Smart Senior Citizen Facial Emotion Analysis with Robotic Bot Assistant

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Abstract- *One of the primary drivers of the activity recognition study is thought to be the challenges encountered by elderly individuals who live freely. The majority of people will experience loneliness if no one is around to look after them. The development of sensing technologies has made it possible to wirelessly communicate and gather a variety of data types. Nevertheless, the majority of activity recognition systems in use today use pre-built pattern recognition models. The theoretical underpinnings of a real-time approach for activity and emotion recognition are laid out in this study. It makes use of a camera-based accessing pattern to display various emotions, such as sadness, tears, depression, etc. The system will be processed with Back Propagation Neural Network (BPNN). The system identifies the emotion detection with the system analysis. The implementation can be done with the identification of the proposed system. A suggested conceptual framework for an autonomous monitoring system for elderly individuals, which could reduce the requirement for explicit user input or engagement while keeping monitoring the elderly person(s) well-being, is thus based on an effective analysis. The virtual robotic chats will be implemented inside a comprehensive and optimal structure within the system. A voice based assistance done with HMM algorithm is generated using the implementation where a bot based care taker is used.*

Keywords- Back Propagation Neural Network (BPNN), HMM, Emotion detection, Explicit analysis.

I. INTRODUCTION

Older adults, sometimes known as senior citizens, are frequently left alone in regular homes or old age homes. They experience intense sadness as a result of this issue, and they feel awful about being alone in their homes. In order to eliminate the loneliness experienced by those who are dealing with a serious situation, a solution to the software problem must be developed.

The developed solution must be more effective for the elderly, who must be satisfied with the way it has been implemented. The advancement of technology has significantly enhanced both people's lives and machine learning (ML). The issue of "population aging" affects many nations, meaning that an aging population necessitates greater access to social, medical, and nursing services.

Many older persons will have one or more diseases, impairments, or chronic ailments that need to be managed in order to preserve their ability to live independently. The American Medical Association Journal addresses the readiness required for improved health and medical treatment for an aging population. The artificial intelligence (AI) system that has been put into place combines a number of clever elements to actively help an older person at home. In particular, we detail how temporal constraint violations are recognized and utilized to initiate meaningful and contextualized proactive interactions. This is done through the use of constraint-based scheduling technology to actively monitor an individual's pattern of activity. In addition, this research offers a psychological assessment of the system that focuses on the attitudes of senior citizens and takes into account the system's acceptability, perceived value, interaction modality, and emotional response.

In summary, the suggested system observes that the field of technology for senior care has reached a relatively advanced stage. It is true that many auxiliary equipment types available in today's aged assist equipment can satisfy the needs of the old; nevertheless, keep in mind that these are merely helper machines, not robots. The elderly must manually handle the remote control or yell a word of speech using it.

Robotics has become more widely used in several industries in the last few decades. Self-directed robots have begun to appear in human life, particularly in domains pertaining to the well-being of the elderly. Globally, the number of elderly individuals is increasing dramatically. As a result, there is a growing need for personal care robots. The objective of The goal of this demand is to encourage independence and increase mobility opportunities. Robotic care will eventually come into close contact with human lives. However, in the future, what kind of responsibilities will robots play in the house before elderly people? It depends on the types of robots as well as the aspects of aging covered in the research. The role and purpose of robot care in the lifespan

of elderly individuals is examined in this article. It considers both the benefits and drawbacks of using robots in daily life. According to the World Population Prospects (19th revision), 11% of the population was 65 years of age or older in 2019 and 16% of the world's population (16% of all people) will be 65 years of age or older by 2050. The swift increase in the population over 65 has raised and will continue to raise issues related to health management, particularly for the elderly who suffer from chronic illnesses. The necessity to provide care for the old has prompted research into several approaches to managing aged care.

Technology-based non-pharmacological therapies, like robotics, have been shown to extend independence and postpone an old person's admittance to an assisted living facility. This essay will examine the several kinds of robotic systems that are now on the market for providing care for the elderly. This research will examine robotic solutions with applications in senior care that are humanoid, animaloid, or non-humanoid in nature. We'll also talk about the different uses for robotics and the kinds of robots that are used to provide care for the elderly oversight.

The healthcare sector for the elderly, like other businesses, requires a new method of delivering healthcare services known as automation of aged care.[4] It is believed that this new strategy will lessen the load on caretakers and enhance the quality of life for the elderly.[4, 5] The use of robotic technologies has grown in popularity recently as a result of rising healthcare expenditures, an aging population, and a shortage of caregivers.[4, 6]

Furthermore, a small percentage of the elderly desire to live as independently as possible rather than in nursing facilities.[5]

The foundation of artificial intelligence is the idea that human intelligence can be described in a way that makes it easy for a machine to emulate and perform jobs of any complexity. One of artificial intelligence's objectives is to simulate human thought processes. When it comes to concretely defining processes like learning, reasoning, and perception, researchers and developers in the field are moving at an unexpectedly fast pace. There are others who think that in the not too distant future, inventors will be able to create machines that are more intelligent than humans in any given field. However, because value judgments are inherent in all cognitive activity and are influenced by human experience, some people choose to remain dubious.

Algorithms are used by reactive AI to maximize outputs given a set of inputs. AIs that play chess, for instance, are reactive systems that maximize the optimal move to win. Reactive AI is typically quite static and incapable of picking up new skills or changing with the times. It will therefore yield the same result when given identical inputs.

AI with limited memory can adjust to previous experiences or refresh itself using fresh information or observations. Frequently, there is little to no updating (hence the name), and the memory is not very long. For example, autonomous cars are capable of "reading the road" and "learning" from previous experiences to adjust to unfamiliar circumstances.

II. RELATED WORKS

Ensuring the quality of care for elderly individuals has become challenging in Japan due to the continuous decline in the labor force. We are suggesting a communication robot system to keep an eye on elderly individuals who live alone in order to address this issue. The goal of the robot system is to lessen the workload for caregivers while preserving the social and cognitive abilities of senior citizens. The features and application of natural language in our communication and monitoring robot system are covered in full in this study.

Systems of healthcare robots could be a significant part of the answer to the societal issues that face our aging population. In earlier work, we developed healthcare robot systems and services for the elderly and discovered that elderly individuals can accept and benefit from robots to help with health care. We created cognitive games for senior citizens, and they seemed to enjoy them. We also looked at the music videos that elderly people like. All things considered, these medical robots may prove advantageous for older populations whose members experience ailments necessitating mental support. In this research, we investigate whether younger generations embrace healthcare service robots intended for the elderly population.

The goal of this study is to build an assistant system that uses a smartphone and robots to support elderly people, following the ideal user model. Human data can be a reflection of an individual's lifestyle, therefore the writers gather data on people's everyday activities to build a user model, which they then utilize to provide users with relevant services. In order to give the user with suitable service, we apply the user model to the 3D acceleration sensor that we employ to capture the human data. We decide to apply the user model for the system because it can filter and classify the user data.

Utilizing 3D acceleration sensors that users carry, we gather human motion data and store it in a database so that

Motion logs may be generated. Motion logs can then be used to construct Life logs. The user models are produced by Life log mining. By using the user models, the system may then directly assist senior citizens. The purpose of the system's display of their social information is to encourage older people to interact with one another by showcasing their shared interests. The study demonstrates the potential for utilizing user models to assist senior citizens with their social circumstances. We explore the issue of learning young people's opinions about healthcare service robots in this paper. In this study, 65 university students, ages 16 to 30, used Skype, vital sign monitoring, and prescription reminders using our healthcare robot system. Results indicated that young people thought medication reminders and vital sign monitoring would be most helpful for elderly individuals, but would also be moderately helpful for kids, teens, and young adults. They also evaluated the robot's usefulness and convenience of use relatively highly. They thought that Skype was a good feature for people of all ages, but particularly for teens. The only notable gender disparity in the ratings was the perception held by women that the medication reminder service would be less beneficial for younger persons.In conclusion, younger people may find a robot intended to help older persons with healthcare acceptable, and the study's findings will aid in determining what further demands younger people with chronic illnesses have that aren't being satisfied.

The autonomous feeding robot has a wide range of potential applications in the sectors of medical care and social old care. It is designed to address the challenge of self-feeding for the disabled. The majority of feeding robotic systems on the market today, however, have set operations and are not entirely capable of meeting the diverse needs of the disabled. The systems typically lack the ability to interact with the disabled and can only do activities inside predefined protocols. In this study, we build a robotic system for autonomous feeding that is multimodal in nature. It is made up of three modules: one for interaction control, one for visual perception, and one for voice recognition. The speech recognition module offers a portal for people to communicate with robots.

III. EXISTING SYSTEM

In the existing system a communicative robotic system has been generated with efficient monitoring them remotely. As robotics technology becomes more and more common, elderly care robots have also been introduced. Seniors can get companionship, health monitoring, and everyday job assistance from robots. Elderly-robot interaction raises a number of ethical questions notwithstanding the benefits of robots. Because they see fewer people in their life, elderly individuals may become lonely or feel less in control of their lives. Elderly people may lose their own freedoms. In this study, we attempt to draw attention to the ethical issues and offer some initial recommendations that could be useful in lowering the ethical issues through the use of tailored systems with appropriate guidelines and older people's consultation.

There is much to be gained from studying human interpersonal connection through robotics, even if a large portion of research on human-robot interaction focuses on people interacting with autonomous robots. In the present study, older adults a demographic that can profit from increased social connectivity and communication with remote people use mobile remote presence (MRP) devices. In order to guarantee older individuals' safety, independence, and social support and maybe enhance their quality of life and preserve their independence communication technologies are crucial.

But before older individuals would embrace and use such technologies, it's important to know what they think about the advantages, drawbacks, and requirements for using robotic systems. As a result, we worked with twelve willing volunteers (ages 63–88) to complete a needs assessment. They gained first-hand experience meeting visitors using the robotic system as well as operating the robotic system to visit them. Benefits mentioned by the older adult participants were lowering travel expenses and inconveniences, lowering social isolation, and being able to see and be seen via the robotic system. Among the issues raised were excessive system use, personal privacy, and roboticsystem.

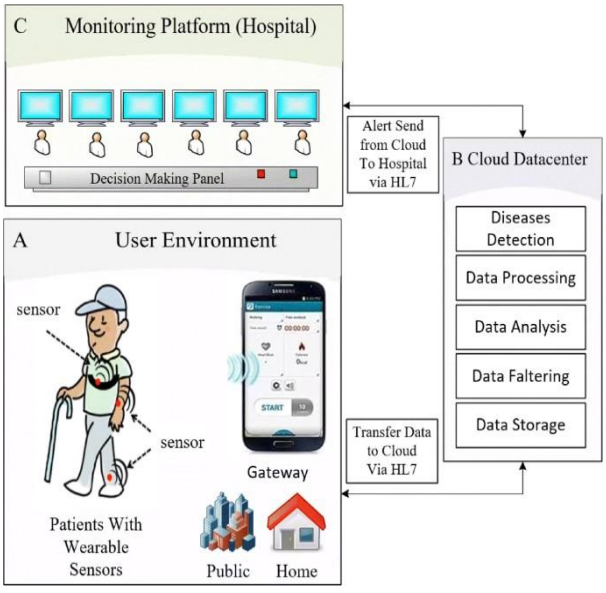

Fig 1 Existing system architecture

IV. PROPOSED SYSTEM

In the proposed system, smart monitoring of emotion analysis of the concern old people has been done. HAAR cascade plays a vital role in the generation of the concern maintenance of the face feature extraction. Back Propagation

Neural Network (BPNN) is used to match the emotion analysis with voice based classification patterns. The voice assistance based on emotion done with Hidden Markov Model HMM signal generations.

The development of artificial intelligence has paved the way for a plethora of software-based applications that are intuitive and hands-free, spanning from basic applications to home automation.

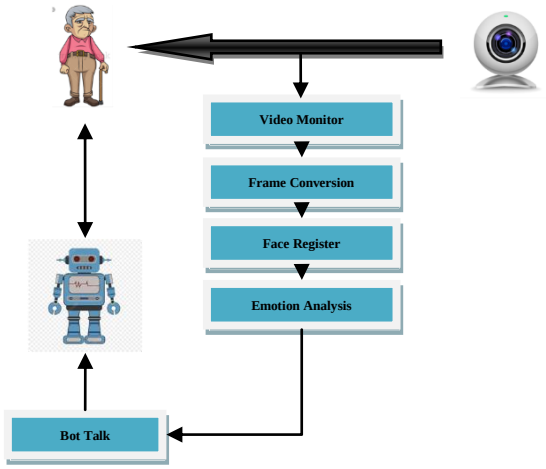

Fig 2 System architecture of the proposed system

The potential for expanding communication between the patient and the caregiver has improved thanks to the integration of artificial intelligence and natural language systems.Permitting the creation of EPH text forms and a real-time patient assessment. Using speech technology and artificial intelligence (AI)-based natural language writers, a hands-free smart device with multilingual voice interface is being developed to monitor elderly people's emotional health. In the medical field, emotion detection holds great promise for the diagnosis of illnesses that impact verbal communication in people. By employing an HMM to identify the voice-based help, the system projects the BPNN.

V. METHODOLOGY

(i) Video Acquisition

The system aims to improve the quality of the movies obtained from the thermal imagers and furnish the imagers with the capacity to acquire, broadcast, and analyze videos. In the PL section of the FPGA, a video processing and capturing unit will be implemented. These units will be in charge of implementing video processing, such as bilateral/Gaussian filtering and 2D-FFT/IFFT, after receiving PAL video data at a frame rate of 25 frames per second.

Ethernet and USB are unable to handle such a high speed. The raw data rate of the frames created for PAL video @ 25 frames per second is 20 M-Bytes/sec. As a result, before streaming video over Ethernet, it must be compressed. We'll compress with JPEG.

(ii) Frame Conversion

When creating material for devices that employ various standards (like NTSC vs. PAL) or different content playback scenarios (like film at 24 frames per second vs. television at 25 frames per second or 29.97 frames per second), frame rate conversion is usually used. It is possible to combine several acquired frames into a single recorded frame by frame processing. Before the final frame is decoded, the combination takes place. The following frame processing options are available for selection: Absence of frame averaging, frame summing, and frame processing.

(iii) HAAR Cascades

No matter how big or little an object is in the picture, the Haar cascade method can identify it. This algorithm can operate in real time and is not very sophisticated.

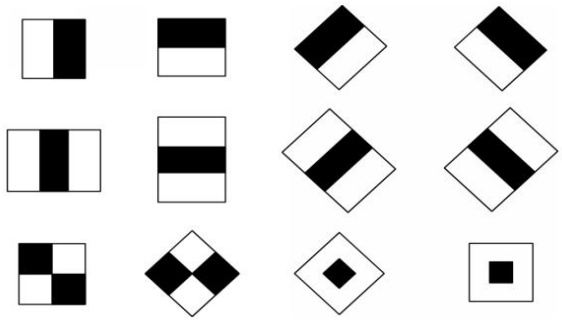

Fig 3 HAAR Cascades

A haar-cascade detector can be trained to identify a variety of things, including face featuresOne of the first and most effective face detection algorithms ever developed is Haar Cascade Detection. It was there for a very long time before Deep Learning gained notoriety. Haar Features were utilized to identify faces as well as eyes, lips, and other features.

(iv) BPNN classification

The fundamental component of neural network training is back propagation. It is a technique for optimizing a neural network's weights according to the error rate recorded in the preceding epoch (i.e., iteration). By improving the model's generalization, you can lower error rates and increase

its reliability through proper weight adjustment. "Backward propagation of errors" is the abbreviation for back propagation in neural networks. It is a common technique used in artificial neural network training. This technique aids in the computation of a loss function's gradient with regard to each weight in the network used to categorize the various emotional states.

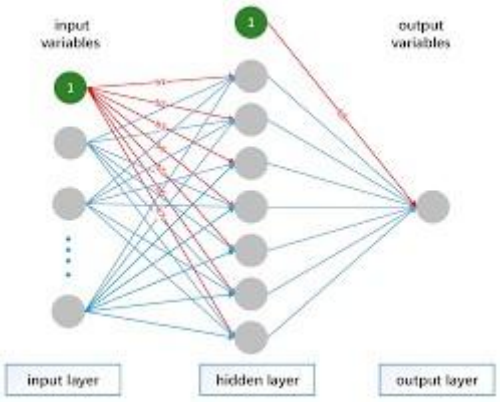

Fig 4 BPNN Architecture

By using the chain rule, the back propagation algorithm in neural networks determines the gradient of the loss function for a single weight. Unlike native direct computation, it computes one layer at a time effectively. Although the gradient is computed, its application is left undefined. It expands on the calculation found in the delta rule.

(v) Emotion Detection

The BPNN classification method is used to identify the emotional state of the elderly. This emotional information are provided to the chat support. Back propagation neural networks are mostly used for layer transfers from input to output. The back propagation neural network gets its name from the fact that errors are identified at the output layer and are removed by moving backward in the neural network.

(VI)HMM chat

A voice communication process known as "hidden morkov model chat" is demonstrated at an extreme data analysis level. The communication text and sign that are provided are turned into a voice-based process. The Hidden Markov Model (HMM) technology is used for application maintenance, where text signals are combined with noise and transformed into speech.

VI. RESULT AND DISCUSSION

Python is a software tool that may be used to apply the entire technique and examine the results of the proposed system. Four speech categories happy, furious, hostile, and sad were used as the basis for the experiment in Python 10. After the processing has been recorded, accuracy can be determined by applying BPNN. The collected features are fed into BPNN, which evaluates their accuracy based on several metrics listed below.

a) Epochs: The neural network's epochs are the number of iterations it goes through. Three of the 500 iterations in this case have correctly identified the speech file's category. Although the network averages the three iterations and displays the best outcomes out of time, the system does not anticipate that the best result will appear at the third iteration.
b) Time: It establishes how much time was spent on the prediction overall.
c) Performance Measure: Plotted using the neural network's SOM plots, it shows the elapsed performance hit in the network architecture.
d) Validation Checks: This shows how many validations the network is able to apply to the testing process.The 95% accuracy attained when testing the signals of various categories is shown in chart 5

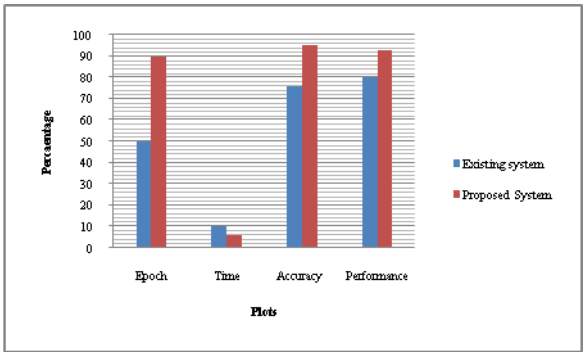

Fig 5 Comparison chart of the system implemented

VII. CONCLUSION AND FUTURE SCOPE

This study adds credence to the hypothesis that results could differ depending on the approach taken when analyzing facial expressions for emotion recognition. The differences between the labeling and semi-open categorization paradigms were investigated in this study. Researchers may be compelled to adopt a different strategy when examining emotion recognition, taking into account the impact of context on the interpretation of facial expressions and emotions and moving toward paradigms that more closely resemble real-life emotion recognition, given the unclear attribution to the differences that have been found. Through chat training and

HMM conversation, the project also assists the elderly in changing their emotional states.

In future development, the old people can be monitored with a real time surveillance with an IOT based robot creation. The emotion can be detected at a accurate rate of 100% generation system.

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