (SDN) which enabled dynamic controllability [12] of cloud network infrastructure. Some basic security mechanisms may be sufficient for securing data communication in the community network. For example, asymmetric keys can be assigned to each

gateway by the service provider that offers smart community services. They are used for authentication and negotiating symmetric session keys for data communication [3], and they can be updated on a periodic basis. Since each device gateway is normally a powerful device like a wireless access point, cryptography may be applied as needed during data communication so as to meet the above mentioned security requirements. When representing its members, a device appears to have social needs. If an adversary observer finds that often communicates with a particular device, it may correctly guess the source device's communication purpose with a high probability based on the public information of the social role of the destination device, even if the communication content is hidden by cryptography.

User interface represent the interface [7] to make easy contact with user. While Chatbot is easy to use, at the background it has the complexity to achieve. Most of Chatbots have logs of conversation and the developer use the logs in order to understand user requests. The log is then used to improve the Chatbot conversation. Chatbot works by matching the question from user with the help of machine learning. For instance, if the user question is, "Show me the university list of programs" or "I need the program list", both mean the same thing. The developer need to train the Chatbot to understand both questions by delivering the same output. The Chatbot is being trained through the analysis of thousands of logs from human conversation. If there are more logs, the application [13] will become more intelligent. In order to get best quality of Chatbot conversation, they need to have the richness of vocabulary of conversation among people.

Medical knowledge keeps expanding and healthcare professionals need to be aware of every change. A proper understanding of technology [8] and treatment changes is essential to providing quality care. This becomes important especially when healthcare practitioners are dealing with pregnant

and breastfeeding women. Addressing all these requirements is SafedrugBot, a messaging service that offers assistance to medical practitioners via Telegram, the messaging app. The chatbot helps doctor access right information about drug dosage on the go so that they can guide the patient in the path they must follow. SafedrugBot is a virtual assistant designed to help healthcare professionals in providing valuable guidance and monitoring the health of a woman during breastfeeding. It acts as an assistant that offers medical users the right data through chat. The chatbot is capable of searching through the vast database to find out detailed information on drug guides using search queries based on active ingredient or brand name of the drug in question.

The interaction begins with a text/speech user query, which will be processed by the 'NLU' module. Speech Known [9, 10] as automatic speech recognition (ASR) is one of the core techniques of computational linguistics that develops methodologies that enable the recognition of spoken language into text by computers. This technique can help disabled people who cannot use other devices to interact with chatbots, and it also improves typing speed. 'NLU' module firstly detects the language of the user query. Afterward, it classifies user intents using Support Vector Machine (SVM) and parses the user query's structure by using a specific parser in combination with a regular expression (Regexp).

III. SYSTEM MODEL

3.1 EXISTING SYSTEM

The system is implemented as mobile application. The user interface is used to remind patient about his/her disease. First the user has to register his/her details and has to login in order to use the application. The home page of the application contains entire details of patients that is entered at the time of registration. A reminder is set which tells about patient's disease every morning. When someone

arrives in front of patient and claim as their relative the patient won't be in a state to recognize them. To overcome this problem, fingerprint of close relatives should be stored along with their details in the app along with their face details. When someone arrives, their fingerprint must be provided as input to the application so that it will display their complete details which are fed previously which is stored in the database. The database which we are using is SQLite database and the storage capacity depends on android phone's storage.

The patient can store details till the memory of android phone reaches its maximum limit. The patient could identify the person after taking a glance at the details produced by chatbot. Chatbot also keeps track of patient's location. Due to decline in memory the patient is unable to remember their own name and their state of suffering from Alzheimer's. Reminder is set so that the patient is able to remember their state of being suffered from the disease. Reminder utters the details that are displayed in the home page. The details include patient's name, company, designation, home address and the disease they are suffering from. Application also monitors patient's location. When the patient crosses the Geofence message will be automatically sent to their relative or caretaker's phone. The message will be in the form of link which contains latitude and longitude of patient as parameters. The link will be redirected to Google maps which will show the patient's current location.

3.2 PROPOSED SYSTEM

The proposed system is exclusively designed for the early stages of Alzheimer. For every 15 min, it gives a remainder regarding the disease and once own name fed in the system. It helps the patient to socialize, like a normal person. In addition it also provides memory exercise, related to the names and details of loved ones, recent events and recently visited locations, which would be monitored by physicians and relatives. It also helps the patient to track their way

back to home. The Artificial Intelligence approach is based on the utilization of basic knowledge sources such as the knowledge of sounds spoken on basis of spectral measurements, knowledge of proper meaningful and syntactical words. From the technology perspective, speech recognition has a long history with several waves of major innovations. Most recently, the field has benefited from advances in deep learning and big data. In this work speech recognition system is used to create a command platform to operate the mobile and in the application context, email generation and sending system is developed.

The proposed system primarily designed to assist the dementia patients by providing the training process which will increase their memory performance. The system also performs the analysis and review process based on the training provided to the patient and the corresponding response received from the patient. The memory exercise includes the training regarding the names and details of loved ones, recent events and recently visited locations in text as well as in visual representations. Based on the analysis, the chatbot system generates the report which illustrates the memory level of the patient periodically. And also the system can able to provide the location guidance to the patients in voice notes, if the patient roams/moves outside of their home location. The location guidance system also notifies the caretaker regarding the present location of the dementia patient.

IV. SYSTEM IMPLEMENTATION

4.1 CHATBOT DESIGN

Interactive computing, with wirelessly connected embedded devices that are being used in various day-to-day activities, are changing and improving the standards of the quality of life. Based on this interactive computing and communication technologies, many devices/products are now emerging and with this multimedia intelligence it is providing comfortable, secure and convenient

personal services everywhere and making a lot of users comfortable. The primary operation of the system is drawn from the objective to conclusion which is used to assist or guides the Alzheimer patients by performing the memory training operations. It collects the significant and sensitive information about the patients which are collectively applied in the memory exercise. The system is mainly evidenced the performances throughout the operations including the authentication, delegation and memory scoring process. And also the chatbot accurately provides the changes in the location which is iteratively validated by checking the location continuously.

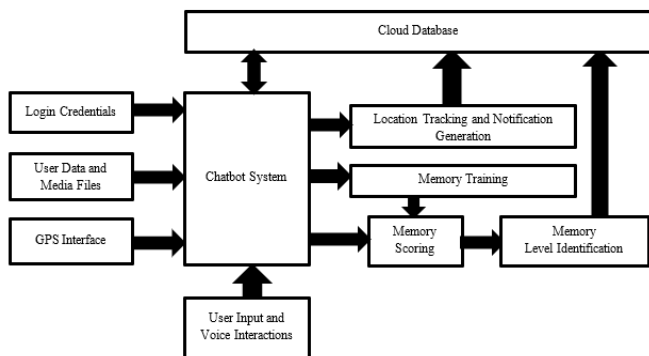


Figure 1 Block Diagram

The client sends the query to the server. Based on the query the server sends the corresponding file to the client. Before this process, the client authorization step is involved. In the server side, it checks the client name and its password for security process. If it is satisfied and then received the queries form the client and search the corresponding files in the database. Finally, find that file and send to the client.

4.2 DATA ACCESS

Cloud data storage, a user stores his data through a CSP into a set of cloud servers, which are running in a simultaneous, the user interacts with the cloud servers via CSP to access or retrieve his data. In some cases, the user may need to perform block level operations on his data. Users should be equipped with security means so that they can make continuous correctness assurance of their stored data even

without the existence of local copies. In case that users do not necessarily have the time, feasibility or resources to monitor their data, they can delegate the tasks to an optional trusted TPA of their respective choices. In our model, we assume that the point-to-point communication channels between each cloud server and the user is authenticated and reliable.

The Authentication Server (AS) functions as any AS would with a few additional behaviors added to the typical client-authentication protocol. The first addition is the sending of the client authentication information to the masquerading router. The AS in this model also functions as a ticketing authority, controlling permissions on the application network. The other optional function that should be supported by the AS is the updating of client lists, causing a reduction in authentication time or even the removal of the client as a valid client depending upon the request.

When client wishes to retrieve the information he/she accesses the data server through a web based interface. The server either sends the files back to the client or allows the client to access and manipulate the files on the server itself. Before initiating data access, user registration is performed to provide authorization. During registration process, unique id is generated from system to every registered user. And the user entry is created in cloud data base to establish authorized access to data. Cloud data storage, a user stores the data through a Cloud Service Providers (CSP) into a set of cloud servers, which are running in a simultaneous, the user interacts with the cloud servers via CSP to access or retrieve his data. In some cases, the user may need to perform block level operations on his data users should be equipped with security means so that they can make continuous correctness assurance of their stored data even without the existence of local copies.

Once the cloud is configured, then the user API is used to create the access for mobile interface. In mobile interface, Jsh (Java Secured Channel) is

created to connect with the cloud. Jsh connection is established IP address, Device Id and corresponding credentials using the wifi interconnection model. The credential server is responsible for retrieving and storing the user information and their memory state. In the Alzheimer monitoring system, the session management system lies in the critical connection and the corresponding requests validation process which needs to reliably perform its tasks in near real-time without substantial overhead in the communication process. The credential data server holds the information about the user and their memory details are maintained in the database.

4.3 SPEECH RECOGNITION AND DEEP LEARNING

An improved speech recognition system for analyzing an input signal to recognize the speech contained within the signal and output an accepted and recognized text signal, comprising: A first speech recognition engine receptive of the input signal, performing speech recognition processing, and supplying a recognized-text output signal which represents in textual form the speech recognized in the input signal. A second speech recognition engine receptive of the input signal, performing speech recognition processing, and supplying a recognized-text output signal which represents in textual form the speech recognized in the input signal; and A comparator receptive of the recognized-text output signals from the first and second speech recognition engines and supplying the accepted and recognized text output signal based upon the comparison of the recognized-text output signals, the accepted and recognized text output signal representing in textual form the speech recognized in the input signal and accepted by the computer.

The deep neural network is created and developed as the component vector to design the deep learning structure with the Restricted Boltzmann Machine (RBM) learning machine. The RBM based hidden layer is gradual develops the learning process and

employs the adaptation model with the assistance of the perception in the learning process. This model accumulates the formation of the hypothetical situation handling capacity to the hidden layer of the deep learning structure.

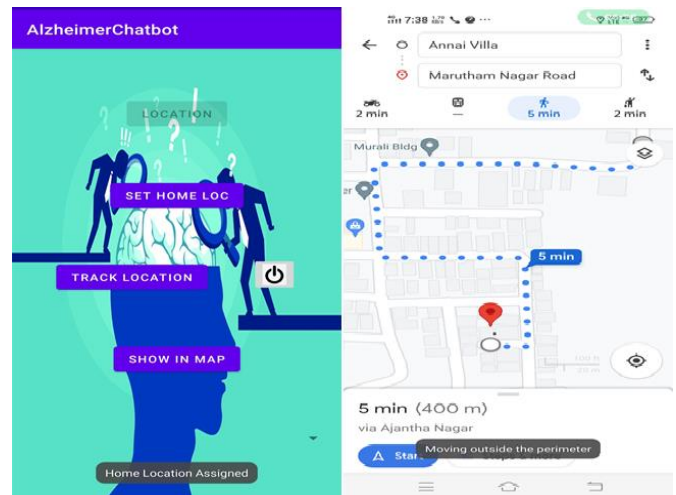


Figure 2. Chat bot Interface and Location Tracking

V. CONCLUSION

AI simplifies the lives of patients, doctors and hospital administrators by performing tasks that are typically done by humans, but in less time and at a fraction of the cost. The proposed work mainly focused on patients suffering from the initial stages of Alzheimer. Companion Chabot is one such application built to assist the patient and to maintain their social life without the help of any caretaker. This application helps the patient to lead a normal life just like any other normal person. It mainly focuses on tracking the location of the patients and providing the notification to the caretaker. The various levels of dementia are learned with the acknowledged memory exercise treatment using the consort chatbot interface by applying the memory training and scoring operations. In future the chatbot can be developed, with health concern feature, which collects the details of symptoms from the patient, to perform the initial diagnosis process. Further it can be integrated with the specialized

hardware based chatbot such as Alexa, Google Nest to improve the Human Machine Interaction process.

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