Task & Data Analysis

Name of Dataset: EEG rhythms
Date: March 2006
Author: Gerold Baier (Translation Alberto de Campo)

This template is for TaDa analysis of scientific datasets in the SonEnvir project. It is based on the work of Stephen Barrass ("Auditory Information Design", PhD thesis, 1997). For further information read chapter 4 "TaDa: Task and Data analysis of information requirements".

Files: The data consist of several files:
GBalpha.csv, MLTalpha.csv, RhythmSeizure.csv, RhythmWave1.csv, RhythmWave2.csv.

Format: All files are comma-separated lines of floating point numbers, i.e. csv text format.
For convenience, conversions to .aif files and mtx files are also provided.
These ascii-files are organized as follows:
Every number is an electric potential, measured on the skin of the head, expressed in microvolts.
Every line contains all the potentials recorded at the same instant.
In every line the potentials of all selected electrodes are written in sequence, separated by commas.
The sequence of lines is the time series, i.e. the sequence of all potentials of the electrodes at a constant sampling rate.

Scenario

The Story:

The EEG data files should be sonified in realtime in order to present rhythmic phenomena.

File Details GBalpha.csv and MLTalpha.csv:
Two normal adult subjects, Channels: P3, P4, Pz, O1, O2.
Reference: Averaged earlobe electrodes, (A1+A2)/2. Sampling rate: 250 Hz.

File Details RhythmWave1.csv, RHythmWave2.csv, and RhythmSeizure.csv:
15 year-old patient with partial epileptic seizures, frontal focus.
Channels: FP2-*SD F10-*SD T10-*SD P10-*SD FP2-*SD F8-*SD T4-*SD T6-*SD FP2-*SD F4-*SD C4-*SD P4-*SD FPZ-*SD FZ-*SD CZ-*SD FP1-*SD F3-*SD C3-*SD P3-*SD FP1-*SD F7-*SD T3-*SD T5-*SD FP1-*SD F9-*SD T9-*SD P9-*SD.
Reference: Source density, i.e. averaged neighbouring electrodes. Sampling rate: 500 Hz.
(Channel names follow 10-20 resp. 10-10 EEG convention.)

Tasks: Develop a real-time sonification that translates data time to listening time.
Rhythmic events occur between 1 and 20 Hz. In all cases a special EEG-rhythm in the frequency range of 8-13 Hz (alpha-band) occurs which is of particular interest. It should be represented as an audible rhythm such that: a) its transient appearance in a single electrode can be tracked; and b) correlations of the same rhythm in different electrodes can be followed.

Possible Task Group1: design a sonification for channels 4 and 5 (electrodes O1 and O2) of file MLTalpha.csv, and use it to play file GBalpha.csv in order describe the differences of the same physiological rhythm between two subjects.

Possible Task Group2 and 3: Design a sonification for the short alpha-transients in channels 14 und 15 of file RhythmWave1.csv (around time index 20000-20600, Group2) and RhythmWave2.csv (around time index 18200-18900, Group3), and use it to play file RhythmSeizure (both groups), in order to describe the occuring differences.

The Keys:

Question:	Can the alpha rhythm be identified? When is it present? How does it differ between subjects?
Answers:	Yes/no, how fast and how reliably can it be detected? qualitative descriptions.
Subject:	Qualities of the alpha rhythms
Sounds:	? (to be developed)

TaDa

The Task:

Generic question:	What is it? When is it present? Are they different?
Purpose:	identify, analyse, compare
Mode:	interactive
Type:	discrete
Style:	exploration

The Information:

Level:	Local, intermediate (cross-comparison)
Reading:	direct
Type:	Unknown (qualitative description)
Range:	Continuous strength of presence
Organisation:	time, location

The Data:

Type:	interval
Range:	+- ca 200 microvolts
Organisation:	time, location

/********** Original german documentation by Gerold Baier: *********/
Attached 5 Ascii-Files, die wie folgt organisiert sind.

Jede Zahl ist ein elektrisches Potential, abgegriffen an der Kopfhaut, ausgedrueckt in Mikrovolt.
Jede Zeile enthaelt alle Potentiale, die zu einem bestimmten Zeitpunkt abgegriffen wurden.
Pro Zeile sind die Potentiale aller gewaehlten Elektroden hintereinander geschrieben, separiert durch Kommas.
Die Zeilenfolge gibt die Zeitreihe, das heisst die zeitliche Sequenz der Potentiale aller Elektroden bei einer konstanten Sampling Rate.

Files GBalpha.csv und MLTalpha.csv:

Normale erwachsene Versuchspersonen. Kanaele: P3, P4, Pz, O1, O2.
Referenz: Gemittelete Ohrlaeppchen-Elektroden (A1+A2)/2. Sampling rate: 250 pro Sekunde.

Files RhythmWave1.csv, RHythmWave2.csv und RhythmSeizure.csv:

15 jaehriger Patient mit partiellen epileptischen Anfaellen, frontaler Focus.
Kanaele: FP2-*SD F10-*SD T10-*SD P10-*SD FP2-*SD F8-*SD T4-*SD T6-*SD FP2-*SD F4-*SD C4-*SD P4-*SD FPZ-*SD FZ-*SD CZ-*SD FP1-*SD F3-*SD C3-*SD P3-*SD FP1-*SD F7-*SD T3-*SD T5-*SD FP1-*SD F9-*SD T9-*SD P9-*SD.
Referenz: Source density, d.h. gemittelte Nachbarelektroden. Sampling rate: 500 pro Sekunde.

(Kanalnamen sind entsprechend der 10-20 bzw 10-10 EEG Konvention.)

Tasks: Es wird eine Real-time-Sonification gesucht, die die Datenzeit in Hoerzeit uebersetzt.
Rhythmische Ereignisse treten zwischen 1 und 20 Hz auf. In allen Faellen tritt ein besonderer EEG-Rhythmus im Frequenzbereich 8-13 Hz (alpha-Band) auf, der von besonderem Interesse ist. Er soll als hörbarer Rhythmus dargestellt werden um: sein transientes Auftreten in der Einzelelektrode verfolgen zu koennen; die Korrelationen des gleichen Rhythmus in verschiedenen Elektroden verfolgen zu koennen.

Task Gruppe 1: eine Sonifikation der Kanaele 4 und 5 (Elektroden O1 und O2) des Files MLTalpha.csv zu entwickeln und dann damit das File GBalpha.csv abzuspielen um die Unterschiede des gleichen physiologischen Rhythmus zwischen zwei Versuchspersonen zu beschreiben.

Task Gruppe 2 und 3: Eine Sonifikation der kurzen alpha-Transienten der Kanaele 14 und 15 des Files RhythmWave1.csv (Zeitpunkte 20000-20600, Gruppe 2) und RhythmWave2.csv (Zeitpunkte 18200-18900, Gruppe 3) zu entwickeln und dann damit das File RhythmSeizure (beide Gruppen) abzuspielen, um die darin auftretenden rhythmischen Veraenderungen zu beschreiben.
**********/