The development of NFC-based medication management system for elderly patients

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Abstract - *With entering into an aged society, more and more people pay attention to their health and disease. Especially, it is significant for senior citizens with chronic disease to have a medication system as it is directly related to their lives. This study suggests the NFC-based medication management system for elderly patents. By developing hardware and software, the suggested method can assist elderly patients to take medicines properly without missing or abusing through guidance and alarm and maintain their health.*

Keywords: near field communication (NFC), medication management system, elderly patients

1 Introduction

The aged population has been rapidly increasing due to improvement of living environment and development of medical technology. The ratio of Korea's aged population, which entered into the aged society with over 7 percent in 2000, is forecast to rise to 14.3 percent in 2022 which means the aged society, and 19.7 percent in 2026, the super aged society[1]. Most of developed countries also have more proportion of aging population earlier so that more of high-tech companies in Silicon Valley, U.S. are developing technologies not on young generation but on the elder or their children or providers who live with to their load off. In addition, businesses are developing various goods for the aged or handicapped as they are on rise as a major customer layer. Compared with other age groups, senior citizens need more attention on management of their health and diseases. Researches show that most of the elder, who are over sixty-five years, has more than three chronic diseases including high blood pressure. A clinical statistics indicated that four out of ten senior citizens take more than four medications. Some seniors are even hospitalized from drugs' side effects. However, they need to be cautious not to worsen diseases or ruin their health by not taking medications to avoid side effects. These elderly patients understand how important regular medications are to treat their diseases, but have trouble taking medicines due to cognitive impairment and decreased memories[2]. They need special attention as they take various medicines for chronic diseases and complications, so there are more possibilities to have side effects or harmed from drug interactions. This research will analyze cases of the elderly patients' medication manage system and suggest NFC-based smart medication management system.

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2 Related works

There are precedent medication management products such as medication organizers with alarm system, pill bottles with a built-in wireless module, medication alarms and information management software. Firstly, the product of Apex Medical Corp., U.S. is a medication organizer with alarm system to set timer with LED screen and its buttons. GlowCap of Vitality is a pill bottle with a built-in wireless modem of Telit to alarm patients to take their medicines.

Fig 1. (Up) Apex Weekly Pill Turtle Organizer, (Down) Vitality-Glow Caps[3]

They also have functions such as monitoring when patients took medications, reporting if patients took medication on time and requesting to pharmacies to fill medications by pressing a button. However, it is uncomfortable for elderly patients to take medicines out of their package to put into cases. There is an Android application named "Pills on the go", a medication alarm and information management software. This app can support basic medication-related alarming but can't manage medication as it is software.

3 NFC-based medication management system

This suggested system is divided into a bottle-typed medicine attachment for NFC-based medication management and NFC-based medication information management software. First, a cap is developed for NFC-based medication information management which is attachable to existing medication for serving elderly patients' medication easily. On top of the NFC-based medication information management cap, LED Display module is installed with functions of display and alarm so that it rings once it's time for a user to take medicines. Then, if the user's smart phone reads NFC tag module on the bottle cap, the user can input and check medication schedule of the medicine with ease. The user also can turn off the alarm (light and/or sound) on the cap for medication information management, which is also significant information to check medication. The entire operation process of suggested system is as Figure 2.

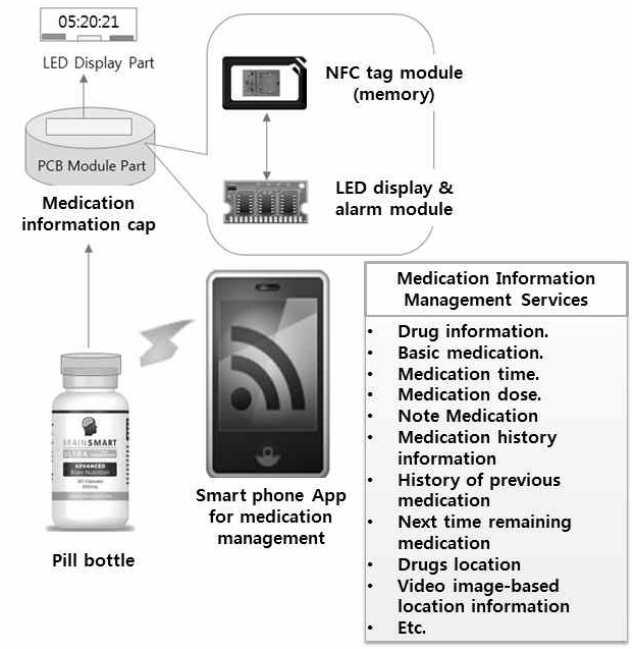

Fig 2. The workflow for medication management services

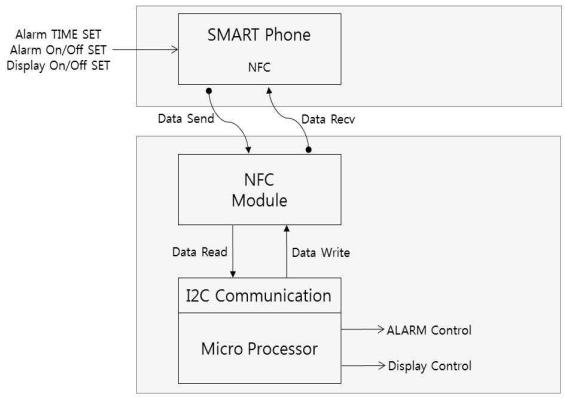

Fig 3. Block diagram of medication Information cap

The attachable cap of bottle-typed NFC-based u-medication information management is consisted of NFC module to save and transfer medication information and control device module to manage medication information. The NFC module already has a NFC Read/Write module and a memory module to memory medication information and the device module is consisted of a medication time alarm LED, a Beep and a switch. Medication information management control software is made of I2C Communication, NFC function control software, LED display and alarm control software. The data flow and function is as Figure 3.

4 Conclusions

This study has introduced NFC-based smart medication management system for the elderly patients. To enhance convenience and availability of the suggested system, surveys were conducted for pharmacies and elderly patients and reflected the results on the product plan and development. With this product, elderly patients can manage their medication information easily so that they can prevent missing or abusing essential medications. For further research, purchasers' taste and preference on various cap design and production will be considered before deploying on a commercial scale

5 References

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