

Assisting Technologies for Alzheimer's Patients And Caretakers

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Abstract—In this paper, we propose an idea to assist the Alzheimer's patient in order to conduct their day to day activities easily. Alzheimer's is a type of dementia that causes problems with memory, thinking and behavior. New technologies can help ease anxiety, establish routine, and improve the quality of life for everyone involved. This kind of technology is called "assistive technology" and can promote independence and autonomy, manage potential safety risks around the home and reduce stress.

I. INTRODUCTION

Alzheimer's disease is an irreversible, progressive brain disorder which slowly destroys memory and thinking skills, and eventually the ability to carry out the simplest tasks. Alzheimer's disease is currently ranked as the sixth leading cause of death in the United States, but recent estimates indicate that the disorder may rank third, just behind heart disease and cancer, as a cause of death for older people. The statistics from India are alarming, a total of 3.7 million people in India are suffering from Alzheimer's disease, the most common form of dementia, and related disorders, and the figure is likely to double by 2030, according to health experts.

Alzheimer's is the most common cause of dementia among older adults. Dementia is the loss of cognitive functioning—thinking, remembering, and reasoning—and behavioral abilities to such an extent that it interferes with a person's daily life and activities. Dementia ranges in severity from the mildest stage, when it is just beginning to affect a person's functioning, to the most severe stage, when the person must depend completely on others for basic activities of daily living. [1]

Technology needs to be developed to assist early and middle stage Alzheimer's patients and their caretakers. Technology can be used to solve these, for example, the forgetfulness of an early to mid-stage Alzheimer's patient can be countered by audio-visually reminding them of their day-to-day tasks. Also, any insalubrious activity resulting from the hallucinations and delusions can be greatly reduced by keeping track of their location and pulse rate.

II. LITERATURE REVIEW

According to the India Ageing Report 2017, the elderly population, which is growing at a faster rate of three percent, may up the burden of Alzheimer's in India, as the disease primarily occurs in patients over the age of 60.

Age Group	Relative Changes in AD for 1990 to 2000	Relative Changes in AD for 2000 to 2010	Relative Change in Dementia for 1990 to 2000	Relative Change in Dementia for 2000 to 2010
55-59	42.86	15.00	17.02	23.64
60-64	35.76	22.77	15.96	23.85
65-69	44.74	15.45	16.11	23.44
70-74	44.51	15.19	16.57	23.00
75-79	44.85	15.48	16.55	23.19
80-84	44.64	15.49	16.49	23.25
85-89	44.63	15.59	16.53	23.20
90-94	44.61	15.54	16.47	23.20
95-99	44.63	15.54	16.47	23.21

Table 1: Relative change in the Prevalence rate of AD and Dementia in India[2]

Place	India Urban	India Rural
N	75	108
Govt. or Occupational Pension	13.3	26.9
Income from family %	28	44.4
Disability pension %	27	0
Food insecurity%	28	17.6
Living alone %	4	15.1
Living with spouse only	13.3	5.7
No children %	5.3	8.3
No children within 50 miles %	0	2.6

Table 2: Family and financial support for people with dementia.[3]

III. TECHNOLOGIES AVAILABLE

1. Clocks for Dementia

Alzheimer's patients lose the ability to recognize what time it is and whether its night or day. These clocks help reduce anxiety and ease the worry of missing an appointment or any other key event.

a. Wall Flip Clock w/ Day & Date | Wood Trim

A day and date clock allow people to know the day and time without looking at a calendar, adding much-needed structure and predictability to a patient's life. [4]



2. Location Detectors

Wandering is the single most critical worry for a caregiver. Those suffering from Alzheimer's, other forms of dementia and memory loss have a tendency to wonder whether they are at home or in unfamiliar surroundings. They are trying to make sense of the world they find themselves in at that moment. Patients will sometimes leave clues that they are about to wander by announcing that it is time to go home, when in fact they are home. They may get dressed to go to work when they stopped working long ago. Their past memories are now present. Without warning, they may start to wander into forbidden or dangerous areas within their own home - and locked doors could just make a wandering situation more severe.[5]



a. Freedom GPS Locator Watch - Lok8u

Freedom, a GPS Tracker for the elderly, is a Wandering Tracking and Emergency Alert Watch. It is the

ONLY wandering locator watch using RF (radio frequency), GPS, and GSM (cellular network) technology to communicate position data.[6]

b. Motion Detector with Remote Alarm

The remote alarm comes with a high-performance transmitter and receiver set that can be customized to monitor a room or selected area in your home, depending on your individual requirements.

c. GPS Tracker Watch for Elderly - Theora Care

The Theora Care™ remote monitoring system provides a complete personal tracking device solution to keep caregivers and their care recipients connected, informed and communicating. Theora Connect™ combines a watch, pre-activated cell phone, two-way voice interface (no button pushing required) and a GPS personal tracker in an attractive wristwatch which provides direct communications for enhanced peace of mind for caregivers and their care recipients.[5]

d. GPS Locator Watch | TRiLOC GPS Watch

Wearable like a watch, TRiLOC™ incorporates 2G/3G/HSPA+ cellular, GPS and Bluetooth 4.0 technologies. TRiLOC™ includes a GPS, lockable clasp, SOS button with two-way hands-free voice, multiple ge-fencing and true fall detection. The TRiLOC™ takes 1.5 hours to charge and operates for over 48 hours per charge. Monitoring intervals can be set for one (1) minute (emergency), ten (10) minute and one (1) hour intervals. The watch face is approx. 2" x 2", the display is 1" W x 5/8"H and lightweight at only 3.1 oz.[7]

e. Bed Alarm – Safe Wander +Gateway

It consists of a tiny Button Sensor worn by your patient, a Gateway plugged near his/her bed, and a mobile device App, the Safe Wander™ system sends a beeping alert to your mobile device as soon as the sensor detects your patient getting up.

3. Reminders

Since the patient has a serious issue of forgetfulness, he is not able to remember his medications and the time at which the medicines have to be consumed. He might take the medicines repeatedly or not at all. The caretaker needs to be alert in such a case. In order to make the patient self-dependent, and in the case of multiple caretakers, medication reminders are necessary.

a. Emergency Medical Alert Bracelet

It uses Next Generation patent-pending data platform system offering among the highest levels of privacy and security. It allows secure instant access anywhere anytime Patient medical profile information can be displayed in up to six native languages. Emergency alert email notifications with GPS or Internet Protocol (IP) location can be sent to up to six contacts; parents, guardians, caregivers, doctors or others. Tools allow for management of multiple profiles for a family, senior center or nursing home. It stores important ID and model information about your medical devices (ex: stents, pacemakers, replacement joints, etc.). No batteries required

b. Reminder Rosie Voice Controlled - Medication Alarm Clock

Reminder Rosie allows the caregiver to record up to 25 reminders at a time. The reminder keeps being repeated

intermittently for up to 30 minutes. This voice recording device must be plugged in but does have back up batteries so it can temporarily keep working during a power failure and not lose the recordings.

4. Emergency contact

Community alarm – This is a pendant worn by the person that they press if they become worried or if there is an incident

IV. COMPARISON

A. Based on features

Devices/ Features	Lok8u	Theora Care	TriLOC	Proposed Methodology
Proximity Detection	✓			✓
GPS Tracking	✓	✓	✓	✓
GSM Communication	✓	✓		✓
Device Detach Alert			✓	✓

B. Based on Parameters

1. Freedom 0920 by Lok8u

a. Technology

Creates an RF proximity zone around the portable receiver of 35 yards indoors, 85 yards outdoors. Becomes a GSM/GPS device outside the proximity zone, ensuring location tracking.

b. Cost

Contract needed. Currently unavailable (Was Rs. 3500 per month converted when last available) (\$50)

c. Limitations

Extremely cost prohibitive

2. Theoracare by Clairvoyant Networks

a. Technology

Provides a combination of GPS tracking, two-way SOS communication and text alerts for the caregiver. This device is based on all-digital phase-locked-loop (ADPLL)

b. Cost

The basic combination of software and hardware costs Rs.14000 converted (\$200)

c. Limitations

Lack of proximity detection makes indoor patient tracking difficult

Does not monitor Vital Signs

3. TriLOC by Safetracks

a. Technology

This provides GPS tracking and device detachment detection

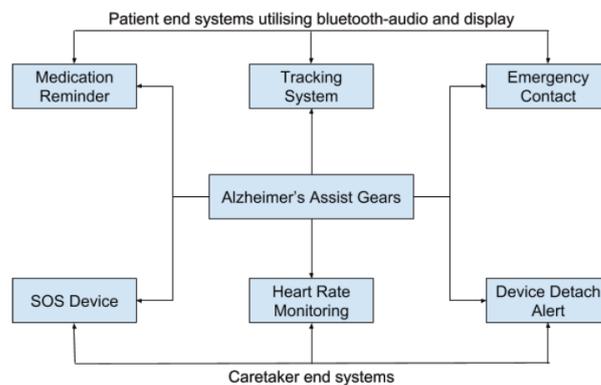
b. Cost

Rs. 25000 converted (\$350) + Monthly subscription of Rs. 2750 converted (\$40)

c. Limitations

No method for a patient to communicate with the caretaker.

V. PROPOSED METHODOLOGY



1. Medication Reminder

This proposes a design of a medication reminder which specifically targeting a wider population of elderly users.

2. Tracking System

A GPS based tracking system is proposed which keeps track of the location of the patient.

3. Emergency Contact

The emergency contact will be displayed on the screen.

4. SOS Device

This device is based on all-digital phase-locked-loop (ADPLL). A wake-up mode is implemented for low power consumption.

5. Heart Rate Monitoring

A Heart Beat (HB) sensor is being developed for acquainting the input signals using Light Dependent Resistance (LDR) and Light Emitting Diode (LED).

6. Device Detach Alert

It will give an alert when the device is removed from the patient's hand.

VI. CONCLUSION

All the available technologies for Alzheimer's patients like clocks, location detectors, medication reminders, and other assistive technologies are available separately and no device which collectively has all these facilities is available. In order to make the life of the patient as well as caretakers easy, a device that has all these features needs to be incorporated. Also buying separate devices for different purposes is cost inefficient.

VII. REFERENCES

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