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CARING COMPANION: EMPOWERING ALZHEIMER PATIENT WITH ASSISTANCE

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Abstract: This innovative system represents a paradigm shift in Alzheimer's patient care by seamlessly integrating cutting-edge technologies. The GPS enabled tracker assists patients in locating their daily essentials efficiently. The Smart Medicine Dispenser leverages IoT powered dispenser using Raspberry Pi to ensure the timely administration of medications. Automated alerts for missed doses not only promote medication adherence but also contribute to the effective management of chronic conditions, enhancing overall healthcare outcomes for Alzheimer's patients. The integration of AI based Virtual Assistants and Chatbots powered by artificial intelligence adds a layer of support by offering basic information and reminders. This not only aids in daily tasks but alsoserves as a communication bridge, potentially mitigating the impact of cognitive decline on patient engagement. By ensuring a constant awareness of the patient's location, this system contributes significantly to the overall well-being and security of individuals affected by Alzheimer's. In summary, this comprehensive system goes beyond traditional approaches, leveraging the synergy of IoT and AI to create a holistic solution for Alzheimer's patient care, addressing cognitive, medical, and safety aspects with a focuson improving both patient and caregiver experiences.

Index Terms **– Raspberry pi kit, AI voice assistant module**

I. INTRODUCTION

I.1 Background

Alzheimer is a progressive disease that destroys memory and other important mental functions. Brain cell connections and the cells themselves degenerate and die, eventually destroying memory and other important mental functions, so they need someone to take care of the individual. It poses significant challenges for both individuals diagnosed and their dedicated caregivers. This project proposes a assistive device which will be helpful for both the patient and caregiver. This project explores how IoT and AI-driven solutions can revolutionize Alzheimer's patient care, offering a more sustainable and enriching life for those affected by this debilitating disease.

I.2 NLP Algorithm

Natural Language Processing (NLP) is a branch of AI that focuses on developing computer algorithms to understand and process natural language. It allows computers to understand human written and spoken language to analyse text, extract meaning, recognize patterns, and generate new text content. NLP algorithms have a variety of uses. Basically, they allow developers and businesses to create a software that understands human language. Due to the complicated nature of human language, NLP can be difficult to learn and implement correctly. Natural language processing (NLP) is a machine learning technology that gives computers the ability to interpret, manipulate, and comprehend human language. NLP enables voice assistants to understand the intention behind a user’s query or request. This allows them to provide accurate responses and relevant information, reducing the need for human intervention.

II. LITERATURE REVIEW

[5] This "Automatic Medicine Dispenser using IOT": Merits of the proposed system include improved medication assistance, capability in dispensing both solid and liquid medication, integration with mobile application enabling Medicare for remote controland monitoring, an added notification system for both caregiver and patient in case of missed medicine intake, emphasis on cost-effectiveness for accessibility to larger people. Limitations of the proposed system include increased dependency on technology, potentially challenging for elderly users, need for consistent internet connectivity IoT gateway - firebase, problems of using of the touchscreen interface on the mobile application lack of steps on maintenance and durability aspects, success barriers on user acceptance and adoption of technology driven medication management [3]. [2] "Design and Implementation of Smart Voice Assistant and Recognizing Academic Words": Merits of the proposed system include psychological support services, image classification with Convolutional neural network, location tracking for monitoring, steganography for image security, communication via voice messages, integration with google assistant, effectiveness in image detection. Limitations of the proposedsystem include limited scope (mild and moderate ad), dependency on technology, privacy concerns, generalizability not discussed,incomplete development details, ethical considerations not explored [2]. [1] " Secure IOT Assistant- Based System for Alzheimer'sDisease": Merits of the proposed system include virtual assistant integration (Alice), comprehensive approach hot word detection,voice to text conversion, intent recognition, text to voice conversion, Linux and python integration for flexibility communication with IoT devices, speech recognition system using Ann, mfcc feature extraction technique, comparison of training algorithms (lm and bgfs quasi-newton resilient backpropagation). Limitations of the proposed system include limited scope discussion, dependencyon external accounts (wit, wolfram alpha, snow boy), confidence-based interaction challenges, specific Linux operating system requirement limited discussion on user interaction, external Api dependence [1] . [4] "A Review and Analysis of Mobile Health Applications for Alzheimer Patients and Caregivers": Merits of the proposed system include a collection of over 60 prevailing mobile applications build for assistance, the extraction of important features from each of those applications like learning and caregiving, medicine dispenser or the pill box, schedule for performing daily activities, doctor remote monitoring in the form of doctor dairy which is accessible for the clinician. Limitations of the proposed system include availability of merely 5 applications which possess the necessary set of features for both caregivers and patients, although the required features were prevalent there frequency in each of the applications was limited, not cost effective.

III. SYSTEM OVERVIEW

The design, development, and assessment of assistive technology for those with special needs, the blind, the elderly, and Alzheimer's patients have been the subject of extensive research [6]– [9]. This section will provide a quick overview of some research that is focused on creating assistive tools for people with Alzheimer's. There were just a few papers written about software systemsand mobile applications. Yamagat et al.'s study from [10] demonstrated how Alzheimer's sufferers could benefit from having theirfavourite music and family photos displayed on tablets and iPads, as this would aid with their memory. Armstrong et al. [11] described in a different study the explicit and implicit methods that can be used to provide care to Alzheimer's patients utilizing touch screens,motion sensors, voice recognition, and smartphone buttons. Similar to this, in [9], Donnelly et al. created a smartphone applicationto offer mild AD patients a virtual carer who would frequently deliver memory cues through video reminders. In [11], a medicationdispensing system is suggested that would notify a carer if the patient did not take their medication at the scheduled time and wouldremind them to do so Did they take the medication or not? A few more studies talked about smart medication systems thatcould be helpful for individuals who need to take their medications frequently. Medication would be administered by these devicesat the appropriate intervals and in the correct chronological order.

Sr.No	Module	Components
1	Smart Medicine Dispenser	Raspberry Pi , Servo motor, wires, batteries, power source
2	Lost Item Tracker	Raspberry Pi, Battery, Piezo buzzer
3	AI Assistance	NLP
4	Patient In home tracker	GPS tracker, Batteries, Raspberry Pi

Tabel 1: List of Components

IV. METHODOLOGY

The proposed system aims to revolutionize Alzheimer's patient care by utilizing cutting-edge IoT and AI technologies.

MAIN FUNCTIONAL MODULES

1. Lost Item Finder
2. Smart Medicine Box
3. AI Assistance
4. User Interface

The four separate modules put the Alzheimer's patients in a system environment where their health and medicines are monitored, they can readily locate missing objects, and their whereabouts can be traced. IoT Devices: Raspberry Pi is used to build a smart medicine dispenser and lost item tracker[11]. Communication Layer: Device Connectivity: Establish a secure communication channel between IoT devices and the central system. Cloud-based Backend: Data Processing: Implement a cloud-based backend for processing and storing data from IoT devices. Employ edge computing for real-time data analysis. Database: Store patient data, historical records,

and AI-generated insights in a secure and scalable database. User Interface (UI): Web/Mobile Application: Develop a user-friendly interface accessible through web and mobile applications. Include dashboards for caregivers and patients to configuresettings, receive alerts, and view analytics. Alert and Notification System: Emergency Response: Implement a robust alert system tonotify caregivers, family members, and emergency services in case of emergencies. Differentiate between normal alerts (medicationreminders) and critical alerts (emergency situations). g) Communication Platform :Integrate a communication platform for video calls and messaging between caregivers, patients, and family members. Ensure the platform is easy to use and supports various devices.

Hardware Components

1. Raspberry Pi
2. Servo Motors
3. Bread Board
4. Connecting wires
5. Piezo Buzzer
6. Box

IoT Devices: • Connectivity modules (Wi-Fi, Bluetooth, etc.) for communication between devices.

Software Components:

1. Operating System (OS): Raspbian OS for Raspberry Pi, providing the platform for software applications.
2. Virtual Assistants or Chatbots: Software for providing patients with information and reminders.
3. Web Interface: Application for caregivers to monitor and interact with the system remotely.
4. Database Management System (DBMS): Software for efficient storage and retrieval of patient information and history.

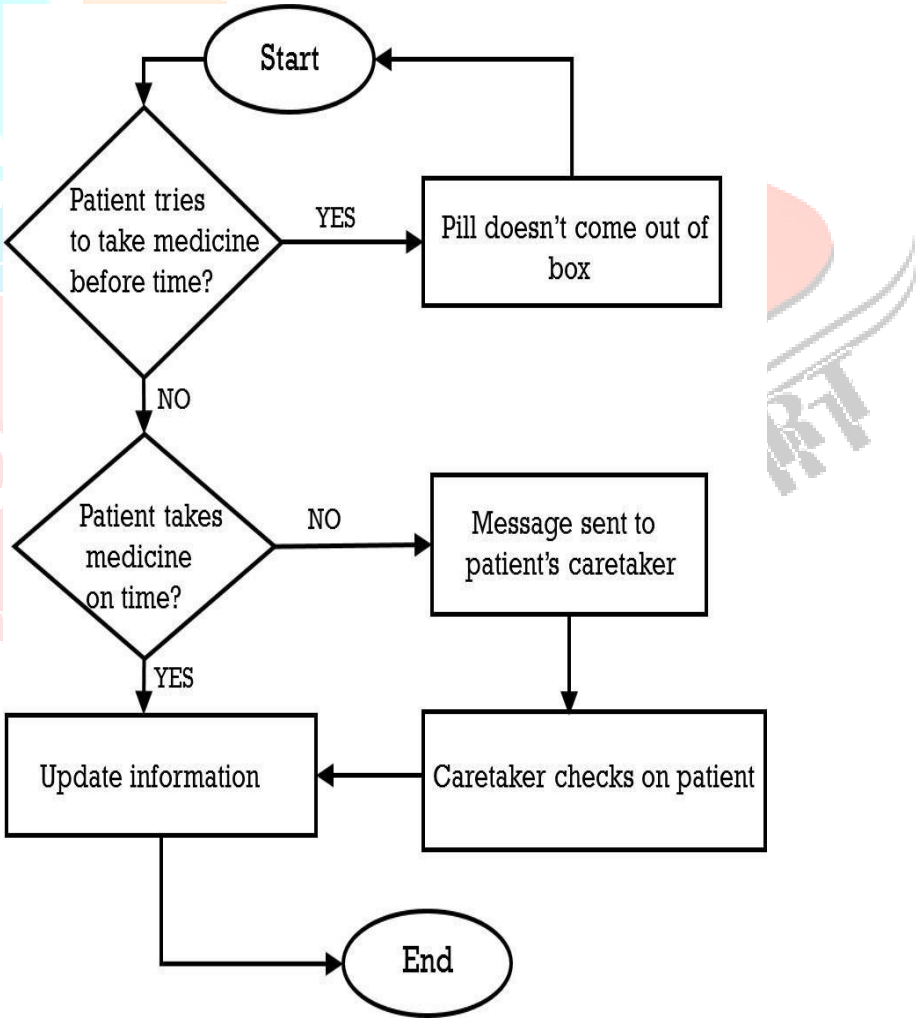

Fig 1: Smart Medicine dispenser

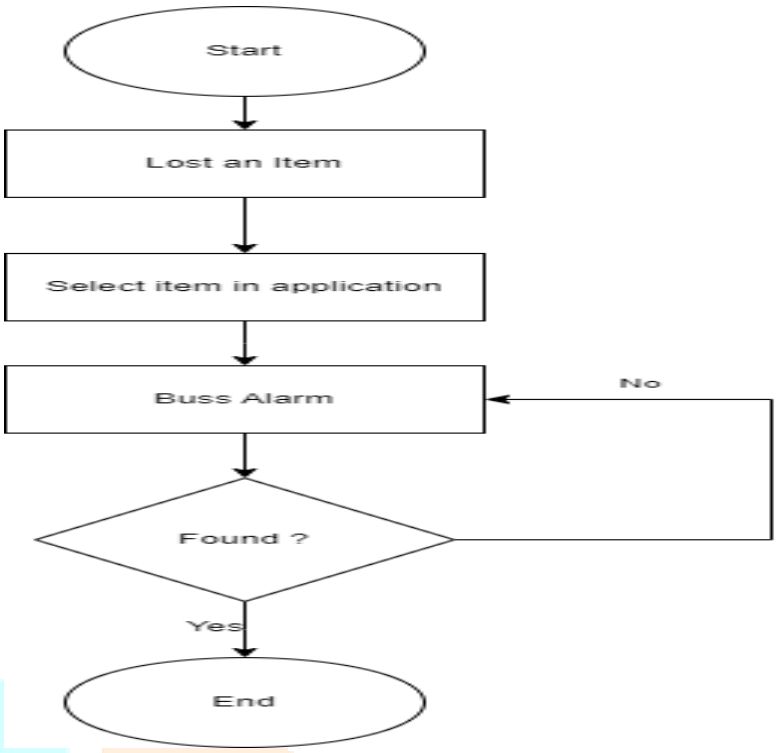

Fig 2: Lost Item Finder

V. APPLICATIONS

Health Monitoring Integration: Integration with health monitoring devices for comprehensive data. Machine Learning: Implementation for behavior analysis and proactive assistance. Wearable Technology: Inclusion of wearables for continuous monitoring. GPS Improvements: Advancements for better location tracking accuracy. Community Integration: Features supporting community engagement for caregivers. Continuous User Feedback: Iterative design updates based on user feedback. Healthcare Professional Collaboration: Collaboration for comprehensive healthcare. Enhancing Quality of Life: Technology offers innovative solutions to alleviate daily challenges faced by Alzheimer's patients, promoting independence and comfort. Providing Caregiver Support: Empowering caregivers with tools to monitor and assist patients more effectively, leading to improved well-being for both parties.

VI. CONCLUSIONS

Assistive tool was designed and developed for Alzheimer's patients. In respect to the earlier works, this proposed system contributed in two folds: firstly, several features are integrated in a single system, and secondly, a mobile application was developed to utilize those features effectively from a single platform. Thus the proposed system provides an integrated round the clock service to the patients both in home and outdoor. Alzheimer's patients and the caregivers of patients will be greatly benefited from the system, since the system will provide support for constant monitoring, provide assistance for taking medicine, look after the heart condition of the patient, and help to find patient's belongings whenever needed

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