Building a Portable Talking Medicine Reminder for Visually Impaired Persons

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Abstract—Assistive systems can help improving the ability of disabled persons in taking care of themselves. There are more than 39 million visually impaired persons in the world, and moreover, the amount is increasing year by year. Therefore, Developing assistive systems for the visually impaired persons is an important issue. Since the medication guides are often too complex for visually impaired persons, it makes The visually impaired persons frequently forgetting to take drugs or being wrong in medication. In this work, we are going to develop a portable talking medicine reminding system to assist visually impaired persons in medication and reduce the number of medication errors. The assistive system will mainly provide auditory feedback in operation, and braille output for special needs. The assistive system will also provide a user-friendly interface that is specifically designed for visually impaired persons and is compatible with common-used screenreaders. The assistive system identifies drugs based on the now relatively common barcodes on drug begs. In addition, to overcome the problem that it is difficult for visually impaired persons to scan the barcode horizontally or vertically, an omni-directional barcode recognition technology will be used in the assistive system. It will make the assistive system easier for visually impaired persons to use. The assistive system will be built on a handheld device for better portability so that it can assist visually impaired persons anytime and anywhere, and reduce the number of medication errors. The system will be suitable to be used in the applications of ubiquitous health-care.

Keywords—assistive systems for visually impaired persons; portable and talking assistive systems; medicine-taking reminding; barcode recognition; ubiquitous health-care.

I. MOTIVATION

Assistive technology can help improve the ability of disabled persons in taking care of themselves. Building barrier-free smart living space and providing sufficient assistive systems and devices for disabled persons are one of the civilization indicators of a country [1]. The amount of visually impaired persons in the world is over 39 million [2]. The amount is increasing year by year. Due to their impairment, the visually impaired persons face more difficulty in their daily life. Most of them rely on assistive systems and devices to overcome the daily difficulties. There have been many assistive systems and devices developed for visually impaired persons in the past [3]–[10]. However, the amount and categories of assistive systems and devices for visually impaired persons are insufficient. The consequences are severe. It is important to develop appropriate assistive systems and devices, based on the needs of the visually impaired persons, to help solve some of the problems that they face in daily life, thereby improving their ability to take care of themselves.

Compared with sighted persons, visually impaired persons frequently forget to take drugs or make errors in medication because medication guides are often too complex for visually impaired persons, which include the category, dosage and taking time. Many visually impaired persons may make errors in the daily medication. The medication errors will reduce the quality of life of the visually impaired persons, and furthermore, may seriously damage their health. Currently, some medication reminding softwares have been developed and available in markets, for example, RxMindMe, Med Minder and OnTimeRx [11]–[13]. However, these softwares are designed for sighted persons rather than visually impaired persons. The special need of visually impaired persons are not considered in the design of the softwares. Thereby, it is worthwhile and important to develop an assistive system specific for visually impaired persons to assist them in medication and reduce the number of medication errors.

II. THE PORTABLE TALKING MEDICINE REMINDER FOR VISUALLY IMPAIRED PERSONS

In order to assist visually impaired persons in medication to reduce the number of medication errors, in this work, we are going to develop a portable assistive system for visually impaired persons, that is named Portable Talking Medicine Reminder (PTMR).

The developing PTMR system is built on handheld devices, for example Android smart phones, for better portability. Since barcodes are now relatively widely attached to drug begs, we will use barcode-based drug identification in the PTMR system so that the system knows the category of drugs in the beg. Due to their impairment, it is difficult for visually impaired persons to put barcodes under the camera len horizontally or vertically during recognizing barcodes. It will significantly impact the result of barcode recognition. Therefore, an omni-directional barcode recognition technology will be used in the system, that can correctly and efficiently recognize the barcode in any direction, for example a rotated barcode. The text-to-speech technology will be used in the PTMR system for auditory feedback. Also, the braille feedback will be available in the PTMR system as an optional output format. That is, the PTMR system is able to simultaneously provide messages in both auditory and braille formats. For convenient use, we are going to design

a user-friendly interface specific designed for visually impaired persons. The user interface will be compatible with commonly used screenreading softwares. When users scan the barcode on a drug beg, the PTMR system recognizes the barcode, and then provides the medication information, such as drug name, taking time, dosage. The PTMR system also describes the color and the shape of the drug to avoid misery. The full guides in auditory and braille formats will be provided while the PTMR system is operated. In addition, we will build a service platform to achieve automatic collection of medication information in the work. A medication data exchange standard will be also designed for the use of transferring medication information between the user's client and service platform. The PTMR system can be configured automatically based on the medication information received from the service platform. The automatic configuration is one of the featured functions that facilitate the use of the PTMR system. It is difficult for visually impaired persons to input data on a handheld device with a touch screen. By using the featured function of automatic configuration, the problem of being unable to input data can be completely solved. Furthermore, the potential problem of typing error will be also avoided. The PTMR system will provide reminding and guiding functions to prevent visually impaired persons from medication errors, such as wrong type, time and dosage. The PTMR system will regularly send the medication and error logs to the visually impaired persons' nursing staffs or relatives automatically. Based on the logs, the nursing staffs or relatives can give necessary suggestions and care to the visually impaired persons in the medication. The portable talking medicine reminder developing in the work will serve visually impaired persons anytime and anywhere, and help to reduce the number of errors in medication.

III. CONCLUSION AND FUTURE WORK

In this work, the assistive system that is called portable talking medicine reminder (PTMR) will be developed for visually impaired persons. The assistive system is designed to remind visually impaired persons in medication. The system helps avoid the medication errors, for example forgetting to take drugs or taking wrong drugs, and provide a better health-care. The PTMR system will provide several featured functions, such as user-friendly interfaces, auditory and braille feedback, automatic configuration, that facilitate the use of visually impaired persons. The PTMR system is portable and can be used anytime and anywhere. Furthermore, the PTMR system can be used in the applications of ubiquitous health-care. The work is still in progress.

ACKNOWLEDGMENT

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