ELECTROENCEPHALOGRAPHY BASED ANALYSIS OF EMOTIONS AMONG INDIAN FILM VIEWERS

PRESENTED BY,

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MOTIVATION

- The film industry has been a major factor in the rapid growth of the Indian entertainment industry.
- The emotions corresponding to various movies have to be analyzed in great depth with respect to different genres.
- Therefore a method for taking reviews for a film using relatively cheap EEG headsets, than the conventional ones, is proposed here.

OBJECTIVE

- Capture the live emotions of the person, while watching a film.
- Use EEG headsets which help in the cognitive assessment.
- Develop a reference emotion for mapping the cognitive readings recorded, thereby, emotions.

NEUROCINEMATICS

- Neurocinematics, is how watching movies, or particular scenes from movies effect our brains, and the response the human brain gives to any given movie or scene.
- The term Neurocinema comes from neurologists who are studying which pieces of a film can have to most control over a viewers brain.
- The term **Neurocinematics** was coined by Hasson et. al.

PREVIOUS WORKS

- Hasson et. al. used functional magnetic resonance imaging (**fMRI**) to capture the viewer's emotion during viewing of films, that detects changes in blood flow to track brain activities.

- A new method called Inter-subjective Correlation (ISC) was introduced (simultaneous activation of similar regions of brain).

- fMRI offered a new dimension of analyzing emotions.

PRACTICAL CHALLENGES FACED

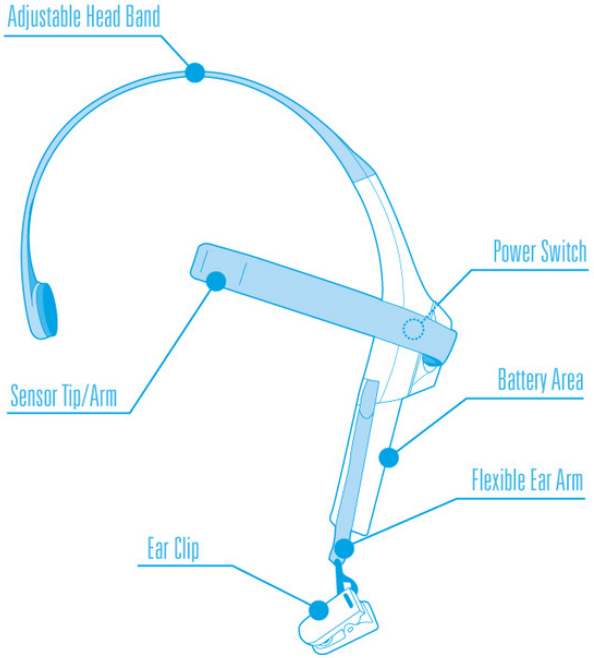
- Viewers lie inside a MRI scanner, which has a small amount of space compared to normal viewing conditions.
- Viewer's emotion might vary based on the number of people they are watching a film with.
- fMRI is an expensive procedure, and can be considered for numerous subjects, only after measuring the reliability of the experiment.

PROS OF EEG

- EEG has the capability to detect changes within a millisecond timeframe, which is excellent considering the fact that movie scenes change quickly.

- Recent availability of low-cost EEG devices has made it possible to use the concept of EEG for large-scale purposes (Neurosky Mindwave Mobile).

NEUROSKY
MINDWAVE MOBILE

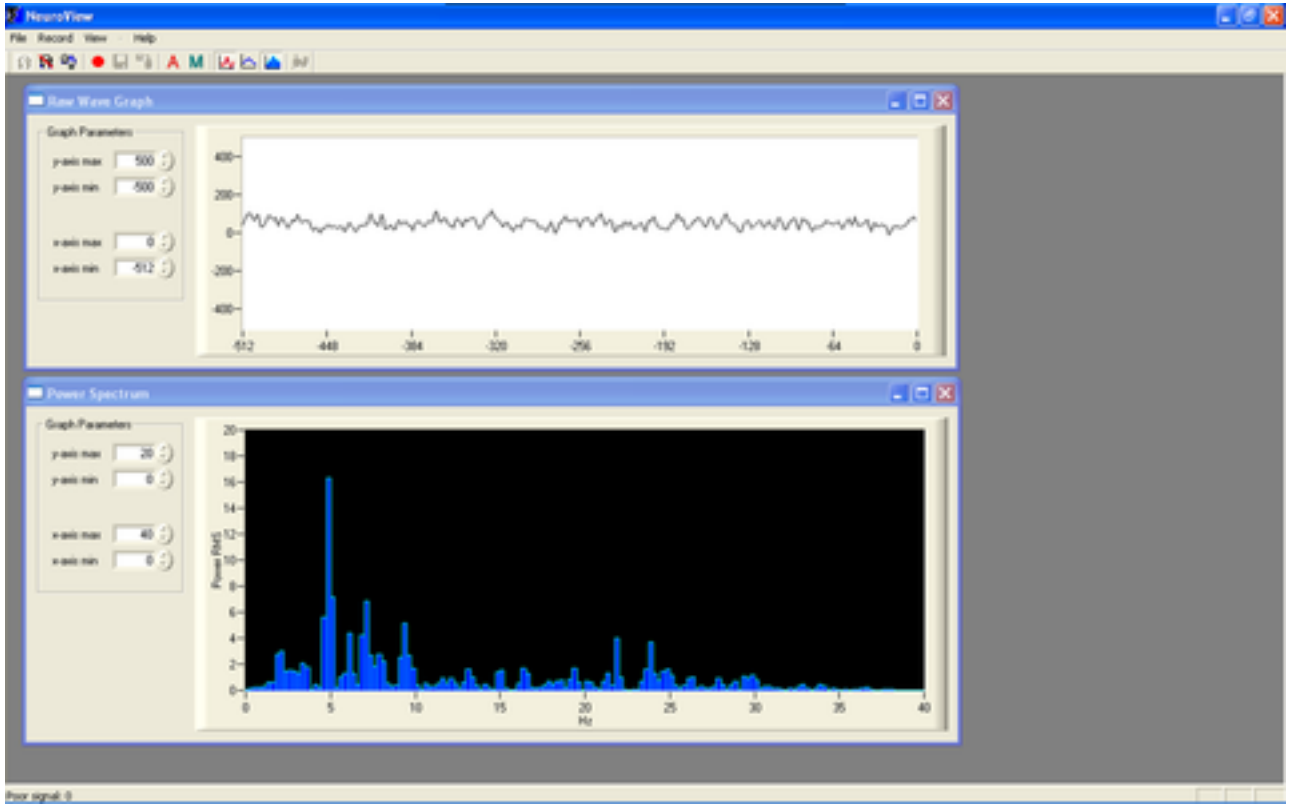


NEUROSKY MINDWAVE MOBILE

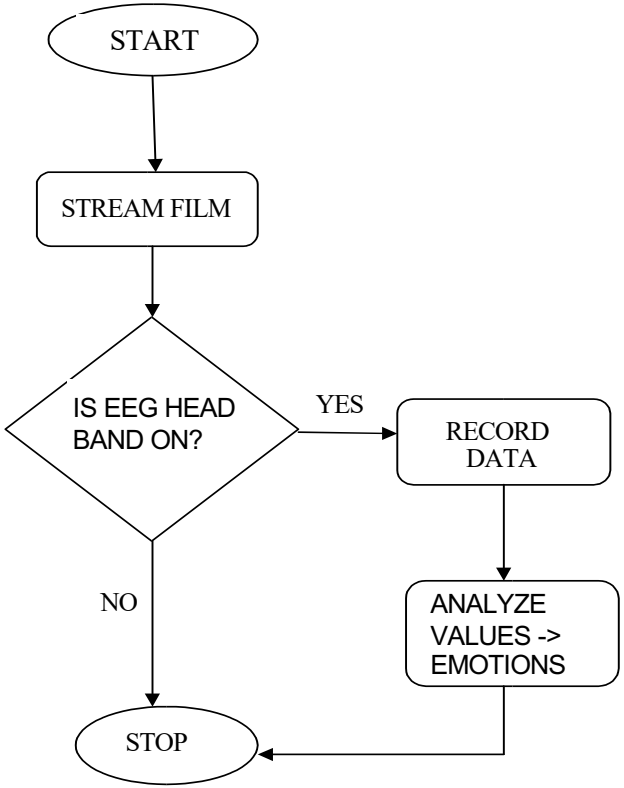
- The Neurosky Mindwave (used in this experiment) is a headset equipped with a single, dry EEG sensor. It uses Bluetooth technology to transfer signal samples to the host computer.

- The Mindwave Mobile measures the voltage between an electrode resting on the forehead and electrodes each in contact with an ear to serve as a ground reference.

SOFTWARE USED (NEUROVIEW)



FLOW DIGRAM


START
STREAM FILM
IS EEG HEAD BAND ON?
YES
RECORD DATA
NO
ANALYZE VALUES -> EMOTIONS
STOP

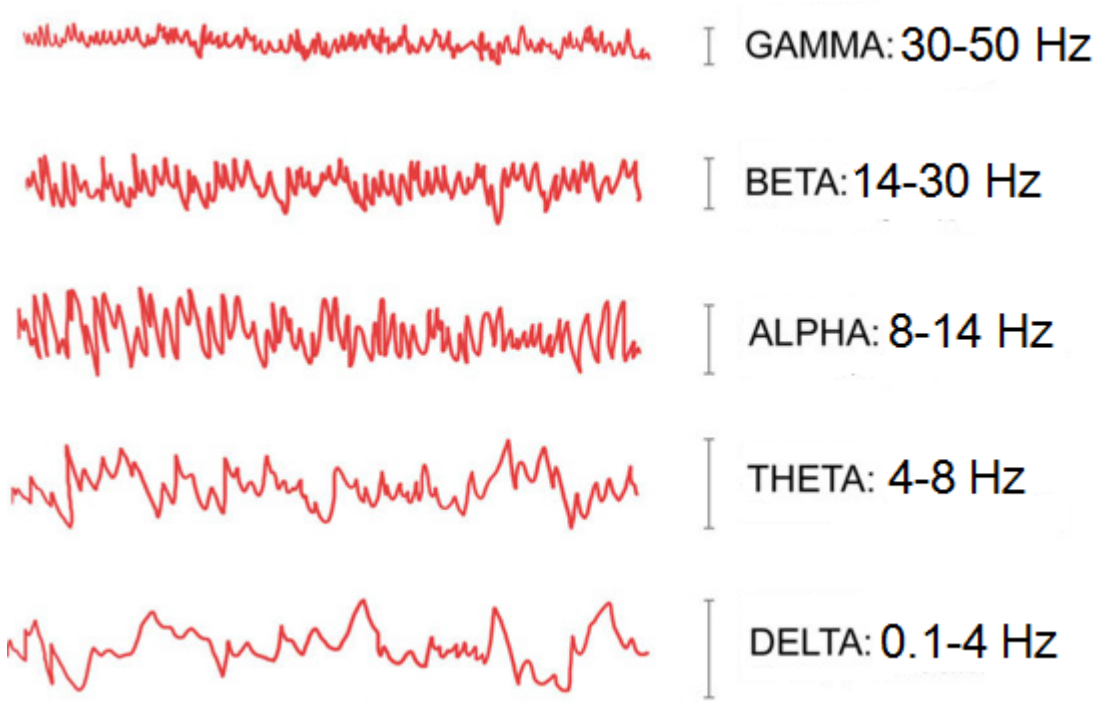
EXPERIMENT PERFORMED

- The High Definition video was presented in a laptop, and sound was delivered via earphones to two volunteers (two males of age category 20-25). The volunteers were allowed to watch the movie without any hindrance.

- The opening 15 min of two different categories of Indian film clips – Maya, a well-known horror movie by Ashwin Saravanan (2015), and Thillu Mullu, a well-known comedy film by K. Balachandar (1981) were presented to the volunteers.

- The raw EEG data was analyzed using NeuroView software, and simultaneously raw waves were converted to digital data which was analyzed using R to get a final value of frequencies (corresponding to different emotions) for a specified time interval for each movie.

BRAIN WAVES


GAMMA: 30-50 Hz
BETA: 14-30 Hz
ALPHA: 8-14 Hz
THETA: 4-8 Hz
DELTA: 0.1-4 Hz

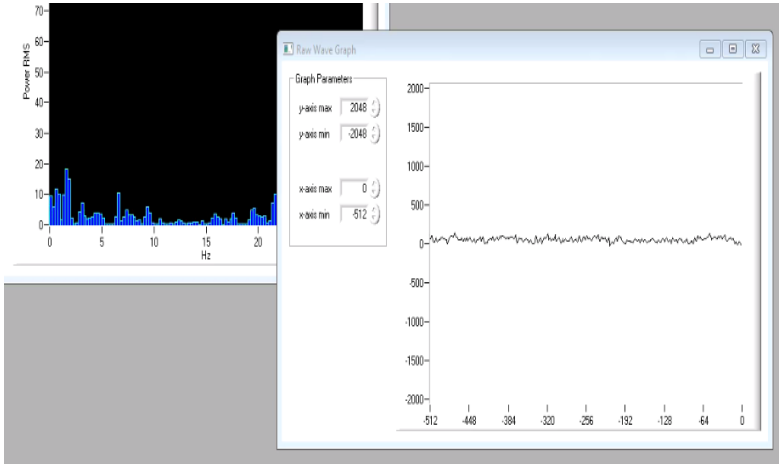
DATA OBSERVED

- The R language is used to perform analysis on the large data set that is obtained. The obtained data set consists of the powers of brainwaves across all frequencies at a time gap of one second.
- The data is loaded into R studio in the form of a CSV file.
- The mean value at a particular second is calculated for each power spectrum, and the highest value among all values is considered as the final value for that particular time interval.

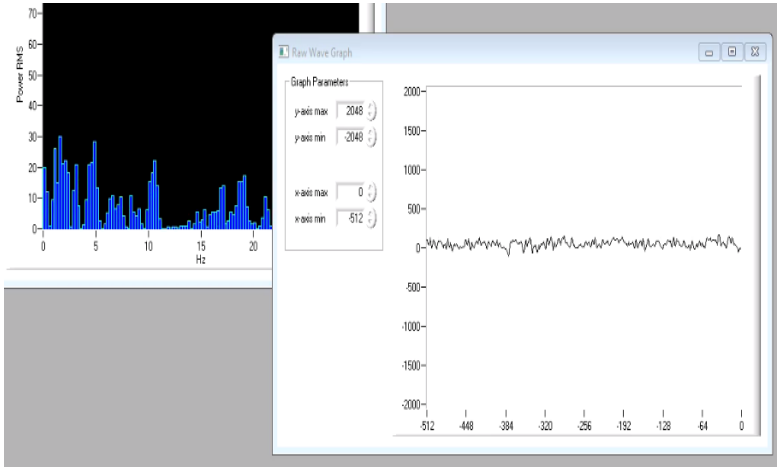
RESULTS OBSERVED (COMEDY)

- The result data set for comedy film was analyzed, where, an alpha wave was observed at every second at least once, indicating the fact that volunteer was constantly in a state of anti-depression (was happy).

- Moreover, the observation of alpha waves throughout has indicated that the viewer was completely engrossed in the film.



Raw Brainwave and Power Spectrum (as viewed in NeuroView) of Volunteer 1 watching the film Thillu Mullu (comedy)



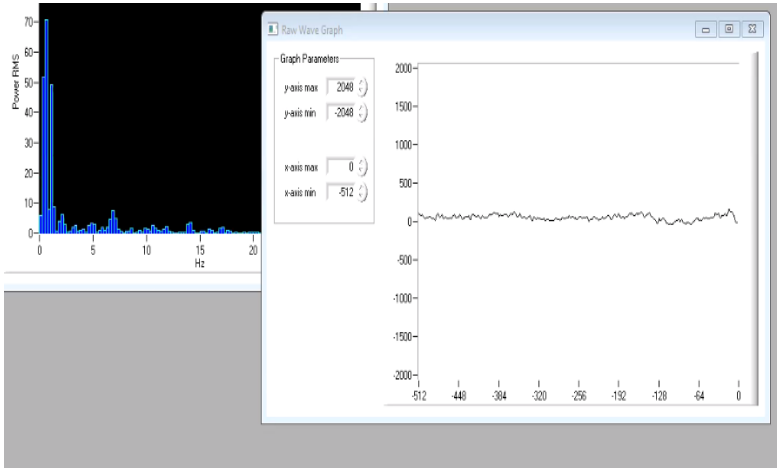
Raw Brainwave and Power Spectrum (as viewed in NeuroView) of Volunteer 2 watching the film Thillu Mullu (comedy)

RESULTS OBSERVED (HORROR)

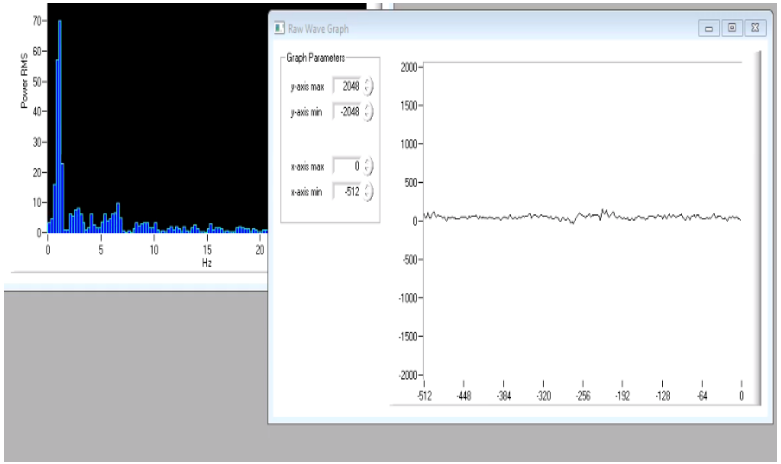
- When the above methods were applied to the horror clip viewed by both volunteers, the theta wave was observed as the most powerful wave, but it was closely followed by alpha wave at every instance.

- This indicated the fact that volunteers were constantly oscillating between the states of anxiety and relaxation, and shows that the film has captured viewers' attention at every second.

- Whenever the ghost appears, theta wave spikes and returns to a normal state in a few seconds, while alpha wave is observed for a scene involving the protagonist.



Raw Brainwave and Power Spectrum (as viewed in NeuroView) of Volunteer 1 watching the film Maya (horror)



Raw Brainwave and Power Spectrum (as viewed in NeuroView) of Volunteer 2 watching the film Maya (horror)

CONCLUSION

- Here, a new statistical approach to study the emotions in brain was explored for accessing the viewer's brain activity and scaling the readings for an effective output.

- Latest EEG devices like Neurosky Mindwave Mobile, can offer a cheaper and more affordable means of analyzing emotions effectively and easily.

- The emotions of two different viewers for two different genres of Indian films - Comedy and Horror, were successfully captured and analyzed, and the results have successfully matched with the intended emotions (which was determined based on the released movie's IMDb reviews).

HURDLES AHEAD

- Processing depends on unknown parameters, most of the dynamics are still uncovered.
- Signal-to-noise ratio is very challenging, so sensitive measures are hard to obtain.
- Relevant brain activity is small compared to interfering artifacts and compared to brain background activity.
- Specific measures are even harder to obtain (with coarse-grained sensing)
- Underlying phenomena are also highly diverse and rich and derived measures are still poorly understood – not always clear what to look for.

THANK YOU!