Development of a Smart Early Detection System for Solitary Deaths Based on Life Response Data

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ABSTRACT

This study developed a smart early detection system for solitary deaths in South Korea using life response data. The system analyzes living patterns of elderly people living alone, detecting abnormal signs based on remote meter reading data and CCTV entry information. It integrates an AI-based data analysis model with a GIS-based monitoring system. Experimental results showed high performance in data collection, analysis, and relearning speeds. This system is expected to contribute to preventing solitary deaths and improving the quality of life for elderly people living alone.

INTRODUCTION

South Korea faces a rising number of elderly people living alone due to rapid aging and increasing single-person households. The 2022 solitary death survey by the Ministry of Health and Welfare shows an upward trend in solitary deaths, particularly among the elderly in their homes. Solitary death, discovered after a period following an individual's death alone, raises concerns about personal dignity and social costs. This study aims to develop an early detection system for solitary deaths using life response data.

DESIGN AND IMPLEMENTAION

1. System Architecture

The System Components

- Life response data collection system
- AI analysis model for life response data
- Monitoring system for vulnerable groups

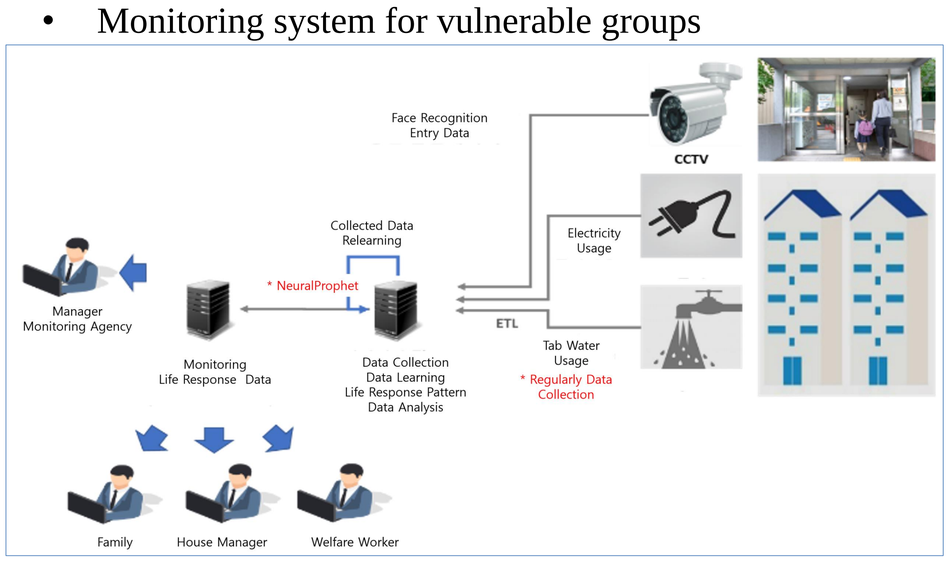

Fig 1. System structure diagram

2. Data Collection and AI Based Analysis Model

Data Collection and Storing to Database

- Remote meter reading equipment collects electricity and water usage data
- CCTV entry information is gathered from main entrances
- Data is preprocessed and stored in a MySQL database

AI Analysis Model

- Implemented using NeuralProphet
- Features include learning of trends, seasonality, and anomaly detection
- 4-level classification: Normal, Caution, Warning, Danger

Fig 2. Embedded data collection equipment and learning data

3. Monitoring System and Face Recognition

Running and management

- GIS-based UI for visualizing data and managing alerts
- SMS notification function with error minimization algorithm

Face Recognition System

- Uses RetinaFace for face detection
- CNN-based model for face learning

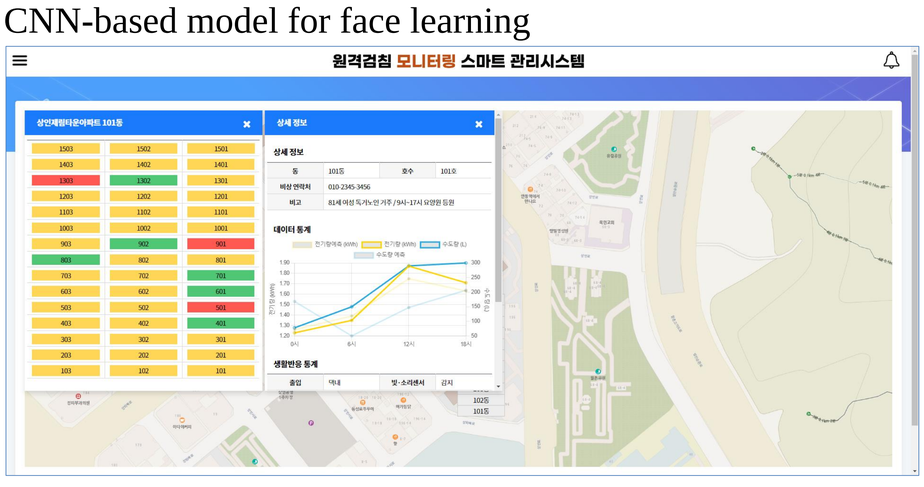

Fig 3. Main screen of life response monitoring platform

4. Experiments and Results Analysis

Experiments conditions and evaluation

- Experimental setup : 1,000 data points each for 1,000 water and electricity meters
- Evaluation: Data collection speed, analysis speed, relearning speed
- Environment: VM-based server with Elastic/Opensearch

Experiments Results

The system significantly outperformed targets in all evaluation areas

Evaluation Item	Target	Actual Result
Data collection speed	3 seconds/case	0.013 seconds/case
Data analysis speed	2 seconds/case	0.037 seconds/case
Relearning speed	40 seconds/case	8.2 seconds/case

Table I. Evaluation system test results

CONCLUSION

This study developed an early detection system for solitary deaths using on-device life response data. Key achievements include non-invasive monitoring, data analysis, GIS-based UI, and face recognition entry management. Future improvements involve expanding applicability, enhancing performance, and linking with other services. The system aims to prevent solitary deaths and improve quality of life for elderly and single-person households.

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