Survey on Tracking of Dementia Patients Based on Diverse Methods

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Abstract

One of the common problems face by elderly people is Dementia, and the people affected by this Disease is escalating as compared to the past. People suffering from Dementia and Alzheimer's face many challenges in their day to day routine and their families and caretakers face major difficulty to monitor them. The Dementia patient has symptoms like loss of memory, change in behavior, and change in character, forgets to do their everyday tasks and forgets their environment and they will not even respond to their name being called. This survey mainly focuses on the methods and techniques used for monitoring Dementia Patients. This paper includes a survey on how the different types of methods are used to monitor Dementia patients. This paper also includes the location tracking of the Dementia Patients if they are lost, and using different techniques like Bluetooth device, GPS, Hardware Devices using which the patients can be tracked, So that the patient can be tracked quickly and safely. There are many devices available to monitor the Dementia and Alzheimer's disease and this paper includes the different types of devices, algorithms and techniques used for monitoring the patients.

Keyword- Dementia Patient Monitoring, Location Tracking, GPS, Hardware devices

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I. INTRODUCTION

One of the major health problems of elderly people is Dementia. Dementia is a disease which majorly affects the brain of the people, and their behavior. Many disease causes dementia in human it includes Alzheimer's disease and it can also result from accidents or stroke. People affected by Dementia may not be able to perform their daily activities as well as they will forget everything. As the Population of the world increases so the diseases and the people must face many challenges regards to the Healthcare. Caring for a loved one with dementia poses many challenges for families and caregivers. People with dementia from conditions such as Alzheimer's and related diseases have a progressive brain disorder that makes it more and more difficult for them to remember things, think clearly, communicate with others, or take care of themselves. In addition, dementia can cause mood swings and even change a person's personality and behavior. Communication difficulties can be one of the most upsetting aspects of caring for someone with Alzheimer's or some other type of dementia. Although it can be hard to understand why people with dementia act the way they do, the explanation is attributable to their disease and the changes it causes in the brain. Alzheimer's disease and dementia erase a person's memory so that familiar surroundings become unfamiliar, making it difficult to adapt to new environments. The disorientation of the disease often leads to wandering, a common and serious concern for many caregivers who worry their loved one may become frightened, lost or apt to walk into a dangerous situation there are now new solutions to address wandering and help keep your loved one safe and secure.

Technology for safer walking has the potential to offer benefits to people with dementia and their cares in specific circumstances. Walking in a safe environment provides physical and psychological benefits for people with dementia. Walking usually represents a response to a need, such as boredom or discomfort. However, some walking is associated with risk. This behavior, known as "wandering", is a compulsion to leave home that affects 15-60% of people with dementia. Wandering exposes people with dementia to a significant risk of getting lost. One study has found that 40% of people with dementia get lost outside their home .People with dementia can be confined at home, or moved to a care home, as a result. Interventions may be required to reduce risks associated with walking. However, these should assist safer walking rather than prevent wandering, in order to balance minimizing risk with maintaining personal freedom and the benefits of walking. Devices that have been developed to help people live more independent lives, known as assistive technology, can help with safer walking. Two types of technology may be used. First, an alarm system that is used to alert cares to the fact that an individual has moved outside a set boundary. Second, tracking devices to locate a person at any time or place.

II. RELATED WORK

Xiangyu Wang et al [1] have proposed a, Semantic-Based Location Recommendation with Multimodal Venue Semantics system for recommending the location using POI recommendation Algorithm. It uses the User Generated Content like Photos, check-in patterns venue context and text description s for location semantic similarity measurement. It can be used while travelling .It can

also be used to know about the different places. It gives a recommendation for locations to be visited. It enables people to exchange their thoughts and their view about different places. LarsMeinel et al [2] has proposed a system for elderly people with dementia, OPDEMIVA: An Integrated Assistance and Information System For Elderly With Dementia which is designed to detect the daily activities of the patient so as to track their progress of disease and reminding them about their medications using a Stereo Sensor providing RGB-D for 3-D people detection, Object Recognition and pose estimation. It is a system to help people with special demands. It can be used by medical Professionals. This system reduces the barrier between patient and the caretaker. It also bridges the gap between the patient and medical professional.

Hendrik Knoche et al [3] has proposed a system for Tracking Rehabilitative Progres with Fitts and Starts by designing a tablet game to diagnose, train, asses the rehabilitative progress of the neglected patients. This system is applied in much Health monitoring application. It also monitors the patients' health conditions and their disease progress. It can also help them to improve their visual functioning. OmarAlfandi et al [4] has presented a case study on the, Challenges of Leveraging Mobile Sensing Devices in Wireless HealthCare which includes the study on wireless sensor networks and mobile device sensors, routing protocol and android sensor subsystem. This paper mainly focuses on the adaptability of smart phones used by individuals for health monitoring. These systems can be applied in Health monitoring application. It monitors the patient Health. It also improves the patient convenience levels with reduced cost. Rasika S.Ransing et al [5] has developed a system for Smart Home for Elderly Care, based on Wireless Sensor Network as the wireless sensor network are an emerging type of network formed by a set of distributed sensor nodes that collaborates to monitor the environmental and physical conditions. It also includes a lightweight wireless network zigbee has proved to be well suited for smart homes and automation system using the Physiological parameters of patient. It can be applied in medical tele-monitoring system. This system can also be used in ambulatory settings. It can also be used at home. It involves low cost physiological monitoring system. In addition this system also gives a warning message in case of emergency.

Ting Zhang et al [6] has proposed a system for healthcare based on Bluetooth Low Energy for Wearable Sensor-based Healthcare Systems. As the wearable sensor based healthcare device have drawn lot of attention during the several past years .This paper also includes an overview of the state of the art Bluetooth Low Energy for supporting and monitoring patient health. It is applied in the bio-signal monitoring. It can also be applied in biomedicine and the system is convenient to use. This system can be utilized from home with reduced cost. Zhe-Min Lin et al [7] has developed a system for blood pressure monitoring based on Bluetooth Low Energy (BLE) Based Blood Pressure Monitoring System which integrates a blood pressure monitoring device with a smart phone. Through the Bluetooth Low Energy the device can send the measured patient blood pressure rate to the smart phone. It is a Promising application for patients. It can be used at home which provides high accuracy. It also measures pulse rate, Systolic blood pressure and Diastolic blood pressure.

III. SYSTEM DESCRIPTION

A. Poi Recommendation Algorithm

POI recommendation algorithm [1] has its advantages in recommending locations based on the interest of the user. It is used mostly in location based social network to recommend locations to be visited by the user based on their previous visits to a particular location. The location recommendation is provided based on the user generated contents like photos, and text. The POI recommendations can be improved by using it along with venue semantics.

B. FITTS' law

Fitts'law [3] is a descriptive model of human movements mainly used in Human computer Interaction. It also predicts the time essential to swiftly move to a target area which is a function of the proportion between the distance to the target and the width of the target. In addition to this it can also provide an insight into patients visual neglect and their rehabilitation progress.

C. Tablet Game

The tablet game [3] was inspired by the arcade game 'whack-a-mole' which has the target that is a mole randomly appear from holes for a short time that the player needs to hit it with a soft mallet before they disappear. It is developed as a touch screen based game in which the target appears and the player hits by tapping on them. The target remains on the screen for few seconds before disappearing thereby involving the patients as testers. The main purpose of this game is to test the patient whether we can infer the patient's health condition and the degree of neglect from game play data and also to provide an opportunity for them to improve their visual capacity.

D. Wireless Sensor Network

Wireless Sensor Network [5] has become an attractive field for research because of its widespread application. WSN is different and unique from traditional wireless networks and hence has many advantages like low maintenance and easy installation. The WSN comprises of small devices equipped with one or more sensor, and a wireless transceiver. Such devices are called as sensor nodes or motes. These sensor nodes can be deployed either inside the phenomenon to be sensed or very close to it. The size of the sensor node is small enough to allow easy and random deployment of a large number of motes into remote and inaccessible environment.

E. Zigbee

Zigbee [5] is one of the popular technologies which has a great progress in industrial standard and also installation of lightweight wireless networking hardware. It is a best technology to be used for smart home systems and automated systems. It is a low cost, low power system. The main objective of the zigbee technology is its low power battery application. Zigbee is the worldwide open standard for wireless radio networks in monitoring and control field. It has many advantages like flexible and extendable network, cheap and easy installation.

F. Bluetooth Low Energy

Bluetooth Low energy is a high speed technology which is based on Wi-Fi standard, and Bluetooth low energy is entirely a new technology for the rapid buildup of simple links. The Bluetooth Low energy can be used for sensors and other devices .Bluetooth low energy has wider communication range, much lower power consumption and lower data rate, while the lower data rate may still meet the need of some wearable health care systems. The lower power consumption feature will enable a single batter change to last for a much longer time and the size of the battery can be much smaller. The new Bluetooth has unique features and functionalities.
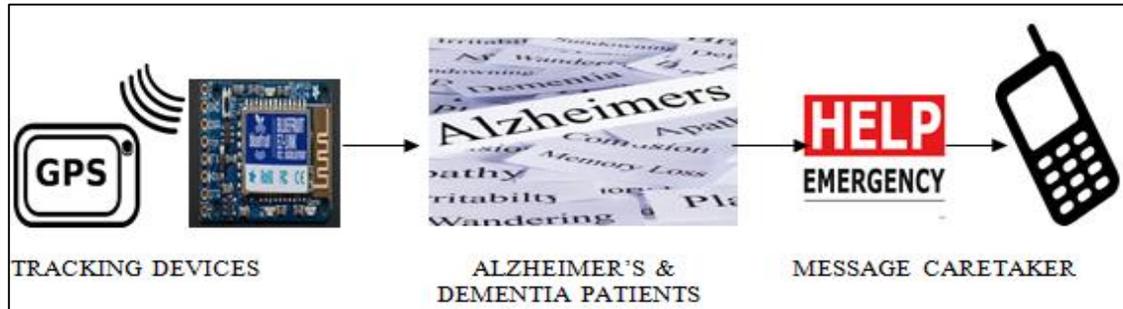

Fig. 1: Tracking Dementia Patients

G. STAIz

STAIz [10] is a mobile device based system which aims at improving the way of monitoring, diagnosing and rehabilitation is done in Alzheimer's patients. This system reduces the burden of taking care of the Alzheimer's and also the doctor in monitoring them. It monitors the patient frequently in smaller intervals. The system can be used at homes with the supervision of the care taker and it also reduces the need for an active internet connection. The main goal of this system is to provide medical professionals with relevant information about the patient's health progress all in a mobile environment without the need for the internet connection.

H. M3DITRAC3R

M3DITRAC3R [8] is an robotic application which will adopt the features of time tracking and alarm triggering based on the alarm based medication reminder. In addition to this the patient tracking and dispensing will be adopted from the autonomous medicine and water delivery robot. This robot is a mechanoid robot and this robot tracks patients using infrared sensor and this robot has the ability of tracking time, tracking patients and dispensing medicine for the patient. The users of this robot are the mobile senior citizen patients who have the inability to keep track of their prescriptions due to some health constraints.

I. Finger Printing Method

Finger printing [11] technique is used for calculating the location of the mobile unit which has signal strength measurement capabilities. Location Finger printing technique has two phases which is an offline phase and an online phase for calibration and for location estimation respectively. In the offline phase the received signal strength indicator from different access points are measured at the selected locations. A location with received signal strength indicator is known as calibration points. This measurement which is united from several access points in one location are called as fingerprints.

J. KiMENtia

KiMENtia [14] is a technique for improving the memory activities as well as the physical activities of the Dementia patients based on Kinect Sensor which are user to enable the user to control and interact intuitively with the computer without any intermediate device. This technique mainly focuses on the area of the brain which is mainly affected who suffer from Dementia. It includes details related to remembering specific pieces of information such as the name of the people or objects are forgotten sometimes they have the lack of finding adequate work.

K. Bayesian Tracking

Bayesian Tracking [15] is an algorithm which is used for location estimation. These methods mainly focus on estimating parameters that possess dynamic behaviour. Bayesian Tracking Algorithm provides the position information of the object if the information from an object is not found it declares that the object to be lost thus the Bayesian method is able to handle disappearance of objects, sudden changes in the object.

IV. RESULT AND DISCUSSION

In this survey, many approaches based on Monitoring and tracking the Dementia patient and Alzheimer's patient were listed and most of these approaches were found to be accurate, reduce complexity of the system, improves the performance of the system, and supports the caretaker in finding the patients quickly. These systems were found to be useful in tele-monitoring systems, Healthcare systems and also it can be applied in real-time applications. The various technologies and its applications were represented in the table below,

S.NO	TECHNIQUES	APPLICATION
1.	POI Recommendation Algorithm.	It can be used while travelling to know about different places.
2.	Wireless Sensor Network.	It can be applied in Health monitoring application.
3.	Bluetooth Low Energy	It is applied in bio-signal monitoring and in biomedicine.
4.	Proxy care	It can be used at hospitals and at ambulatory system.
5.	Non-intrusive pervasive model.	It can be applied in healthcare systems.
6.	Bayesian tracking	It can be applied in location estimation systems.
7.	Dynamic Radial Kernel	It can be applied in health monitoring systems.

Table 1: various technologies and its application

V. CONCLUSION

There are many approaches available for Tracking Dementia Patients and Alzheimer's disease, each approach has its advantages and disadvantages. This Survey paper has provided a comprehensive overview of various Location tracking approaches and patient Health Monitoring. In this paper we reviewed several existing methods and techniques for supporting Dementia Patient tracking which includes POI Recommendation algorithm, Fitts law, Bluetooth low energy system, Wireless sensor network, KiMENtia, and Zigbee.

REFERENCES

[1] Xiangyu Wang,Yi-Liang Zhao,Liqiang Nie,Yue Gao,Weizhi Nie,Zheng-Jun,and Tat-Seng Chua "Semantic-Based Location Recommendation With Multimodal Venue Semantics" IEEE Transactions on Multimedia,Vol.17,No.3,March 2015

[2] Lars Meinel,Julia Richter,Rene Schmidt,Michel Findeisen,Gangolf Hirtz "OPDEMIVA:An Integrated Assistance and Information System For Elderly With Dementia"

[3] Hendrik Knoche,Kasper Hald,Danny Tamsen,Lars Holm Jespersen "Tracking Rehabilitative Progres with Fitts and Starts"

[4] Omar Alfandi,Suhail Ahamed,May El Barachi and Adil Khan " Challenges of Leveraging Mobile Sensing Devices in Wireless HealthCare"

[5] Rasika S.Ransing,Manita Rajput "Smart Home for Elderly Care,based on Wireless Sensor Network"

[6] Ting Zhang,Jiang Lu,Fei Hu,Qi Hao "Bluetooth Low Energy for Wearable Sensor-based Healthcare Systems"

[7] Zhe-Min Lin,Cheng-Hung Chang,Nai-Kuan Chou, and Yuan-Hsiang Lin "Bluetooth Low Energy (BLE) Based Blood Pressure Monitoring System"

[8] Yasothaa Kalai Chelvam,Norshuhani Zamin "M3DITRACK3R:A Design of an Automated Patient Tracking and Medicine Dispensing Mobile Robot for Senior Citizens"

[9] Alessandro Puiatti,Armando Rivero,Anna Forster,Andrea Bernaschina,Gian Carlo Dozio,Nicola Rizzo,Nunzio De Bitonti and Andrea Cavicchioli "Proxy-Care:A Novel Patient Care Tracking System with wireless Sensor Networks"

[10] Helder Moreira and Renato Oliveira,Nuno Flores "STAIz:Remotely supporting the diagnosis,tracking and rehabilitation of Patients with Alzheimer's"

[11] Dennis Rodionov,George Kolev,Krill Bushminkin "A Hybrid Localization Technique for Patient Tracking"

[12] Daniel Rosner,Razvan Tataroiu,Constantin Ilas,Andreea Livia-Beciu,Ovidiu-Marius Alexandru "Efficient Location Tracking System for Patient Monitoring"

[13] Arnoldo Diaz-Ramirez,Fabin N. Murrieta,Jorge A. Atempa and Francisco A.Bonino "Non-Intrusive Tracking of Paients with Dementia Using a Wireless Sensor Network"

[14] Zelai Saenz de Urturi Breton,Begona Garcia Zapirain and Amaia Mendez Zorrilla "Kimentia:Kinect based tool to help Cognitive Stimulation for individuals with Dementia"

[15] Wahee Kim and Sook-Jin Lee "Fast Bayesian Tracking For Location Estimation by Grid-based Method"

[16] Hsin-Hung Chiang,Wei-Ming Chen,Chiou-shan Chou,Han-Chieh Chao "Realtime Patients Face Tracking based on Facial Feature Matching"

[17] Shamma Alqassim,Madhumeta Ganesh,Shaheen Khoja,Meher Zaidi,Fadi Aloul,Assim Sagahyroon "Sleep Apnea Monitoring Using Mobile Phones"