Smart Homes Concept Using the Emotion Learning Approach of Machine Learning

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Abstract : Technology is always evolving and with this innovation, we experience convenience with every new advancement. Not only are these intelligent machines improving our daily routine, but they are also boosting our safety and security. The research for Smart homes is aimed towards converting wall colors, changing light colors around the house, and having a face-scanned door entry system. This system will stand as a pillar in the future and with smart society development. The approach makes use of machine learning to detect faces and emotion analysis, making it the best choice for your business.

IndexTerms – SMART Homes, Machine Learning , Emotion Detection.

I. INTRODUCTION

Human brain features allow facial emotion recognition software to recognize emotions and express them on their face just like a human would. The technology works by analyzing images to match a person's facial expressions with those of the people in a database of faces producing, the closest matches when found. Facial expressions are detected for investigations. Emotion recognition allows a variety of different things, including detecting emotions. [1]

Primary emotion levels are divided into six types: Love, Joy, Anger, Sadness, Fear, and Surprise. These feelings and thoughts are usually expressed through different facial expressions. We can use this technology to gauge consumer moods towards products or brands. It is also good for health care as it helps patients find medicine necessary. In the automation sector, we can use this to understand human emotions which will benefit our cars. Imagine your car asking you to take a lunch break! [1]

Machine learning can learn and quantify human emotions, allowing you to see when they show a smile or other emotion. [2] Emotion sensing technology is a new design approach which will involve tasks more complex than simply creating a visual design. The new approach integrates different aspects such as behaviours and facial expressions, among others. [2]

Understanding human emotions is extremely important and necessary to survive. Women are better at reading emotional cues than men, especially fear and disgust. Humans need to read emotional cues in order to successfully interact with each other. People who are experts in reading emotional cues such as traders, godmen, fortune tellers, etc., have an advantage over those who aren't. [3]
 Computers can do a good job of understanding people, which is surprising considering they lack emotions. Even the most serious crimes may be overlooked if someone had to hide their emotions. Computers use close tracking of Internet activities, activities on social networks and interactions with other users to understand people's personalities and behaviour. [3]

Technology has developed sensing technology that is capable of understanding human emotions and reactions in detail. The sensors allow for real-time recordings, and in the future, it will be able to forecast emotions based on data. [4] With technology that can analyze facial expressions, body language and voice, designers will be able to create new interfaces tailored to the many ways people interpret emotions. [4]
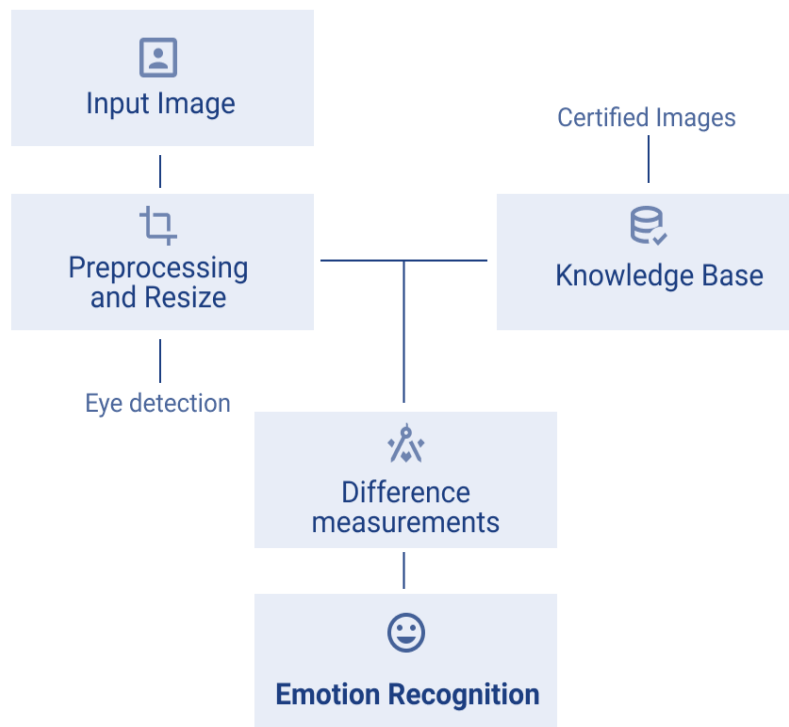
Fig 1. General Concept of Emotion Detection

The emotion sensing technology can have wider applications to other areas in the future. For instance educational and diagnostic software, driverless cars, personal robots, pervasive computing and sentient virtual reality. [5] Skin conductance sensors are used in clinics, hospitals and other settings. They can measure a person's heart rate, blood pressure and temperature to define their emotional state. Sensors are generally connected to an IoT device like a wristband or smartphone, but the technology is evolving quickly and we'll soon have full-body sensors that can measure a person's emotional state from many different angles. [5]

This cutting-edge technology is easy to use and can help track your physical condition better. Sensors, such as smart watches and health wearables, analyze emotional reactions you have during everyday tasks. Such devices allow you to learn how to manage stress and anxiety. [6] Turning on a device will prompt users to either practice mind-controlling techniques, breathing exercises, or calmly listen to music. Emotion-sensing technology gives feedback to users with the help of emotional artificial intelligence and can track skin conductance, breathing, heart rate and eye movements. This is done by adding inexpensive recognition software or additional code for computers or smartphones.[6]

II. LITERATURE REVIEW

T. Yang, C. Wu, M. Su and C. Chang [7] It is vital to distinguish bipolar upheaval patients from unipolar despondency patients in order to determine the correct and speedy treatment for these individuals. With facial recognition software, researchers have been able to find that an individual's profile is dominated by either happiness or sadness—allowing them to specify the appropriate treatment for that person.

T. Hasegawa and S. Kato [8] By examining the patterns between speakers' personality and their perception of the discourse, it is accurate to see some differences in opinion. Spoken communication has two different states: one is a dynamic state which is analyzed by how fast speech can be completed and perceived as more intriguing, while the other is a more formal state for speeches that are scripted and seen as uninteresting.

S. Rossi, J. H. Lee and R. I. [9] Video games are increasingly important in libraries. To support library patrons, it is necessary to create a metadata standard to assess the emotional state of their medium. In this article, authors create a Controlled Vocabulary for computer games with defined categories such as emotions. This will allow for more refined searches and more accurate circulation practices. However, it is not clear which terms are pertinent in these situations and will require further assessment..

A. Jaiswal, A. Krishnama Raju and S. Deb , 2020 [10]New deep learning models provide a more accurate and efficient way to detect an individual's emotions from images. These models are more accurate than traditional methods and can be used for facial expression recognition.

D. Y. Choi, D. H. Kim and B. C. Song, 2018 [11] One way for AI to recognize emotions is by recognizing micro-expressions, expressions that have a lower intensity rather than a higher one. By converting existing coordinates for landmark information into 2D images, emotions can be accurately categorized according to the emotion and intensity it has. The accuracy of recognizing emotions rises even more with the use of CNNs and LSTMS. This method also works on finer facial expressions with 77% accuracy.

P. Babajee, G. Suddul, S. Armoogum and R. Foogooa,2020 [12] The accuracy of a computer predicting human emotional responses can be improved with the help of deep learning. The system is trained using a labeled data set that contains facial emotions and also face detection, feature extraction and other data pre-processing techniques. Our work in progress demonstrates an accuracy rate of 79.8% for all basic facial expressions.

III. PROPOSED CONCEPT

Step 1: First for all we will begin the process of examination.

Step 2: To start will we will access the house using the door camera.

Step 3: Camera will take the picture and examine the system for face recognition.

Step 4: Examine the face using the Eigen faces algorithm.

Step 5: Perform the Image Segmentation and also perform the connected region analysis to find the area of interest from the captured image.

Step 6: Perform the binary pattern analysis of the image.

Step 7: Perform the Facial Components Analysis like Eye, Ear and Lips analysis using the Curve Patterns and training models obtained for the dataset of images and Detect the Emotion.

Step 8: If (Detected_Emotion == "Smile") Then

        Turn Light to Red

        Play Video Song with Smile Emotion

    Else If (Detected_Emotion == "Normal") Then

        Turn Light to Blue

        Play Song with Normal Emotion

    Else If (Detected_Emotion == "Surprise") Then

        Turn Light to Yellow

        Play Video Song with Surprise Emotion"

    Else If (Detected_Emotion == "Sad") Then

        Turn Light to Light Green

        Play Video Song with Sad Emotion"

    Else If (Detected_Emotion == "Ambiguous") Then

        Turn Light to White

        Play Video Song with Ambiguous Emotion"

    [End of If structure]

Step 9: Stop

IV. IMPLEMENTATION AND RESULT ANALYSIS

The coding language used to develop our design is Visual Studio which comes with languages like c# and VB.Net. The GUI for the proposed project is created with C# and the coding is done in C#. In the proposed work, we use Microsoft SQL Server as our database platform. Work is done using VS 2010 and is all written in C#.
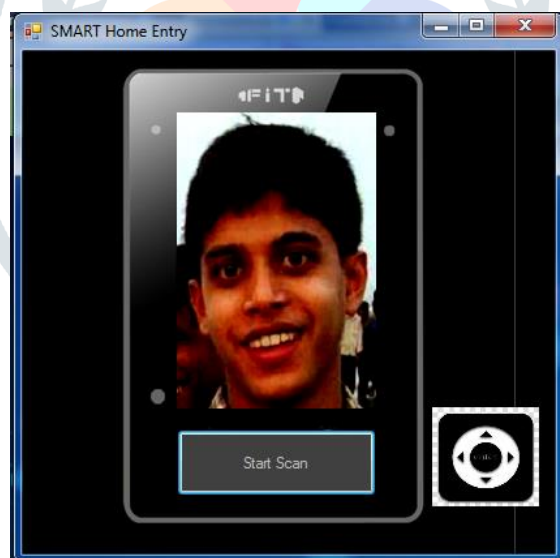

Fig 2. Entry Scanner

Fig 3. Emotion Analysis

Eigenfaces is a technique for recognition and acknowledgment of people. This method recognizes the changes in appearances of faces from photos, preserving space and time because it doesn't have to search through every photo to examine possible data. Systems can now recognize human emotions by analyzing facial expressions. The Smart Home changes the environment and sound to your preferred situation.

For the comparison purpose, we have compares the samples and from the sample comparison the following results are achieved.

Table 1 Result Analysis

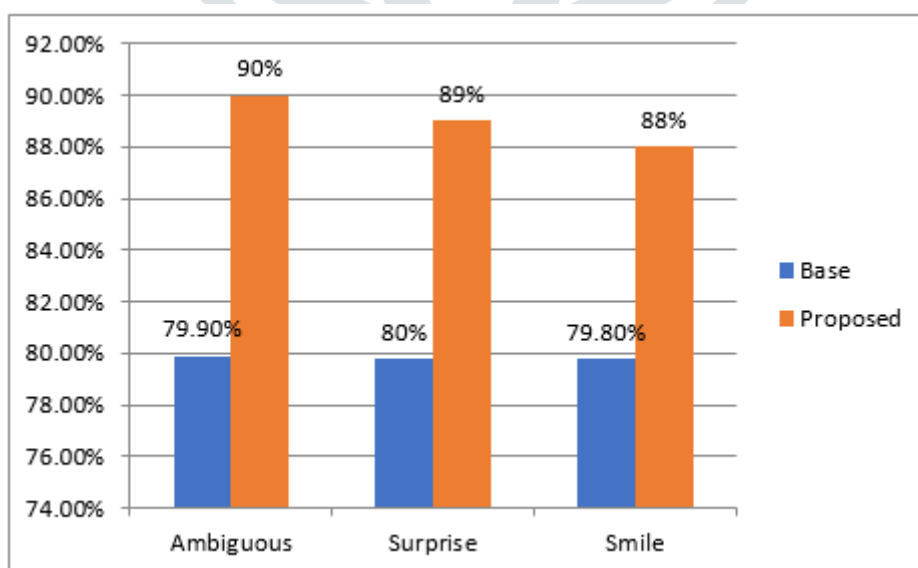| Cases	Base	Proposed
Ambiguous	79.9%	90%
Surprise	80%	89%
Smile	79.8%	88%

Fig 4 Result Comparison Graph

V. Conclusion

Not only are these intelligent machines improving our daily routine, but they are also boosting our safety and security. The research for Smart homes is aimed towards converting wall colors, changing light colors around the house, and having a face-scanned door entry system. This system will stand as a pillar in the future and with smart society development. The approach makes use of machine learning to detect faces and emotion analysis, making it the best choice for your business.

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