SENSORY INTERATION TECHNOLOGY

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ABSTRACT— In the ever-evolving landscape of scientific innovation, the realm of human-computer interaction continues to transcend conventional boundaries. Within this domain, "Sensory Interaction Technology" stands as a testament to the remarkable capabilities of technological advancement. This pioneering technology enables the perception and modulation of human emotions through sophisticated sensor-based systems. By harnessing the intricate interplay of visual and auditory cues, this paper presents a novel approach, termed "Emotion Sensory World of Sensory Interaction Technology." Through advanced image processing techniques, the system adeptly identifies and categorizes human emotions—ranging from sadness and happiness to excitement and surprise—by analyzing the subtle nuances of the eye region in captured images. Leveraging this understanding, the system orchestrates a tailored auditory experience, effectively modulating the individual's emotional state and fostering a sense of equilibrium.

Keywords: Sensory Interaction Technology, emotions, image processing, human-computer interaction, sensory systems.

I. INTRODUCTION

Sensory Interaction of Technology is emerged as a groundbreaking concept that revolutionizes human-computer interaction by integrating sensory capabilities into computing devices. This technology bridges the gap between human perception and digital interfaces by imbuing computers with human-like perceptual abilities. Through advanced sensor-based systems, computing devices can interpret and respond to human actions, emotions, and intentions, facilitating seamless and intuitive interactions. This paper explores the multifaceted landscape of Sensory Interaction Technology, encompassing foundational concepts, methodologies, and applications. Section II provides an overview of Sensory Interaction Technology's foundational concepts and techniques, while Section III introduces specific applications and case studies. Section IV outlines the methodology employed in this study, and Section V presents the conclusions drawn from the research findings. Finally, Section VI discusses potential avenues for future research and development in the field of Sensory Interaction Technology

II. TECHNIQUES OF SENSORY INTERACTION TECHNOLOGY

A. PHYSIOLOGICAL DATA SENSING:

This technique involves capturing physiological data and emotional states, such as heart rate, pressure, and temperature, through various sensors embedded in interactive devices. These sensors, including pressure sensors, heart rate sensors, galvanic skin response (GSR) sensors, and temperature sensors, are deployed within the device, enabling the system to determine the user's personality based on their touch interactions.

B. GAZE AND GESTURE RECOGNITION:

Utilizing advanced camera technology, this technique rapidly detects the user's gaze direction and pupil movements under diverse lighting conditions. By tracking these eye movements, the system dynamically adjusts the cursor's position to align with objects of user interest. Users can interact with these objects by either gesturing near them or bypassing them to explore other items of interest.

C. VOICE COMMAND RECOGNITION:

Through artificial intelligence-based speech recognition, users communicate with the computing system via a microphone. The system filters and stores the spoken input in the computer's memory (RAM). Subsequently, the input words undergo pattern matching against internally stored words to identify the user's intent. The recognition process accounts for variations in speech characteristics, such as loudness, pitch, frequency, and timing differences, ensuring accurate interpretation of user commands and initiating corresponding actions.

D. INTREST BASED INTERACTION DETECTION:

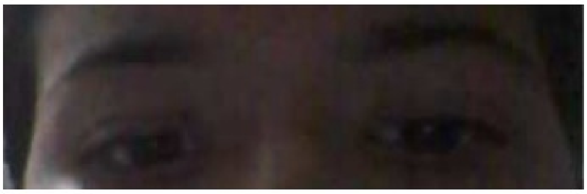
Sensory Interaction Technology enables devices to detect user interest by monitoring eye contact and automatically identifying the user's area of focus. For instance, if a user reads a headline, a device equipped with this technology can prompt relevant content in the browser window, enhancing user engagement and interaction.

III. EMOTION SENSORY WORLD

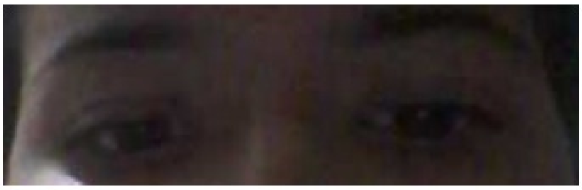
Human emotion serves as a visible manifestation of an individual's affective state, cognitive activity, emotional state, and personality. Extensive research has been conducted in the realm of Sensory Interaction Technology, as evidenced by studies [4-8]. These papers present a myriad of techniques proposed to identify the emotional state of individuals. According to our findings, the neuro-part of the theory revolves around a partially innate, biological program known as the facial affect program. This program specifies the relationships between different movements of facial muscles and particular emotions, such as happiness, anger, sadness, and surprise.

According to Author findings during:
Happiness-the eyes are relaxed or neutral; the outer
Anger-The brows are pulled down and inward; no sclera is shown in the eyes;
Sadness-The brows are drawn together with the inner corners raised and the outer corners lowered or level; the eyes are glazed;
Surprise-The eyebrows are raised and curved.

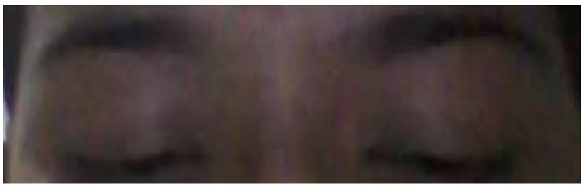
In this paper, we propose a novel technique called "Emotion Sensory World" within Sensory Interaction Technology, which focuses on the detection of human emotions through eye texture analysis. Recognizing that eyes serve as a "window to the soul" and can reveal much about a person's internal state [3], our approach involves capturing the image of a person using a camera and applying a texture filtering algorithm to focus on the eye area. This image is then compared with a database of stored images. The best-matching image that identifies the person's emotion is displayed on the screen. Subsequently, a tailored auditory experience, such as playing a song, is initiated to normalize the person's mood. This innovative technique enhances the capabilities of Sensory Interaction Technology in understanding and responding to human emotions, thereby facilitating more intuitive and personalized interactions.



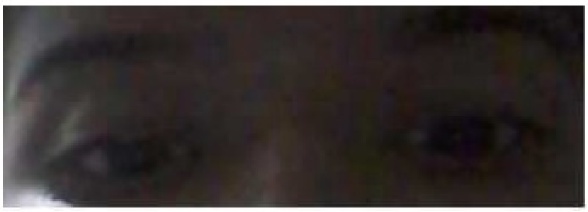
a. Happy



b. Anger



c. Sadness



d. Surprise

IV. METHODOLOGY

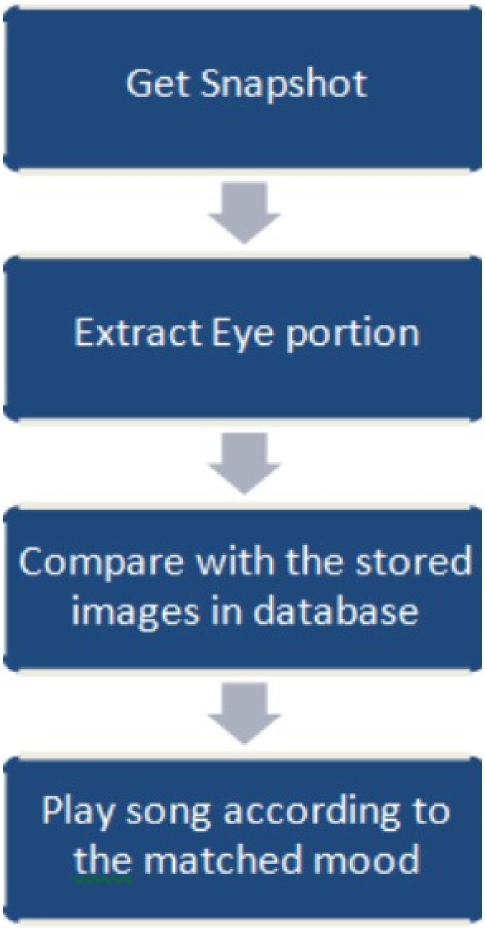


Fig 1.1 Methodology Emotion Sensory World

Step 1: Get Snapshot

A video stream initiates, and upon a person's focus on the face and pressing "Enter," a snapshot is captured. This action immediately returns a single image frame from the video input object, obj. The returned frame of data is independent of the video input object's FramesPerTrigger property and does not affect the values of the Frames Available or Frames Acquired property. The object obj must be a 1-by-1 video input object. The frame is returned as an H-by-W-by-B matrix, where:

H- Image height specified in the ROIPosition property
W- Image width specified in the ROIPosition property
B- Number of bands associated with obj, as specified in the Number of Bands property.

Fig 1.2 Snapshot of a person

Step 2: Extract Eye Portion

i. Detection of Face Parts:

a. Input parameters:

Detector: The detection object built by buildDetector.
Image data: Should be uint8.
Thick (optional): Thickness of bounding box.

b. Output parameters:

It creates bounding boxes for the face, eyes (left and right), mouth, and nose.
An image with the found face is shown in boxes, and these faces are stored as a cell array.
buildDetector: Builds a face parts detector object with threshold values for parts.

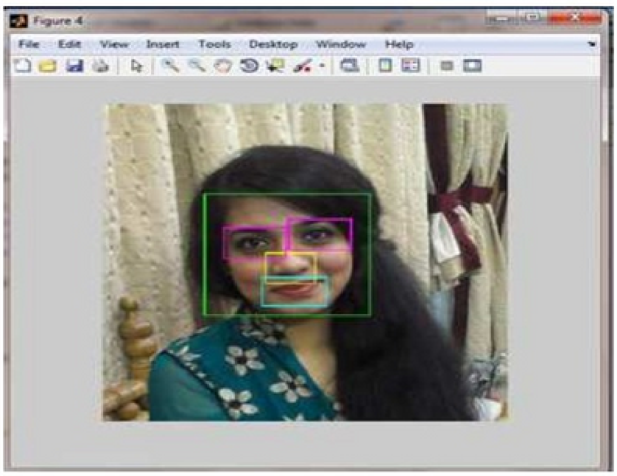


Fig 1.3.1 Detection of face parts

ii. Shape Recognition and Edge Detection:

1. After getting the eye part we match it with the existing images by classifying it according to structure of eye and it texture we call it Shapes Classifier.
2. Separates the eye part only from the box boundaries of face.
3. Convert image from rgb to gray.
4. Threshold the image Convert the image to black and white in order to prepare for boundary tracing using bw boundaries.
5. Invert the Binary Image.
6. Find the boundaries Concentrate only on the exterior boundaries. Option 'noholes' will accelerate the processing by preventing bw boundaries from searching for inner contours.
7. Determine Shapes properties.
8. Classify Shapes according to properties Wrinkles, flat, swelled, etc.

Fig 1.3.2 Extraction of eye portion

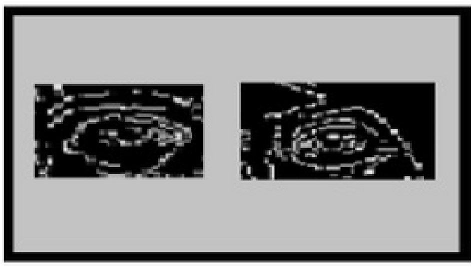


Fig 2.3.3 Conversation from RGB to Grayscale

Step 3: Comparison with stored Images in data base:

The shape classifier will then match the captured photo image with the data entries in our database which in then converted to (gray scale); the idea is to create a function which will return the difference in range [0, 1] between two postures. This means , we want to compare only a posture and on this basis the emotion of person for given two images (a grey region) . For example, if we pass 4 to my function, the result will be 0 (because postures or emotions are not same and the result will be 1 if same).

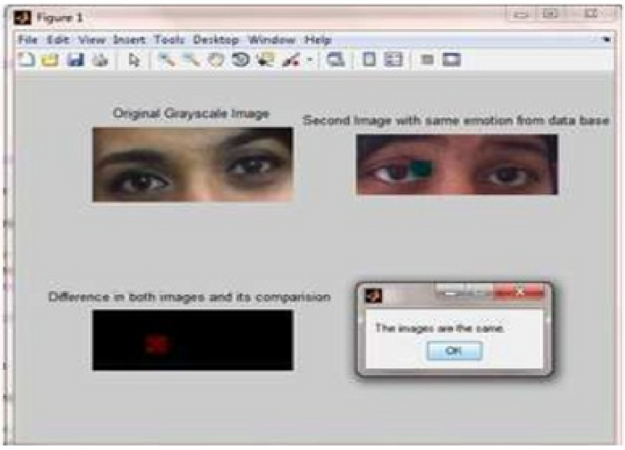


Fig 1.4.1 Comparision of eye with the stores images

Step 4: There are 25 images in database used for training. To create
a database: open "create_db.m", and load the image. It will detect eyes and store left eye and Right Eye in Database and save this entry in "Database.dat".
database{x,y}
x=entry /serial no,
y=1 Left Eye
y=2 Right Eye
y=3 name of Mood
For multiple entries to store in database we can
change with coding:
%load ('database.dat','-mat');
%entries=size (database, 1);
and change: database{1,1}=a;
with database{entries+1,1}=a;
then it will add a new entry each time and save all entries in database.
database {1,2}=b;
with database{entries+1,2}=b;
database {1,3}='a';
with database{entries+1,3}='a';

Fig 1.4.2 Image in Database

It has been computed the correlation coefficient by flattening the matrix into a vector; the obtained results were around 0.987, indicating a close match. If essential we could have measured scaling and regular change to better align the images but it was not needed here.

Step 5: Play song according to matched mood

The generated script take a list of sound files and create a database of these sounds according to the emotion detection defined in database for each song, and then subsequently take one or more audio files according to matched emotion of previously - created image database and plays it, List of sound files is analyzed and written to a single database file. Various sound file formats are supported, including wav , mp3 and aac.our database files are encoded with.wav extension. The sound file in database can then be saved as a wav file using the WAVWRITE function and later can be loaded using the WAVREAD function. The played sound returns the sample rate (Fs) in Hertz and the number of bits per sample (nbits) used to encode the data in the file if needed.

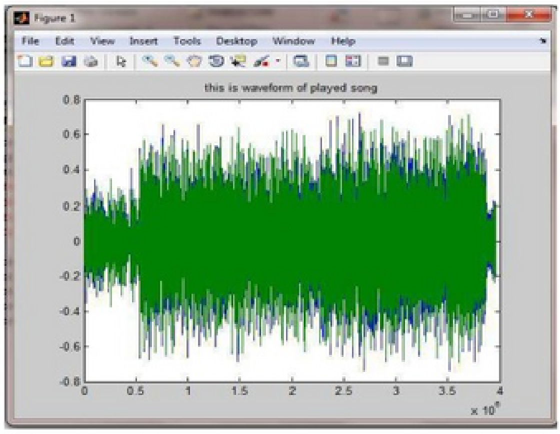


Fig 2.5. Waveform of song played

V. CONCLUSION

The paper proposes two key results of emotional sensory world. First, observation reveals the fact that different eye colors and their intensity results in change in emotions. It changes without giving any information on shape and actual detected emotion. It is used to successfully recognize four different emotions of eyes. This developed methodology can be extended to other activities. Secondly results were achieved for converging in good emotions using a mixture of features, shapes, colors based on eye points. After this successful capturing of eye spots, it will help to tell about the mood of a person and also helps to cheer up by playing songs or other
sources. The motive of this research proves to be a source of economic development over all.

VI. FUTURE WORK

This research work can be extended to home appliances where it can perform various tasks within home premises through blue eye technology. Further as a world is digitizing and we are moving towards robotic world, several human activities can be shrunk with emotion sensory world tool. The tool or system is fitted in robot with eye emotions which detects what is the demand and the action can be taken by robot accordingly.

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