AFFECTIVE COMPUTING

PROJECT SYNOPSIS

BACHELOR OF TECHNOLOGY

Computer Science and Engineering

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Abstract

Over the past few years, the term AI gained huge popularity defining a new era of machines carrying the intelligence which will simulate human intelligence. The AI today is in its extremely basic stage i.e., Artificial Narrow Intelligence. The later stage of AI is considered as more advanced and called Artificial General Intelligence where machines will have strong capabilities of complex problem solving and reasoning. The third stage of AI is an immensely powerful stage where machines will have the ability to make decisions and it will surpass human intelligence and be called as a state of intelligence explosion which can be considered as the critical and unsafe stage for humans even AI can give solution to some critical problems.

Understanding this scenario machines today rather than being simply Artificial Intelligence they need to be more Emotionally Intelligent machines which will understand, simulate, and react to human emotions, making the human-machine interaction and hence relation stronger and more cooperative. The research aims to simulate the human emotional intelligence in the machines and make it more precise by applying certain physical and psychological behavior patterns in human-to-human interaction.

Motivation

With the introduction of Machine Learning and Artificial intelligence the machines today are striving hard to become intelligent rather than only becoming accurate. The term Artificial Intelligence defines simulation of human intelligence by machines. This intelligence can be improved automatically over time as machines go on learning. As far as AI is concerned, we have various robotic systems, software like stock market predictions systems, even personal digital assistants like Siri, Google Assistant and Alexa which help people make human life easier.

Considering an example of personal digital assistants like Siri or Alexa, they are most intelligent if answering the questions and doing online tasks are concerned but can be considered as dumbest when we consider them from the perspective of emotional intelligence. Rosalind Piccard, Director of Affective Computing Research at the MIT once said "Even your dog can understand when you are feeling frustrated by it then why the personal digital assistants cannot. Yet developing that kind of intelligence in particular, the ability to recognize human emotions and then respond appropriately is essential to the true success of digital assistants and the many other artificial intelligences (AIs) we interact with every day. So, this research will aim to find out some ways so that machines can be made more emotionally intelligent and connected to humans rather than just being intelligent.

Literature Review

Artificial (Emotional) Intelligence by Rosalind Picard, *et al.,* **(2018)** the word artificial emotional intelligence defined as a part of affective computing where it represents machines that can understand and identify human emotions. The literature focused on the drawbacks and limitations of artificial intelligence by giving examples of smart assistants like Google assistant, Siri, and Alexa. These assistants are intelligent enough to provide the accurate answers to asked questions but not smart enough to identify the emotions of the human who is asking the questions. Identifies key to improve the result of any smart assistant is to identify the emotion behind every question rather than just answering the question by regular NLP

Understanding Citizens' Emotional Pulse in a Smart City using Artificial Intelligence, by Achini Adikari *et al.,* **(2020)** introduces an innovative approach of smart city where the emotions of people living in a particular smart city can be identified based on the social media conversation done between them over the internet. The approach used simple method of NLP to identify positive and negative words used by the people while talking with each other on social media conversation and tries to predict the mood of citizens resulting to identify how much happy or sad the people of that city are which can be adopted by industry leaders and government officials for smart observation of citizen opinions to improve security, communication, and policymaking.

The literature review reveals that very few research studies have been conducted till date in the domain of affective computing and emotional intelligence. The identification of human expressions based on facial recognition is the most common part of artificial intelligence but even very few or no attempts are made at national level to contribute to the effective computing domain. The emotional intelligence now rather than recognizing the emotions of the human it needs to understand various moods and the behaviors of humans on which very less or no attempt is made at the national level.

- **Pros and Cons of Existing Methods**

Methods	Pros	Cons
Method 1	This method is intelligent enough to provide the accurate answers to asked questions.	Not smart enough to identify the emotions of the human who is asking the questions.
Method 2	An innovative approach to smart city where the emotions of people living in a particular smart city can be identified based on the social media conversation done between them over the internet.	The emotional intelligence now rather than recognizing the emotions of the human it needs to understand various moods and the behaviors of humans on which very less or no attempt is made at the national level.

Aim of Project

To develop a system that will be able to recognize human emotions more accurately than the existing system using multimodal methodology.

Objectives

1. To identify the human emotions based on the various attributes Facial expression + NLP + speech (voice) modulations.

2. Understand and learn the different psychological states of the humans and proper reactions to them.

3. Propose a system which will understand, simulate, and react to some limited set of human emotions.

Methodology

1. **Emotion recognition using facial expression**

   This module of the project detects face/s from live video using OpenCV library and it recognizes expressions using FER library. Sometimes actual emotions are different from facial expressions for example a person may have tears in his/her eyes if he/she is extremely happy, in this case we must consider tone, speech and heartbeat rate etc. as mentioned below.

2. **Emotion recognition using tone**

   Most of the time, analyzing tone is particularly important. Even if words in speech are denoting that sentence is neutral, sometimes it may be neutral, negative, or positive. For example, "I am okay." is a simple neutral sentence considering words only but if a person is in depression, then tone will be low, and sentence will be slightly negative. Hence, recognizing emotions with the help of tone will provide more accurate throughput.

3. **Emotion recognition using NLP**

   Words play a vital role in recognizing emotions, for example "Today I got an offer letter, hence I am extremely happy." In this sentence words like happy, offer denote that sentence is positive.

Software Requirements

Sr. No.	Components	Specifications
1	Operating System	Windows, Linux, Mac
2	Libraries	FER, OpenCV, Deep face, TensorFlow, Deep Speech
3	IDE	PyCharm

Hardware Requirements

Sr. No.	Components	Specifications
1	Processor	Intel Core i5, AMD, GPU (2 GB Minimum)
2	RAM	Recommended 8 GB
3	Webcam	Any working Webcam with better resolution
4	Microphone	Any working Microphone

Bibliography/References

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5. Survey on Human Behavior Recognition Using Affective Computing by Nagesh Jadhav, Rekha Sugandhi Et al.