

Development of Emotional Sympathetic Healing and Relief Services for Senior Care

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Abstract

In this paper, we collect biometric information such as activity volume, location information, heart rate, etc. as a wearable device of personalized health care service for senior care based on PHR platform. Design and implement lifelog collection and storage functions in medical institution PHR data. The emotionally sensitive emotional processing engine monitors, classifies, and stores sensor data collected from senior care sensors through the design phase, and associates real-time analysis system development with AI algorithms with emergency call service systems. It separates call ratings inside and outside the nursing home, and monitors emotional states such as joy, sadness, anger, and fear. Ha robot cameras are installed to support everyday safety and are used to provide residential security, safety, and security notification services. Health and safety tracking and managing medical products on the Internet (; IoMT) to develop solutions for emotionally-balanced healing and peace of mind services for senior care combined with devices.

Keywords: PHR, healthcare, AI, bigdata, IoT, predict.

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1. Introduction

The purpose of this study is to support a healthy and safe life for the elderly, who are socially vulnerable. The goal is to develop a solution for emotional sympathetic healing and relief services for senior care combined with Internet of Medical Thing (IoMT) devices that can track and manage their health and safety. Services based on the personal health record (PHR) platform enable health management and provision of medical services even outside medical institutions. It will be possible to overcome the spatial limitations of single-person elderly medical services and provide services that enable on-site health diagnosis and preventive management through home devices. Develop systematic systems such as information integration gateways and applications that can manage the safety and health of the elderly through IoMT devices that can measure the elderly's biosignals and indoor activities.

In the medical service paradigm change, with the spread of the Quantified Self trend, it is changing from a treatment hospital, which receives treatment when a disease occurs, to a preventive consumer who manages their own health. With the development of ICT infrastructure such as IoT, wearable devices, and big data, it is expected to create innovative services in the healthcare industry by combining with artificial intelligence. The structure of

this paper is as follows. In Chapter 2, research methods for solutions for emotional sympathetic healing and relief services for senior care are developed, and the research results of the proposed solutions in Chapter 3 are presented. Chapter 4 examines the emotional service of senior care, and Chapter 5 presents the conclusion and future IoMT research direction.

2. Theoretical Background

2.1. Smart Healthcare

Building a data lake that stores large amounts of unidentified data provides an open health companion service model development environment using a data sandbox. In addition, we design apps for guards and professionals and emergency services, and follow open PHR standard specifications and guidelines. Develop an 'emotional and sympathetic health companion service system that can manage the safety and health of the elderly in compliance with the open PHR standard specifications and guidelines. Figure 1 is a healing service for emotional sympathy, which is a personalized health care service for senior care based on the PHR platform. Biometric information such as activity amount, location information, and heart rate is collected with wearable devices, and voice conversations through AI hub and HA (Home Assistant) robot, contents for preventing depression, and daily life support services are used to check the health of the elderly and notify dangerous situations.

It provides customized health care and reassurance services in case of cardiac arrest.

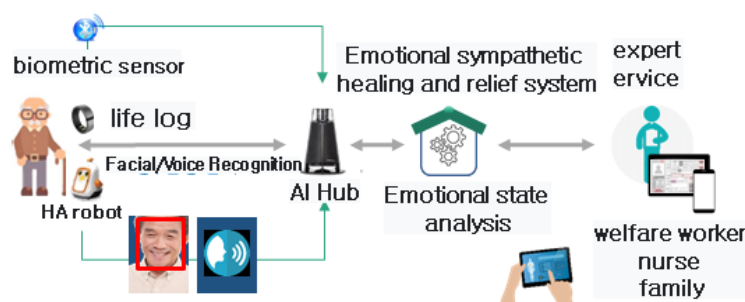


Figure 1; Composition of Health Healing Service through Emotional Sympathy

2.2. Preventive Management and Home Care for the Elderly at Home

Recently, the death of loneliness, which is isolated from family or community, and died alone, is emerging as a social problem. Not only the elderly, but also middle-aged single-person households exposed to problems such as unemployment, poverty, health, and divorce are at risk of dying of loneliness.

According to the research data, there were a total of 2,343 cases of lonely deaths and suspected cases in the district, 162 cases of confirmed cases of lonely deaths and 2,181 cases of suspected cases, resulting in an average of 6.4 cases of lonely death per day. It is intended to contribute to the improvement of the quality of life of socially isolated households by determining the necessary matters for the prevention of social isolation and loneliness among isolated and disconnected single-person households, which are becoming a social problem due to the increase in single-person households. The elderly home care sector mainly used the method of having a caregiver at home or sending them to a nursing home. This was

inconsistent with the desire to live independently at home by the elderly themselves, along with a large economic cost burden on their dependents. As a solution to the elderly care problem, a “home positioning system” that monitors the movement and falls of the elderly has been developed, thereby meeting the need for independence of the elderly and reducing the economic cost of nursing care for the elderly. About 30,000 cases of acute cardiac arrest occur every year nationwide, with the highest rate at home, followed by nursing.

2.3. Status of Artificial Intelligence Services for the Elderly

Figure 2 is a safe care service for the elderly who live alone, and sensors are installed in consideration of the user's residential environment. It uses a non-contact and insensitive-based biosensor, so it can be sensed without being attached to the body or carried, so that the health status of the elderly living alone can be monitored. In addition, in case of emergency, a notification message is sent to family members or social workers to respond to emergency situations.

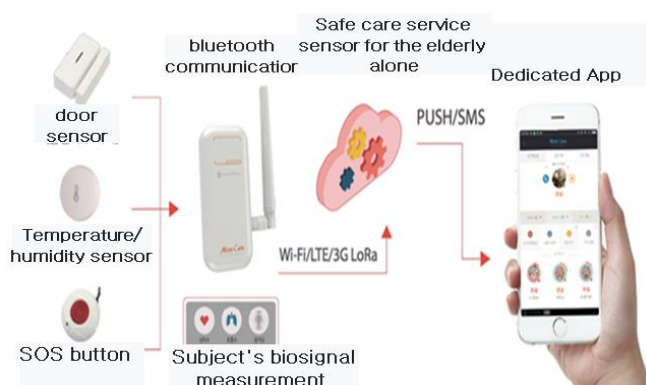


Figure 2; Structure of Safe Care Service for the Elderly Alone

2.4. Emotional Sympathetic Healing System

In artificial intelligence technology applied to the healthcare field, machine learning and HL7 FHIR interoperability are verified, and emotional state recognition and emotional state recognition speed are representative examples. In machine learning, when new data is given, it is a computer program that can learn by itself based on programmed logic or standardized rules, and can recognize, reason, and judge by itself. In addition, application of health care in machine learning/deep learning provides help in drug development and medical service decision making, and creates new health care services by combining with image and voice recognition technology. Image recognition is a field that identifies objects in images and locates them. Deep learning technology is applied to help doctors diagnose and prescribe. It provides help to the medical industry through medical recording and real-time conversational interpretation in fields that are expected to have high ripple effects by combining the process of listening to the sound signal of speech recognition by a computer and mapping it into text information and the Internet of Things. This can shorten the medical record writing time.

3. Results

3.1. Emotion Processing Engine Development

By tracking and analyzing bio-signals and activity information collected through IoMT (biometric sensor, HA robot, AI home hub), it provides senior care relief/emergency service and emotional sympathetic healing service for senior care. For the design of healing and relief services for senior care, the first thing to be done is to analyze user requirements and design the entire system, design an emotional sympathetic emotional state monitoring service and app, and design a function to collect and store PHR data and lifelogs for medical institutions based on open PHR standards and build. Building a data lake that stores large amounts of de-identified data, providing an open health companion service model development environment using a data sandbox, designing apps for guardians and experts, and designing emergency services.

Figure 3 is an emotional sympathetic emotion processing engine that monitors/classifies/stores sensor data collected from senior care sensors through the design stage, and develops an emergency call service by linking real-time analysis system development and AI algorithms. Classification of calls inside and outside the nursing home, and emotional state monitoring joy, sadness, anger, fear, etc. In response service development, we develop apps for use by senior citizens, families, welfare workers, careers, etc. for senior citizens' customized health care service companions, medication reminders, schedule management, emotional sympathetic healing, and safe service keeper. For experts in emotional sympathetic healing and reassurance service, emergency alerts from apps such as doctors, nutritionists, and counselors operate.

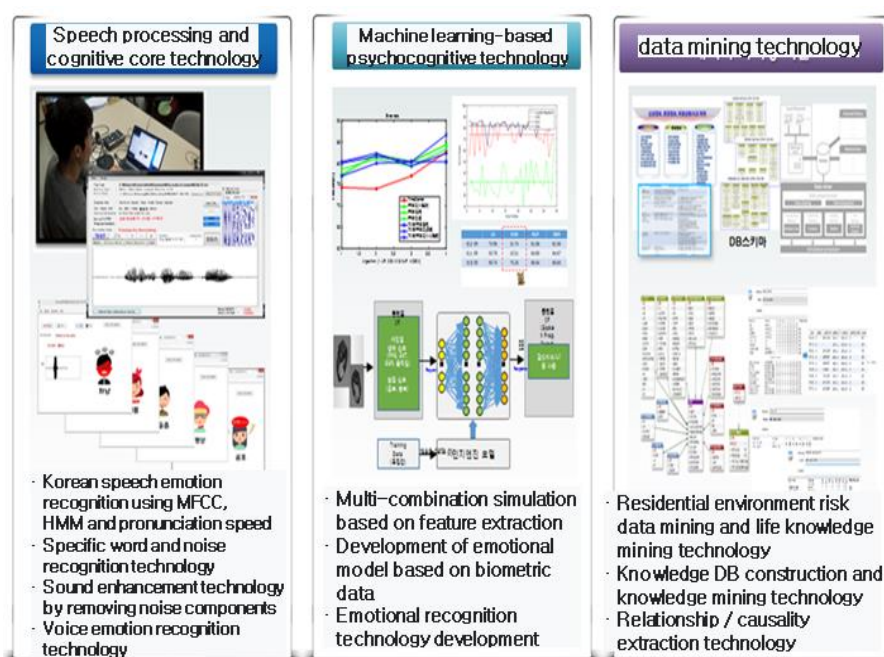


Figure 3; Development of Emotional Sympathetic Emotion Processing Engine

Figure 3 shows the establishment of an emotional sympathetic health companion service platform infrastructure and ecosystem by creating an emotional sympathetic health companion service ecosystem based on the open PHR standard, and a technical support portal

for the emotional sympathetic health companion service system. It refers to daily life safety support services such as emotional sympathetic health companion service keeper/professional app improvement such as health companion service algorithm and market place open for product sales, interactive companion service demonstration through emotion recognition, and real-time life helper service.

3.2. Emotional Sympathy Service

Develop core future-leading technologies with a large industrial ripple effect to create an industrial ecosystem in the era of the 4th industrial revolution. It is based on the provision of PHR standard guidelines that can lead the global standard of industry and technology convergence, the provision of AI-based emotional sympathy-type services for the elderly, and the activation of marketing through health companion services and ecosystem creation. In order to comply with the open PHR standard specifications and guidelines, it is absolutely necessary to develop an 'emotional and sympathetic health companion service system that can manage the safety and health of the elderly.

3.2.1. Senior AI-based Emotional Sympathy Service

The AI-based emotion recognition service algorithm monitors the emotional state and refers to joy, sadness, anger, comfort, fear, surprise, shame, happiness, and expectation. In the AI-based health assistant service algorithm, depression prevention requires conversation, exercise, games, songs, videos, SNS, diet, reading, and education. The emergency notification service algorithm prepares for abnormal signs/pattern recognition, falls/fractures, disappearances/lonely deaths, etc.

3.2.2. Multi-dimensional Health Companion Service, Ecosystem Creation

For the first service demonstration, a biosignal sensor + AI-based home hub is built, and for the second service demonstration, a biosignal sensor + HA robot + AI-based home hub is built. In addition, to revitalize the market through health companion service and ecosystem creation, a technical support portal for emotional sympathetic health companion service system will be established, and a market place will be opened to sell health companion service algorithms and products.

3.3. PHR-based Health Management Service Platform

In order to promote the creation and commercialization of a service ecosystem through collaboration with PHR-based health management service platform and PHR service ecosystem participating organizations, service demonstration is carried out through business cooperation with specialized agencies for the care of the elderly living alone, and expanded to 25 local government agencies specializing in care for the elderly living alone apply. Expand the business area by establishing a health companion service platform nationwide with city and city base institutions (16) and performing institutions (244), which are institutions that provide care for the elderly living alone. Enter the global market by securing global service and technological competitiveness through the application of international standards (HL7 FHIR).

4. Review

For PHR device development environment (SDK) development, kt healthcare terminal porting field and LGU+ healthcare terminal management ability are required. In the mobile terminal SaaS type cloud business, a SaaS service for corporate terminal control and a smartphone control SaaS solution for financial institutions and public institutions are required. Platform technology includes optimized H/W and S/W standard SDK design and production technology, open architecture technology and open source distribution (health care platform (MAPHIS), terminal remote control platform (FOTA), etc.) handle traffic.

4.1. Interactive Companion Service through Emotion Recognition

The HA robot and AI hub detect the facial expressions and voices of the elderly living alone and analyze their current mood to support a service that allows jokes and conversations to prevent depression. When there is no conversation or activity for a long time through motion and biometric information detection, the HA robot provides companion services such as greetings, jokes, and questions. By recognizing emotions and facial expressions, it improves the mental health of the elderly living alone by providing meditation contents and music according to a depressed state or mood change. In Figure 4, it analyzes the learned data through intelligent emotion/voice recognition, detects mood and depression, and provides appropriate mental stability content.

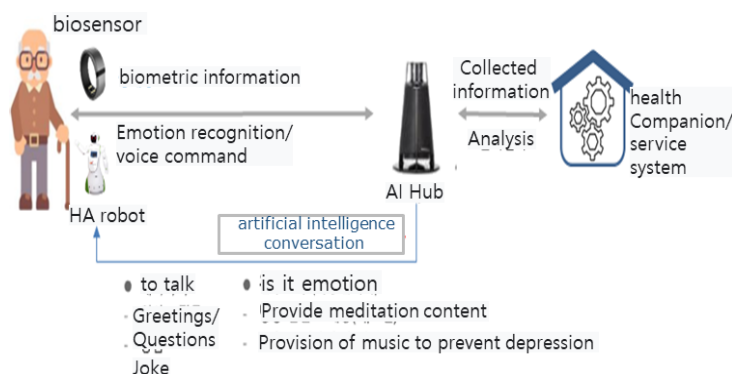


Figure 4; Interactive Companion Service Scenario

4.2. Development of Customized Healing services for the Elderly

To prevent depression and loneliness in the elderly, we provide games and contents such as behavior and language related to dramas and entertainment programs in the field of interest, and speech game services such as memory, language ability, and dementia prevention through AI hub voice recognition do. Figure 5 provides healing contents such as pictures, photos, and music for psychological stability, such as voice quiz matching services for popular dramas, music programs, and entertainment programs that the elderly are interested in.

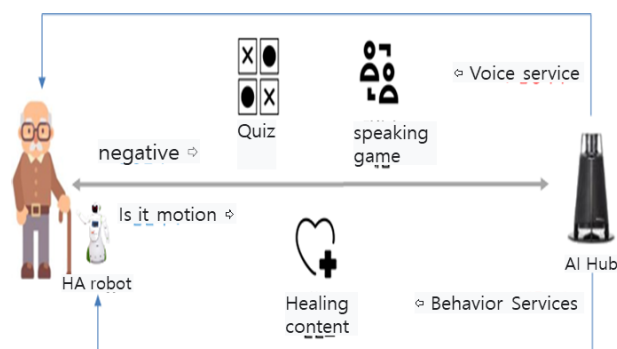


Figure 5; Scenario of Healing Service Customized for the Elderly

4.3. Daily Life Safety Support Service (for Professionals)

It provides a health status and emergency notification service by determining whether there is an abnormality in the daily activities of the elderly monitored by the wearable device's biometric information and the HA robot. Health status information notification and counseling service, wearable devices and HA robots are used to connect with a professional counselor in real time when abnormal health conditions are detected. In addition, when a health signal is detected as an emergency or emergency, emergency situations are automatically received and dispatched to 911 or a related hospital institution. In order to care for patients with cardiac arrest, apnea, and falls, in Figure 6, an HA robot camera that supports daily life safety is installed and used for residential security, safety, and crime prevention notification service provision.

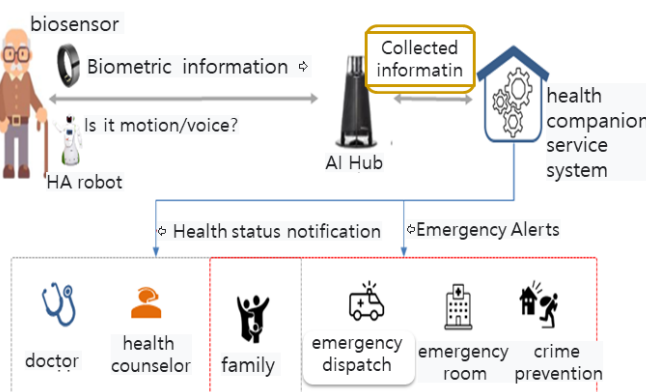


Figure 6; Daily Life Safety Support Service Scenario

5. Conclusion

We develop emotional sympathetic healing and health management services that comply with health companion service algorithm and open PHR standard specifications. This will solve the blind spots for the safety and welfare of the single elderly, expand the field of smart industry application, and contribute to the development of related industries such as health promotion and quality of life for single elderly people. Increase the use of medical information by supporting the safe living environment of single elderly people through the establishment of a multi-institutional exchange and cooperation system. In addition, it will strengthen the social safety net of the elderly by changing social awareness and expanding evidence-based policies through suicide prevention by the elderly, and raise the status as an advanced country by reducing the suicide rate. By resolving exclusionary measures for the

social safety of single elderly people and preventing extreme accidents, the social safety net is expanded and the state-owned safety prevention is realized. In the future, we will contribute to the promotion of safe and healthy welfare for seniors by developing apps for healing and relief services through emotional sympathy and developing emotional sympathetic healing service solutions.

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