

LifeChecker

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Abstract—With the development of technology in the world, the average life expectancy of humans is gradually increasing worldwide. This means that old people would have to live a healthy life for a long time. However, elderly people get reluctant to go to the hospital, and if they do, they get examined at the hospital only when symptoms develop even though they are more vulnerable to diseases. We are going to present to you a new home appliance that can actively examine one's health, advice him, and warn him about suspicious symptoms correlated to dangerous diseases while keeping a diagnostic report to the user.

TABLE I
A LIST OF ROLE ASSIGNMENT

Roles	Name	Task Description
Development Manager	Lee Seungsu	Lee Seungsu was responsible for designing the overall concept of the software and finding the basis for various claims.
Software Development	Park Geonryul	Park Geonryul was in charge of the actual implementation of systems and machine learning. In addition, a basic framework for document creation was created.
Customer	Elia Ayoub	As a customer, Elia uses the designed products and services produced by the team and delivers an objective feedback accordingly.
Document Analysis	Ryan Jabbour	Ryan was given the task of checking all the documentation to present and the logical development of the project.

I. INTRODUCTION

A. Motivation

With the development of technology and healthcare in the world, life expectancy has gradually increased over the years and is approaching a staggering 80 years old. The infant mortality rate has also continued to decline, decreasing by nearly 3%. But is this an indicator that the society is an entirely satisfied?

Health is one of the most important factors in a person's life. Increasing life expectancy in an unhealthy state makes life even harder. Precaution measures against diseases are much more important than treatments themselves in order to

maintain a healthy life for a long time. However, there are cases where the elderly are reluctant to go to the hospital due to habits or due to misunderstandings arising from their experiences. There are cases in which the right time to prevent or treat the person had already passed and it was already too late, and that was to blame on the person itself only. In modern society, where aging and nuclear families are progressing, as people become older, their connections with their families becomes looser. Then, in this context, not worrying about one's health and not taking preemptive measures can lead to serious social problems.

This problem is not defined only to the older generation. A growing number of people have started living alone especially in South Korea and similar problems can appear in these single-person households. Because of living alone, ones can't point out their unhealthy habits. And if this person gets an acute disease, they won't be able to take the proper measures, which could lead to serious health problems.

In this social trend, we thought of designing preemptive and active health care services. A system can be established to periodically check the health of the people living in a household, both single-person households and old people, in order to detect signs of diseases in advance. If this health check service was supported by every home appliance, we could imagine a household that actively protects our health daily and not just a passive household that passively neglect dangerous health issues.

B. Research on Related Materials

- Project MONAI

MONAI is an initiative started by NVIDIA and King's College London to establish an inclusive community of AI researchers to develop and exchange best practices for AI in healthcare. This collaboration has expanded to include academic and industry leaders throughout the medical field.

This project is similar to our project because it is simply analyzing MRI or CT photographs with AI, but the methods used are different.

- BASLER

This project provides an overall solution for the vision system. It supports hardware and software at the same time and can analyse images based on machine learning. It is specialized in medical care particularly. However,

sensors and cameras are very expensive, so it would be difficult to apply them to home appliances as they are presented in this project.

- **Kaggle Project**

It is a stroke detection project undertaken by Kaggle. It can be used as an AI model for our project but since the algorithm used in this project is based on 2D images, it differs from the 3D recognition we need to use in our project.

- **Related Papers**

We researched a number of papers to find the theoretical part for our project. The FAST technique can determine a stroke with a facial photo. Then, a multi-angle facial expression can be detected with one camera. Finally, we found that deep learning can be performed with facial landmark using CNN.

II. REQUIREMENTS

A. Front-End

1) *Camera*: The camera component is a pivotal element of the system, responsible for capturing and recognizing the user's face. It must provide high-quality input images for accurate disease detection, specifically focusing on the early signs of conditions like stroke. The camera should meet the following criteria:

- High-resolution imaging capability to capture facial details.
- Integration with suitable optics and lighting for optimal image quality.
- Real-time image capture with minimal latency.
- Environmental adaptability to perform effectively in various lighting conditions.

2) *Speaker*: The speaker is a vital component for conveying the results of the face recognition and disease detection process to the users. The speaker should serve the following functions:

- Provide clear and intelligible voice feedback.
- Deliver the results of the face photo analysis in a user-friendly manner.
- Integrate text-to-speech (TTS) capabilities to communicate results.
- Ensure audibility and volume control to suit different user preferences.

B. Middle-End

1) *Raspberry Pi*: The Raspberry Pi acts as an intermediary that facilitates the seamless interaction between the front-end of the software, the camera and the speaker, with the back-end of it, the artificial intelligence servers.

- The Raspberry Pi should efficiently relay data between the camera and speaker.
- It must be compatible with the chosen camera and speaker hardware.
- Adequate computational power to handle image processing, data formatting, and communication with the AI server.

C. Back-End

1) *Face Recognition AI*: This is the heart of the system, an AI model designed to recognize facial features and determine whether there are signs of a specific disease, such as stroke. Key considerations for the Face Recognition AI component include:

- Implement a Convolutional Neural Network (CNN) model to effectively process and analyze facial data.
- Develop the AI model using Python and PyTorch, taking advantage of their powerful deep learning capabilities.
- Train the model on a comprehensive and diverse data set of facial images to ensure robust disease detection.
- Aim for a high level of accuracy and sensitivity in disease detection while minimizing false positives.
- Ensure the AI can process data in real-time to provide timely results.
- Scale the AI system to handle the desired number of users as needed.