Emotion Aware Cloud Services Using Brainwaves And 5G Technology

Pranav J.I, Sayujia S

Abstract— Technology today is so advanced that more than 70% of our daily life is spent using technology. The number of fully automated home are rising day by day. Everything is connected to the cloud. One of the major problems the cloud AI faces is the inability to understand the emotions of users which causes inappropriate behavior to the user at inappropriate times. Through this work we present a method to understand the user's emotion through EEG sensors (Brainwave) These sensors are commmonly called brainwave readers. Many brainwave readers exist in the market such as Neurolink by Neurosky and its just the size of a small headphone and will decrese in time. With the combination of these sensors, user activity and machine leaning the emotional state of the user can be determined and using 5G technology we can connect the emotional state of the user to the cloud in realtime.The data from the sensors can be used by the cloud AI's to behave appropriately understanding the user's emotion and cheer them up with possible solutions. There are also other merits to this method. Using machine learning we can identify mental medical conditions such as suicidal tendencies and hallucinations before they get fatal and untreatable.

Index Terms— Emotion Aware Cloud Computing, Brainwave, Cloud AI,5G, Realtime health monitoring, Neurosky, Digital healthcare, Machine learning.

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1 INTRODUCTION

THE area of cloud computing is very large. It is estimated that by the end of 2020's everything from simple tasks to complex operations will completely depend on cloud computing and machine learning. Even today most of us depend on cloud-based AI such as Google Assistant, Apple Siri, Amazon Alexa, etc for tasks such as setting reminder and alarms, entertainment and content delivery, communicating with loved ones and work, scheduling, etc. The problem we face is their lack of understanding our emotion.

For example, suppose one tired from work, a simple happy song about family may cheer him up or a call from loved one may cheer him up and it all depends on the person, but the problem is these nodes or voice kiosk does not understand our emotions. If we ask the AI a simple how are you, it replies but inappropriately sometimes. If it can recognize emotion that the user is feeling depressed, it can cheer him up by asking what the problem is and telling him solutions such as to call a loved one or to watch a motivational movie resembling his condition. This work proposes such a method to understand the emotional state of user remotely from cloud using 5G and machine leaning. The 5G technology will make this possible because, there are a lot of data to be transferred at lightning speed [1].

This article is divided into 4 sections. Section 1 is the introduction, section 2 defines the method and technologies used, section 3 explains the architecture and algorithm, section 4 mentions the identification of emotion and responses and section 5 concludes the article.

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2 METHODS AND TECHNOLOGIES

For understanding the idea, the following Methodologies and Technologies should be familiarized.

2.1 Cloud AI Computing

Cloud AI provides modern machine leaning smart assistants to common users which is connected globally and makes daily tasks easier. Current technologies such as Google assistant are a part of it and is gradually making use of its full potential. The services are not confined to their dedicated kiosk's but to all smart devices such as smart phones, smart car, smart TV's, Personal computers,etc.

2.2 Brainwaves

Thoughts, emotions and behaviors is the result of communication betweens neurons inside our brain. Brainwaves are sunchronized electrical pulse signals from masses of neuron pulses. Brain wave is like a signature. For each thoughts and actions inside our brain, a unique signature exists. Understanding the signature is a herculian task. [2].

The pattern of expression of movement of human body with the brain is unique. This pattern can be considered a sign of the unique identity of and individual and may be detected even remotely [3].

Brainwaves can be considered as musical notes with low and high beats. Brainwave changes frequency according to our emotions and what we do. Brainwave is measured in Hertz.

Theta waves ranges from 3 HZ to 8 HZ which occurs when we are sleeping or when our sensers are withdrawn from external world. We are actually dreaming in theta state.

Alphawaves are waves between 8 HZ to 12 HZ. They are dormant during quiet thoughts and in meditative conditions. Alpha wave indicates a relaxed state of mind, calmness, learning, etc.

Beta waves from varies from 12 HZ to 38 HZ which indicates our normal waking state of consciousness. Betawave are dormant when we are alert. Attentive, engaged in thinking, decisionmaking confusion or any other focused mental activity.

Gamma waves varies from 38 HZ to 45 HZ. They are the fastest and passes information rapidly. Gamma waves are the subtlest ones, and mind has to be quiet to access gamma.

2.3 Brainwave Readers

Brainwave readers detect the faint signals produced by the brain during each event making use of electro encephalogram. Neurosky Mindwave is a small mobile, state of the art device that detects these waves and converts it to understandable form such as alpha waves, beta waves, etc. EEG signals can include signals from other sources such as Electrooculography (EOG), Electromyography (EMG), Electrocardiogram (ECG) signals from other sources, which is considered a nuisance. Elimination disorders can affect important data from EEG recordings [4].

3 ARCHITECTURE AND ALGORITHM

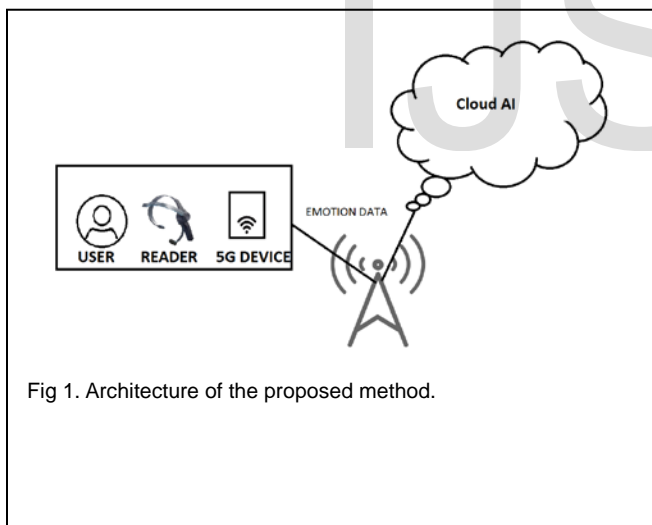The proposed idea can be explained with the use of following diagram.

Fig 1. Architecture of the proposed method.

The clienct side comprises of the user, brainwave reader , which can be embedded as a chip to user and a 5G smart device or kiosk to which the reader is connected. The data is collected from user continuously and is transmitted to cloud.

The emotional data and the user's trend data is analysed by ML algorithm and the emotion of the user and solution that usually changes or enhances his mood is found out. This solution is then passed to the local kiosk for executing.

Overall Algorithm for client is as shown in Table 1

TABLE 1

Client Algorithm

1. Retrieve data from brainwave reader
2. Sent to cloud using 5G
3. If response is received from cloud, then perform it.
4. Repeat step 1 to 4

Overall Algorithm for cloud process is as shown in Table 2
TABLE 2
Algorithm for cloud

1. If data is received from client, then do Steps 2-7 Else do step 1 again.
2. Analyse the data received and set threshold and counter i to 0;
3. Using clustering and neural networks find out the emotion from emotion data and previous user behavior models.
4. From results of previous expiriments select appropriate actions to enhance user's mood according to their success rate.
5. Sent the action to cloud kiosk
6. Wait for response and analyse the data received after performing action
7. If the mood enhances or improve, increase the success rate of the action to mood.
8. Else if mood is not pleasant increase i and check i to threshold
9. If i<threshold try another action and do step 6 Else inform the user's close ones
10. Goto Step 1

We can see that majority of work is done at cloud as they are resource intensive. 5G has morethan enough bandwidth and response rate. Details of EMC using 5G is already explained in the reference [1].

4 IDENTIFICATION OF EMOTIONS AND RESPONSES

The emotion may be negative or positive. For example, tempo-

rary sadness is normal but continued sadness is a sign of depression. Emotions can generally be classified into 3 major catefories: Basic emotions category (happy, sad, fear, anger, surprise, and disgust), then motivation (thirst, hunger, pain, and mood) and the conscious self /Social emotions (shame, dignity, and guilt) [5]. Human emotions are a combination the above just like mixing primary colours (red, yellow and blue) to produce secondary colours (orange, green and violet). The combination of basic category emotions results in more complex emotions.

The actions for these emotions are complex and can only be learned from expiriments. Simple emotions such as happiness and love can be enhanced by happy music, achievements can be enhanced by informing the induvidual's peer and appreciation. Sadness can be removed by motivational movies, anger with songs, etc. Though it differs from person to person, the basic thing stays the same. Through trials these can be machine leaned and applied, but continued sadness is a sign of depression and another peer should handle it physically as the individual might need medical or psychological care.

5 CONCLUSION

In conclusion the proposed method will definitely improve the AI of the cloud services if properly implemented and prevent inappropriate behaviors of current AI services. The use of brainwave also combined with other sensors can detect medical conditions, but it is out of scope for this ariticle. Major tasks are performed at cloud so the increased bandwidth and response rate of 5G technology will unlock the possbibilty of implementation in commercial aspect wirelessly.

REFERENCES

[1] Suzen S. Kallungal, Emotion-Aware Mobile Cloud Computing in 5G, International Journal of Advanced Research in Computer and Communication Engineering ISSN (Online) 2278-1021

[2] What are brainwaves. Internet article from brainworksneurotherapy.com https://brainworksneurotherapy.com/what-are-brainwaves

[3] R. Williams G., Bregler C., Hackney P., Rosenthal S., McDowall I., Smolskiy K. (2008). Body Signature Recognition. Technical Report, TR-2008-915, New York University

[4] Murugappan, M,Nagarjana, Sazali Y(2010) Classification of Human Emotion from EEG using Discrete Wavelet Transform.. Journal of Biomedical Science and Engineering, 3(4), 390-396, doiL10.4236/jbise.2010.24054

[5] Woaswi, Wan & Hanif, M & Mohamed, S & Hamzah, Noraini & Ismael Rizman, Zairi. (2016). Human Emotion Detection via Brain Waves Study by Using Electroencephalogram (EEG). International Journal on Advanced Science, Engineering and Information Technology. 6. 1005. 10.18517/ijaseit.6.6.1072.