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Smart Assistive mHealth System for Medication Adherence in Patients with Alzheimer's Disease

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Non-adherence to medication is a common challenge among patients and can contribute to poor treatment outcomes and wastage healthcare resources [1].

Alzheimer's disease is a progressive age-related neurodegenerative disease that involves insidiously progressive memory impairment [7].

Introduction

Introduction (*Cont'd*)

- Cognitive impairment is the major symptom of Alzheimer's at the early stage.
- Cognitive impairment in patients with mild Alzheimer's disease often times require medication management to prevent forgetfulness due to the diversity of medication involved in the treatment.

Introduction (*Cont'd*)

- The programmability and intelligibility of modern electronic systems and Information and Communication Technology (ICT) can be exploited to assist older people in maintaining healthy and independent living.

Introduction (*Cont'd*)

- Mobile applications are increasingly being integrated into health care system for disease surveillance, appointment reminders, disease outbreak alerts, health education, and remote access to patient records. This is mostly referred to as mobile Health (*mHealth*).

Research Aim

- This work aimed at developing an intelligent assistive mHealth system to facilitate medication adherence in elderly patients with Alzheimer's disease.

Research Aim

- The system ensures medication adherence by creating audiovisual alert for the user with ‘memory loss’ disability to take the right doses of medication at required frequency.

System Design Method

- The complete system design comprises of different units including:
  - *Microcontroller (PIC16F877A) ;*
  - *Liquid Crystal Display* (*LCD*)*;*
  - *Real-time clock chip;*
  - *Communication protocol;*
  - *Alarm sounder; and*
  - *GSM module.*

System Design Method (*Cont'd*)

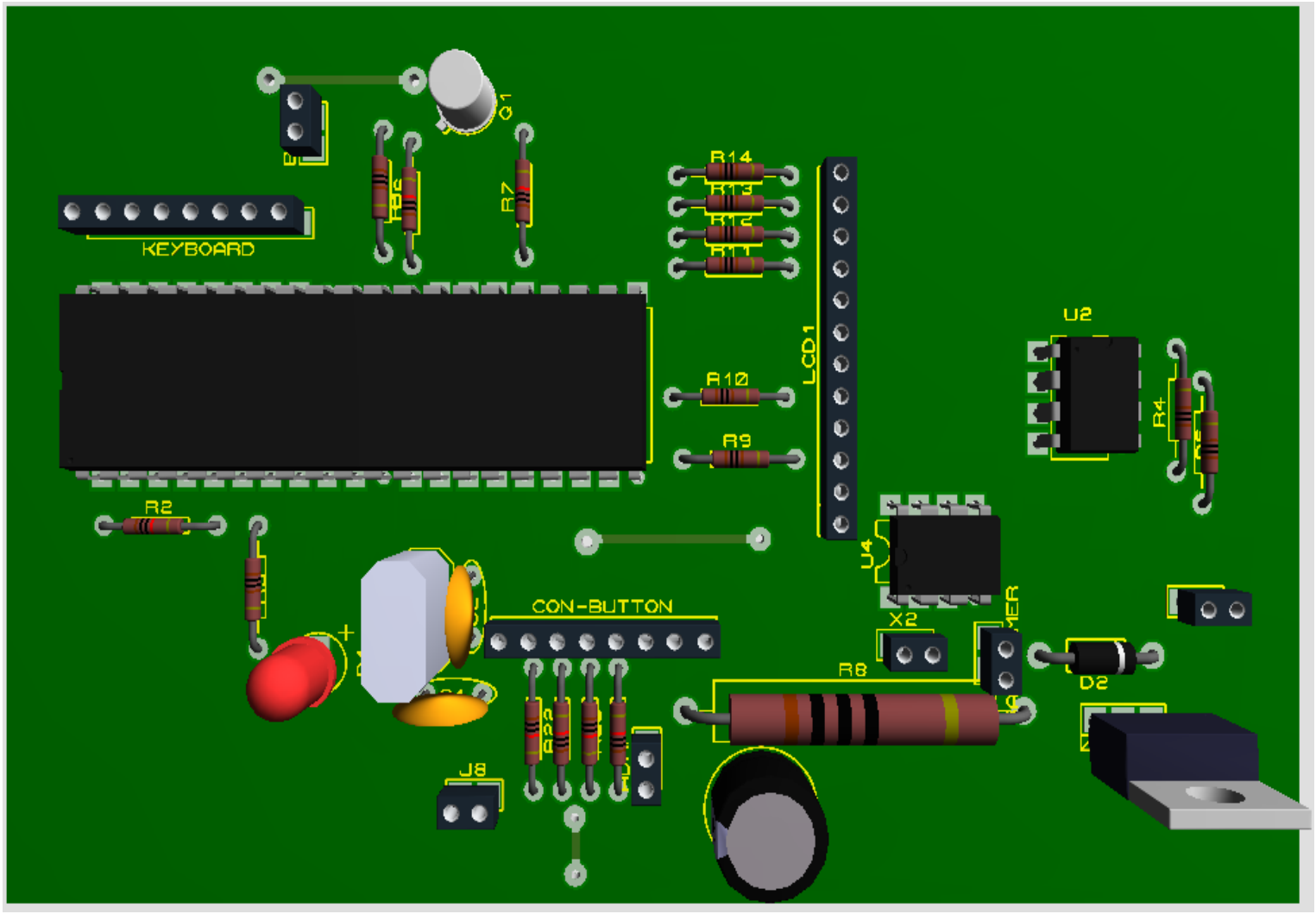

Figure 1: Circuit Design of Smart Assistive mHealth System

The *PIC16F877A* microcontroller is clocked with a 12 MHz crystal oscillator for the generation of the pulses that determines the rate at which information is processed.

The design incorporates (*DS1307*) a real-time clock chip, for accurate timing.

The drug prescription dosage and time intervals are entered into the device via the matrix keypad.

System Implementation

System Implementation (*Cont'd*)

- When the set time is reached, the alarm buzz and the drug prescription information is displayed via the LCD with the correct dosage as retrieved from the 24CXX memory chip.
- The drug prescriptions are keyed in by the physician and the medication schedule is stored in non-volatile memory of the system.

System Implementation (*Cont'd*)

Figure 2: Complete Smart Assistive mHealth System

System Implementation (*Cont'd*)

- At the set time, the Liquid Crystal Display (LCD) unit shows the drug to be taken in the right dosage.
- The buzzer in the electronic device provides a sound effect to get the attention of the patient.

System Implementation (*Cont'd*)

- In case of non-adherence, the system automatically send a text message to the physician via the Short Messaging Service (SMS) using the integrated Global System for Mobile Communications (GSM) module and Subscriber Identity Module (SIM) in the system.

System Implementation (*Cont'd*)

Figure 3: Internal Circuitry of System Implementation

Conclusion

- The programmability and intelligibility of modern electronic systems and Information and Communication Technology (ICT) was exploited to solve the problem of non-adherence to medication caused by cognitive impairment in elderly patients with Alzheimer's disease.

Conclusion

- An intelligent assistive mHealth system was designed and implemented to achieve medication management by preventing forgetfulness due to the diversity of medication involved in the treatment of Alzheimer's disease.

Conclusion

- The developed system provides a cost-effective solution for patients with minimum literacy to conveniently manage their medications, taking the right dosage of medicine at the prescribed time as automated by the system.

Conclusion

- In future work, we plan to miniaturize this system into a wearable device for optimal performance.

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Thank You