Navigating alzheimers and dementia care: GPS integration in denture and splints for enhanced patient safety

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***Abstract*—Alzheimer's disease and other forms of dementia often lead to disorientation, memory loss, and wandering behavior, posing serious safety risks for patients. Traditional tracking methods, such as wearable GPS devices, are frequently removed or forgotten by patients, limiting their effectiveness. The Global Position System (GPS) trackers are attached to dentures and the movements are observed through a mobile application. This technique discusses on a simple method of tracking Alzheimer's edentulous patients with the support of removable dentures. By leveraging commonly used dental devices as smart tracking tools, this approach aims to redefine safety protocols and improve the quality of life for individuals living with cognitive impairments.**

***Index Terms*—Alzheimer's disease, Dementia care, GPS tracking, Patient safety.**

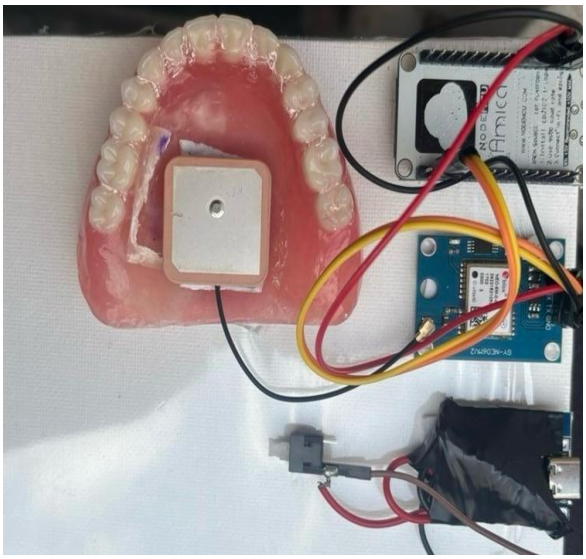
I. INTRODUCTION

Alzheimer's disease accounts for 60%–80% of dementia patients. Attempts were made across the world to discover the methods to prevent its development, hinder the onset, and to treat the disease. The treatment procedures cannot prevent dementia but it can reduce the progress of symptoms. Among the issues of dementia, there are possibilities of losing the patients due to disorientation and wandering. This is a serious problem to the caregivers. Many methods were studied and suggested to overcome this limitation [1]. The World Health Organization and the National Institute on Aging-related tooth loss as a risk factor for Alzheimer's disease. Alzheimer's patients are mostly associated with teeth loss and required prostheses to improve their oral function and quality of life [2]. While population aging signifies enhanced healthcare and quality of life, it also presents significant social challenges. Aging individuals require more medical and long-term care services, placing added strain on social security systems [3].

Attaching a tracker to the dentures and tracing the patients through the Global Position System (GPS) modules can be helpful to the care providers. With the advances in technology, the caregivers can be provided with easy and economic options in tracking these patients. Many mobile devices and techniques operating through GPS were designed [4]. Major issues existing in costing and devices may not be used by the patients [5]. GPS trackers attached to the denture are simple, economic, and convenient to use for the patient. It provides required support to the caregivers in tracking the patients and improves the oral health quality of life [1].

II. PROCEDURE

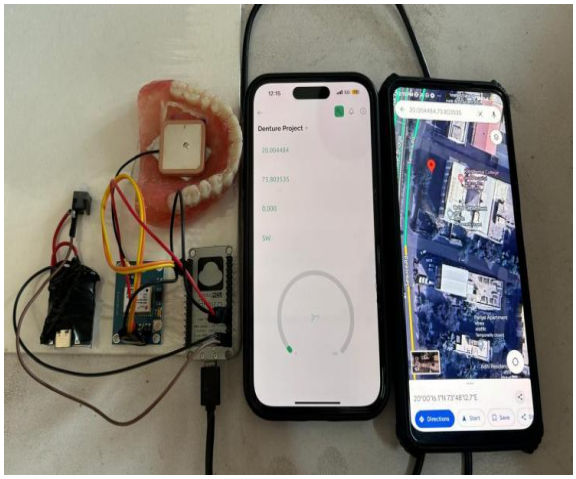
The denture used for the procedure is fabricated by conventional method. The assembly consist of four parts: antenna, GPS module, Battery, Microcontroller. [fig 1]



[fig1]

The antenna is attached to the palatal surface of denture. It receives radio signals from GPS satellites at various frequencies. The GPS module used is NEO 6M GPS module. This module starts to blink red light as soon as the antenna receives radio signals from the satellites. Battery is used for the main power supply. Microcontroller is considered as brain of GPS module as it converts radio signals into information.

As the Antenna receives radio signals from GPS satellite, the GPS module gets activated and starts to blink, Microcontroller processes radio signals into information. Module is connected to BLINK IOT app which receives longitude and latitude coordinates. These Coordinates are placed on GOOGLE MAPS to track location. [fig 2]



[fig 2]

III. DISCUSSION

A GPS tracker device is designed to be attached to the maxillary or mandibular denture. The signals sent by the tracker will be received and decoded through the mobile phones. The tracker design works with Android, iPhone, and other applications. The device shall send information on location, speed through the established free mapping systems available on the phone networks.

establishing the contact of wandering Alzheimer's patients. It can improve the quality of life and care both to the patient and caregiver. Many GPS tracking devices such as pocket tracking devices, clothing attachments, and wearable – bracelets, watches, necklaces, and pendants are commercially available; the use of sensor trackers in dentures is simple, novel, and effective approach in edentulous or partially edentulous patients [4]. The technique can be employed in situations where the dentures are fabricated in edentulous patients or in palatal plates for dentulous Alzheimer's patients. It is comparatively economical with the use of open-source platforms. The thought and technique can be used with extensive modifications to benefit the needy. In addition, since the device is attached to the denture, there are lesser chances to forget or lose it in Alzheimer's patients

The technique described is a prototype and it is quite bulky; it can be converted to micro set up if microchip from microcontroller is placed into denture with antenna and battery placed extraorally. Same set up with GSM SIM module instead of WI-FI module is available but due to harmful radio waves, it cannot be indicated for patients with dementia.

IV. CONCLUSION

The technique described provides a simplified approach to track edentulous patients with Alzheimer's disease.

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REFERENCES

[1] Chander NG, Reddy DV. Denture tracker for edentulous Alzheimer's patients. J Indian Prosthodont Soc 2023; 23:96-8
[2] Fang WL, Jiang MJ, Gu BB, Wei YM, Fan SN, Liao W, et al. Tooth loss as a risk factor for dementia: Systematic review and meta-analysis of 21 observational studies. BMC Psychiatry 2018; 18:345.
[3] D. Stuckler, Milbank Q. 2008, 86, 273.
[4] Petonito G, Muschert GW, Carr DC, Kinney JM, Robbins EJ, Brown JS. Programs to locate missing and critically wandering elders: A critical review and a call for multiphasic evaluation. Gerontologist 2013; 53:17-25.
[5] Gergerich E, Davis L. Silver alerts: A notification system for communities with missing adults. J Gerontol Soc Work 2017; 60:232-44.