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A SOFTWARE PROTOTYPE

BASED EMOTIONAL IMPAIRMENTS DETECTION IN NEUROLOGICAL DISORDERS PATIENTS USING WIRELESS EEG SIGNALS

PRODUCT DESCRIPTION

Rate of occurrence and cause

- Social communication and the ability to respond emotional signals are essential for meaningful **interpersonal interactions**.
- Parkinson's disease (PD) is a **movement disorder**, there is growing evidence of cognitive and social deficits associated with this disease.
- Non-motor symptoms, including disruptions in **emotional processing**, have been found in over **50% of newly diagnosed PD patients** and can appear in any stage of disease progression.
- There is a need for a method of quantifying emotion processing, which is currently done by **clinical ratings**.
- To develop and validate the computational framework for quantifying emotional state changes of PD patients using **neurophysiologic measurement**.
- Helps neurologist/psychologist/psycho-physiologist to detect the emotional impairments of the neurological disorders patients by acquiring the brain signals (EEG signals) and to assist them with **proper medication and counseling**.

EXPERIMENTAL RESULTS

Trajectory of emotion changes

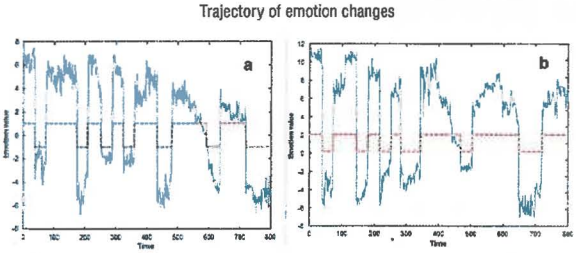

Figure 1 The trajectory of emotion changes of (a) 20 PD patients and (b) 20 healthy controls during the experiment.

Emotions	EEG frequency band					
	Delta (%)	Theta (%)	Alpha (%)	Beta (%)	Gamma (%)	ALL (%)
Happiness	52.64 ± 6.56	42.78 ± 5.11	60.14 ± 4.60	69.31 ± 4.56	73.89 ± 4.80	77.78 ± 6.90
Sadness	66.11 ± 7.27	64.44 ± 5.29	79.44 ± 4.54	85.28 ± 5.79	85.14 ± 4.19	80.56 ± 2.84
Fear	51.67 ± 3.86	49.03 ± 4.30	64.86 ± 5.60	73.33 ± 4.23	71.25 ± 4.30	74.61 ± 4.40
Anger	51.67 ± 6.86	57.36 ± 4.04	79.86 ± 3.79	80.42 ± 4.37	75.56 ± 4.55	78.33 ± 5.60
Surprise	51.53 ± 5.01	46.94 ± 8.68	59.58 ± 6.77	73.75 ± 4.70	70.69 ± 5.53	75.28 ± 3.33
Disgust	46.11 ± 5.85	44.03 ± 6.32	55.42 ± 7.47	79.72 ± 2.87	71.81 ± 3.47	76.06 ± 4.80
Average	53.29 ± 2.23	50.76 ± 2.50	64.88 ± 72.50	76.97 ± 1.91	74.72 ± 2.24	77.43 ± 1.59

Table 1 Emotion recognition rate of PD patients

NOVELTIES

- User friendly and cost effective system
- Lesser number of EEG channels to detect the emotional impairment
- Emotional PD Database development with real patients
- Frequency band localization for enhancing the emotion detection rate

COMMERCIAL POTENTIAL

- Psychological, Psycho-physiological health services, i.e. **counseling**
- **Assistive system for Neurologist/Clinical psychologist** for emotional impairment detection in PD patients.
- **Neuro- Rehabilitation** (i.e. Music therapy)
- **Research laboratories** (Clinical investigation)
- Lesser computation time and usage memory
- Completely non-invasive/non-intrusive automated emotion recognition system
- Wireless based system

Brain Topography during emotion processing

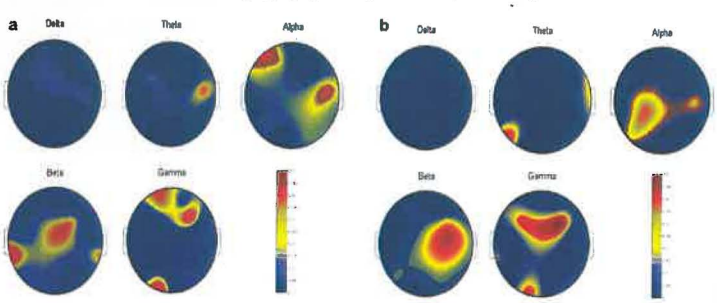

Figure 2 Distribution of top 40 subject-independent features (a) PD patients (b) healthy controls.

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PUBLICATIONS

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