A Prototype Device that Implements RFID and Remote Monitoring Technology to Track Medications for Elderly Healthcare Patients

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Abstract

Many elderly people require assisted living facilities because they are not able to independently manage their complex medication regimens. This restricts their ability to live independently and places a considerable burden on caregivers and the healthcare system in general. A system that implements RFID identification and remote monitoring technology to keep track of complex medication schedules can enable them to live independently while eliminating medication errors and reducing the burden on the healthcare system. The research presented concerns the development of a marketable device that will perform four essential functions: (1) to provide notifications if the user has taken, and (2) to provide passive monitoring of the user’s compliance to a remote caregiver. The device will be marketable because it features an intuitive user interface and can be easily integrated into the current healthcare infrastructure.

Introduction

A large percentage of elderly healthcare patients fail to comply with their prescribed medication schedules. This can result in hospital and nursing home admissions, serious injury, or death. It is difficult for some patients to adhere to intensive medication regimens because the prescribed schedule may be too complex, or the patient may be attending multiple appointments. This is an important issue by researching and developing an intelligent medication monitoring and notification system that will enable patients to follow prescribed medication schedules with minimal effort. This will enhance the lives of older adults and enable independent living.

The goal of this research is to determine if a device can be developed that will eliminate personal medication errors and reduce the load on the healthcare system while enabling patients to live independently. We attempt to satisfy this by developing an appropriate prototype device. The following operation procedure demonstrates the device feature.

1. When the system is powered on, it will attempt to look data from persistent memory. It will then scan in any medicine containers currently on the main surface and merge that data with the data from persistent memory. The system will then alert the caregiver of any missed dosages during the downtime.
2. When a new medicine container is placed onto the platform of the device, the software recognizes the new container by scanning its embedded RFID tag. It will then interpret the medicine’s dosage information from the RFID tag and input it into the system.
3. When a medicine dosage is to be taken, the software activates an audible alert and rotates the correct container to the area above the scale for the user to take. It provides the user with instructions concerning the correct dosage amount and waits for the container to be placed back on the scale section to be reweighed.
4. If the medicine was taken correctly, the software checks if any other medicines need to be taken. If more medicine needs to be taken to complete the dosage, the system will prompt the user. If too much medicine has been taken, the system will alert the caregiver and continue normal operation.

The system developed in this project is an extension of research discussed in [2] and [3]. The system is simple, and the user is not aware of it. In terms of the four essential functions: (1) to provide notifications if the user has taken, and (2) to provide passive monitoring of the user’s compliance to a remote caregiver. The prototype developed is a marketable device that is designed to be small and portable.

Results

The prototype developed in this project implements RFID identification and remote monitoring technology to manage complex medication schedules. This allows otherwise unable healthcare patients to live independently while eliminating medication errors and reducing the burden on the healthcare system.

Figure 1: Projected Population Growth

Emphasizing Age Group

Future Work

Future work should include a clinical trial in which critical feedback from users will determine the next steps for such a critical device. The system should be redeveloped until it is considered usable, reliable, and deployable. In addition to testing, the feasibility and value of a patent for the final device should be considered.

References


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Figure 2: Similar Device Developed by Intel Research

Figure 3: Similar Device Developed by Fujitsu Research Labs of America

Figure 4: SolidWorks Assembly Model of Prototype Device (Framatic View)

Figure 5: SolidWorks Assembly Model of Prototype Device (Left Side View)

Figure 6: User Interface Concept Design

Figure 7: Hardware Concept Design

Figure 8: System Architecture Block Diagram