

Assistive Tool Kit for Alzheimer's Patient

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Abstract—Alzheimer's disease is a chronic neurodegenerative disease that causes to develop dementia. The Alzheimer's patients find it hard to remember recent events, reason and even to recognize people they know. As the disease advances, symptoms can include difficulty with language, disorientation including getting lost, mood swings, loss of motivation, lack of self-awareness and overall behaviour. The objective of this proposed paper is to develop an assistive tool for Alzheimer's patients and their caretakers to provide support like health monitoring, assist to find lost items, provide reminder to take medicine and assist to monitor patient's location. An evaluation study showed that the proposed system was effective and usable for the patients and their caretakers. The model is designed to make people suffering from Alzheimer's as independent as possible.

Index Terms— Alzheimer, heart rate, assistive tool, intelligent system, sensors.

I. INTRODUCTION

Alzheimer disease is a dementing disorder, characterized by cognitive and behavioral problems. It involves the damage, breakdown of connections, and death of the brain cells. It affects the parts of the brain that control memory, thought, and language. It usually begins at age 60. Some of the signs include loss of memory, difficulty with abstract thinking, disorientation, loss of judgment, and personality changes. It progresses from mild to moderate to severe. People with mild AD can usually live alone. People with moderate AD may have great difficulty functioning without supervision. People with severe AD can no longer take care of themselves (2000 Progress Report on Alzheimer's disease). Until a cure is found, people with Alzheimer's disease need care-giving.

According to the director of University of Florida's Institute on Aging, 1 in 10 elders (4 millions) suffer from AD. It is also estimated that 1 in 5 elders will have AD by 2050. One of the goals of the Alzheimer's Association is to reverse this course by providing support for family caregivers to release them from the overwhelming load they face with their family and employer.

There are 3 phases of AD:

- A) Early stage
- B) Moderate stage
- C) Severe stage

A. Early stage

In the early stages of Alzheimer's, a person may function independently. He or she may still drive, work and be part of social activities. Despite this, the person may feel as if he or she is having memory lapses, such as forgetting familiar words or the location of everyday objects.

Common difficulties include:

- Memory loss that disrupts daily life.
- Challenges in planning or solving problems.
- Confusion with time or place.
- Decreased or poor judgment.

B. Moderate stage

Moderate Alzheimer's is typically the longest stage and can last for many years. As the disease progresses, the person with Alzheimer's will require a greater level of care.

Common difficulties include:

- Forgetfulness of events or about one's own personal history.
- Confusion about where they are or what day it is.
- Changes in sleep patterns, such as sleeping during the day and becoming restless at night.
- An increased risk of wandering and becoming lost.

C. Severe stage

In the final stage of this disease, individuals lose the ability to respond to their environment, to carry on a conversation and, eventually, to control movement. They may still say words or phrases, but communicating pain becomes difficult. As memory and cognitive skills continue to worsen, personality changes may take place and individuals need extensive help with daily activities.

Common difficulties include:

- Require full-time, around-the-clock assistance with daily personal care.
- Lose awareness of recent experiences as well as of their surroundings.
- Experience changes in physical abilities, including the ability to walk, sit and, eventually, swallow.
- Have increasing difficulty communicating.

Assistive technology refers to devices or systems that support a person to maintain or improve their independence, safety and wellbeing. Many assistive technology devices are electronic, but the term does not just refer to high-tech devices. However, devices such as smartphones and tablets, coupled with widespread internet coverage, are making technology more accessible for everyone in ways that we couldn't predict just a few years ago. Technologies and apps' (applications or programs for smartphones and tablets) that have been developed for the general public are increasingly being used by people with dementia as well. Over time these mainstream technologies will probably replace many of the products that were developed specifically for people with Alzheimer disease.

II. MOTIVATION

In 2010, there are 3.7 million Indians with dementia and Alzheimer's disease the total societal cost is about 14,700 crores. While the numbers are expected to double by 2030, costs would increase three times. Around 24.3 million people have Alzheimer's disease today, with 4.6 million new cases every year (one new case every 7 seconds).

The number of people affected will get doubled every 20 years to 81.1 million by the year 2040. The increasing rate of Alzheimer's patient is not uniform for all over the world. Therefore this kit can help the Alzheimer's patients and their Caretakers.

III. PROBLEM DOMAIN

- Alzheimer's disease is a progressive disease in which the destruction of memory cells causes slow depreciation in memory, thinking and reasoning skills.
- A great deal of difficulties are faced by an Alzheimer's patient including short term memory loss, aggression, loss of communication skill, repetitive behaviour, anxiety, agitation etc.
- It most often begins in people over 65 years of age, although 4% to 5% of cases are early-onset Alzheimer's which begin before this. It affects about 6% of people 65 years and older.

IV. STATEMENT

A tool for Alzheimer's patients and their caretakers to provide support. This model shall make them independent and to provides an environment of freedom to live.

V. INNOVATIVE CONTENT

A tool that help and provides support to the Alzheimer patient and the caretakers.

VI. DESIGN

A. Block Diagram and Working Principle Patient Wear Band

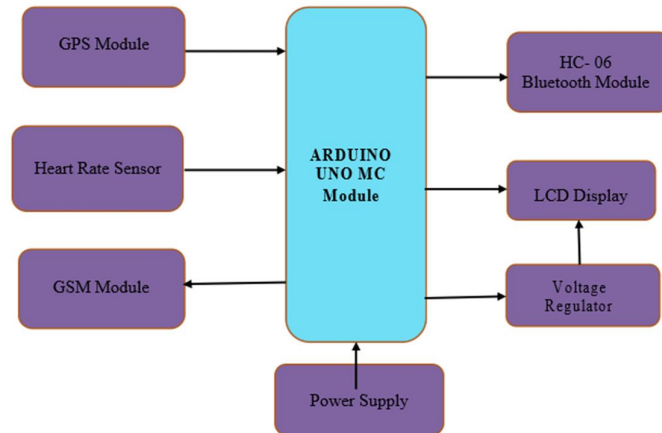


Figure 1: Block diagram of Patient Wear Band

The Patient Wear Band, containing an Arduino Uno Microcontroller interfaced with the other components where the Heart Rate sensor keeps the Patient's Health In-Check regularly and display's the value using 1602 LCD Display. If any value is not in range of the threshold value, a message is sent to the caretaker through the GSM Module.

The GPS Module is used to monitor the Patient's location regularly, if the Patient's location is changed from a certain Home Boundary, immediately a message is sent to the caretaker through the GSM Module.

Two HC-06 Bluetooth Modules are used as "Master – Slave" Pattern enabling the Patient Wear Band to connect to the Pill Box. If the patient has misplaced the pill box, a push button is provided which can help the patient finding the Pill box.

B. Block Diagram of Pill Box

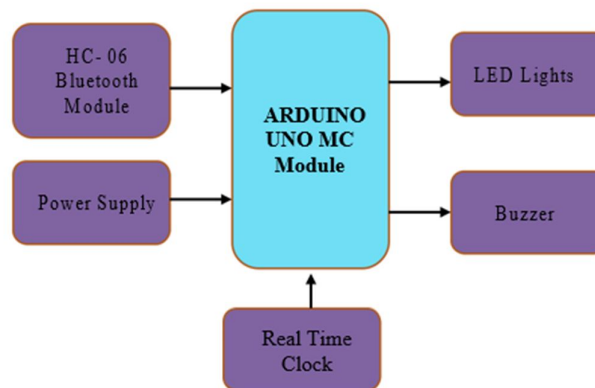


Figure 2: Block diagram of Pill Box

The Arduino Uno connected to the HC-06 Bluetooth Module which intern is connected to the Master Bluetooth of the Patient Wear Band. Using the Real Time Clock (RTC), the Pill box gives Reminders about the daily Medications with 3 LED Lights for Morning, Afternoon and Night Medications.

C. Circuit Diagram of Patient Wear Band

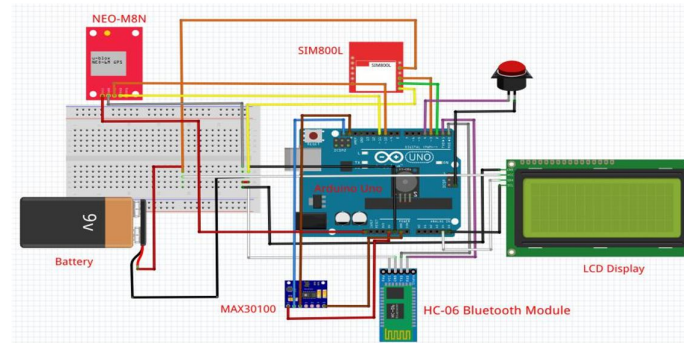


Figure 3: Circuit diagram of Patient Wear Band

D. Circuit Diagram of Pill Box

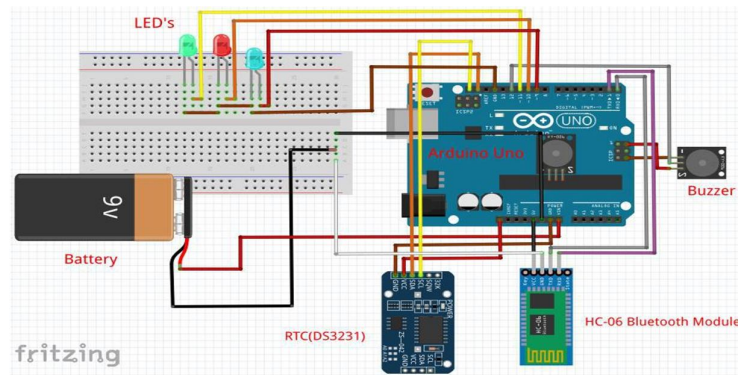


Figure 4: Circuit diagram of Pill Box

VII. SOLUTION METHODOLOGIES OR PROBLEM SOLVING

A. Flowcharts

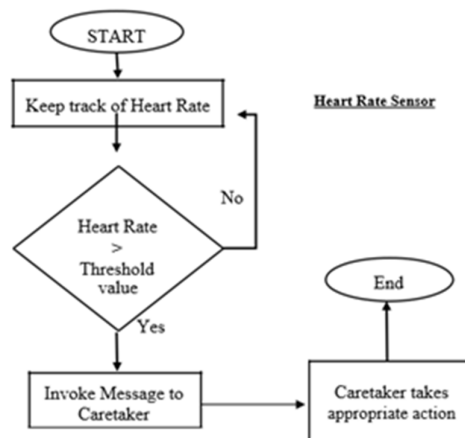


Figure 5a: Flowchart of Heartrate Sensor

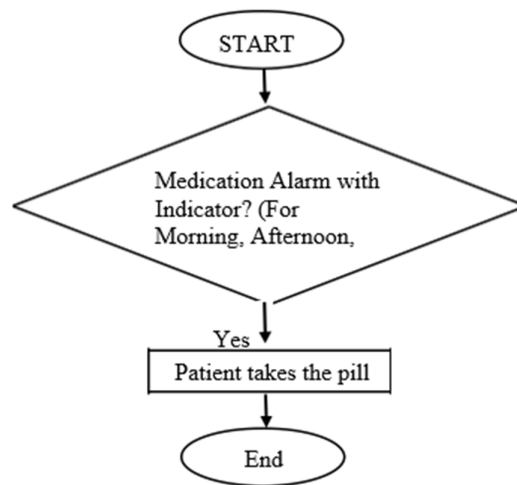


Figure 5b: Flowchart of Medication Alarm

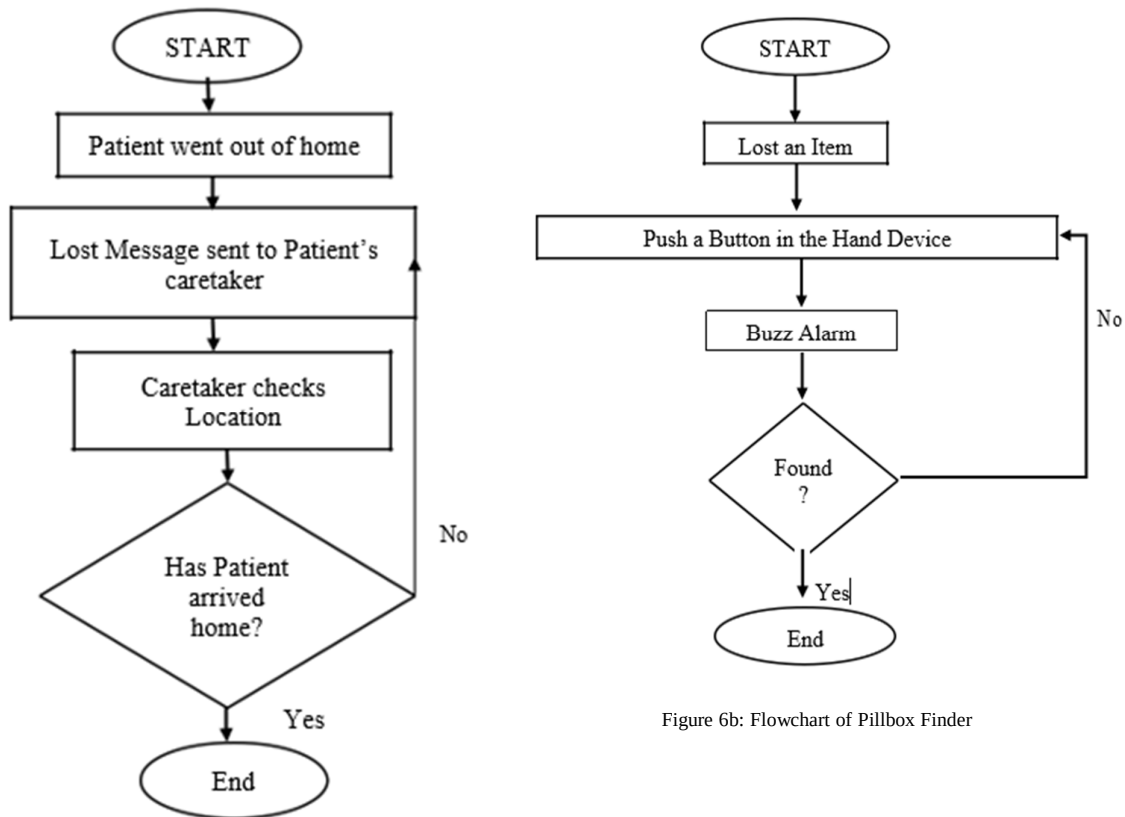


Figure 6b: Flowchart of Pillbox Finder

Figure 6a: Flowchart of Patient Location Tracking system

VIII. RESULTS

The two individual modules are developed

1. Wearable Module for Alzheimer's patients - medication and health is on check on regular monitor

2. Tracking of necessary items such as Pill indicator with a buzzer for easy identification.
3. GPS tracking (Within Wearable Module): To help care taker to identify the patient location when lost, which is a common scenario in case of Alzheimer's patient.

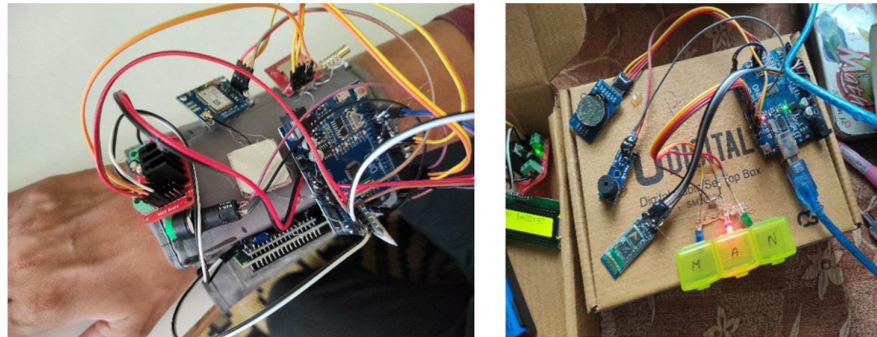


Figure 7 (a): Physical Model of Patient Wear Band 7 (b): Physical of Pill Box

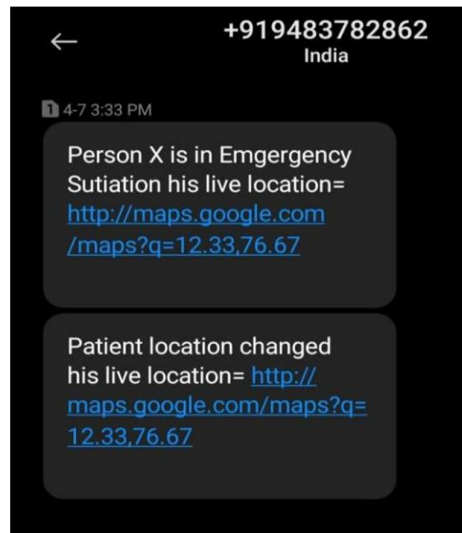


Figure 8: Messages through GSM

IX. CONCLUSION

This project is able to develop an Assistive Tool Kit for Alzheimer's patient to regularly monitor the Heart rate and reminder for medicine at different intervals. Assisting patient to identify the Pill Box during displacement with a buzzer sound and Assisting care taker too by GPS location tracking system to identify the patient location when the patient is not in reach.

FUTURE WORK

The project can be further added with the features such as

- Mobile Application.
- Reduction of size through PCB Designing.
- Increasing the Accuracy of Heart rate sensor, GPS module etc.

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