DREAMER: A Database for Emotion Recognition through EEG and ECG Signals from Wireless Low-cost Off-the-Shelf Devices

Abstract

We present DREAMER, a multi-modal database consisting of electroencephalogram (EEG) and electrocardiogram (ECG) signals recorded during affect elicitation by means of audio-visual stimuli. Signals from 23 participants were recorded along with the participants' self-assessment of their affective state after each stimuli, in terms of valence, arousal, and dominance. All the signals were captured using portable, wearable, wireless, low-cost and off-the-shelf equipment that has the potential to allow the use of affective computing methods in everyday applications. The Emotiv EPOC wireless EEG headset was used for EEG and the Shimmer2 ECG sensor for ECG.

Classification results for valence, arousal and dominance of the proposed database are comparable to the ones achieved for other databases that use non-portable, expensive, medical grade devices.

The proposed database is made publicly available in order to allow researchers to achieve a more thorough evaluation of the suitability of these capturing devices for affect recognition applications.

If you use the DREAMER database please cite:

S. Katsigiannis, N. Ramzan, "DREAMER: A Database for Emotion Recognition Through EEG and ECG Signals from Wireless Low-cost Off-the-Shelf Devices," IEEE Journal of Biomedical and Health Informatics, 2017. In press. doi: 10.1109/JBHI.2017.2688239

Database summary

The DREAMER database contains the participant ratings and physiological recordings of an experiment where 23 volunteers watched 18 film clips selected and evaluated by Gabert-Quillen et al. [1]. EEG and ECG signals were recorded and each participant rated their emotion by reporting the felt arousal, valence and dominance on five point scales. For more details, please refer to [2].

Database file

The DREAMER database consists of the "DREAMER.mat" file in Matlab format. Loading this file loads a variable named "DREAMER" in the workspace. The "DREAMER" variable is structured as follows:

```
DREAMER =

struct with fields:

    Data: {1×23 cell}
    EEG_SamplingRate: 128
    ECG_SamplingRate: 256
    EEG_Electrodes: {'AF3'  'F7'  'F3'  'FC5'  'T7'  'P7'  'O1'  'O2'  'P8'  'T8'  'FC6'  'F4'  'F8'  'AF4'}
    noOfSubjects: 23
    noOfVideoSequences: 18
    Disclaimer: 'While every care has been taken…'
    Provider: 'University of the West of Scotland'
    Version: '1.0.2'
    Acknowledgement: 'The authors would like to thank…'
```

The cell DREAMER.Data{i} contains the data for the i^{th} participant and is structured as follows:

struct with fields:

Age: 'X'
Gender: 'X' ('male' or 'female')
EEG: [1×1 struct]
ECG: [1×1 struct]
ScoreValence: [18×1 double]
ScoreArousal: [18×1 double]
ScoreDominance: [18×1 double]

ScoreValence, ScoreArousal and ScoreDominance are vectors that their i^{th} element corresponds to the participant rating for the i^{th} film clip in terms of Valence, Arousal, and Dominance respectively.

The EEG and ECG recordings are stored in the DREAMER.Data{i}.EEG and DREAMER.Data{i}.ECG variables respectively which are structured as follows:

struct with fields:

baseline: {18×1 cell}
stimuli: {18×1 cell}

The recordings referring to the stimuli film clips are stored in the "stimuli" variable, while the recordings for the neutral clip shown before each film clip are stored in the "baseline" variable. The cells ....baseline{i} and ….stimuli{i} contain the data referring to the i^{th} film clip.

For ECG, each recording is in the form of an M x 2 matrix where M refers to the number of available samples and each column contains the sample of each of the two ECG channels.

For EEG, each recording is in the form of an M x 14 matrix where M refers to the number of available samples and each column contains the sample of each of the 14 EEG channels.

The j^{th} column of the EEG recordings refers to the following electrode positions:

j	Position
1	AF3
2	F7
3	F3
4	FC5
5	T7
6	P7
7	O1
8	O2
9	P8
10	T8
11	FC6
12	F4
13	F8
14	AF4

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The authors would like to thank Thomas Cuntz and Sebastian Palke for the data collection under their BSc (Hons) project.

Disclaimer

While every care has been taken to ensure the accuracy of the data included in the DREAMER dataset, the authors and the University of the West of Scotland do not provide any guaranties and disclaim all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damage) and costs which you might incur as a result of the provided data being inaccurate or incomplete in any way and for any reason. 2017, University of the West of Scotland, Scotland, United Kingdom.

Contact

For any questions regarding the DREAMER database please contact: Stamos.Katsigiannis@uws.ac.uk

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References

[1] C. A. Gabert-Quillen, E. E. Bartolini, B. T. Abravanel, and C. A. Sanislow, “Ratings for emotion film clips,” Behavior Research Methods, vol. 47, no. 3, pp. 773–787, 2015.

[2] S. Katsigiannis, N. Ramzan, “DREAMER: A Database for Emotion Recognition Through EEG and ECG Signals from Wireless Low-cost Off-the-Shelf Devices,” IEEE Journal of Biomedical and Health Informatics, 2017. In press. doi: 10.1109/JBHI.2017.2688239