MindDrawPlay

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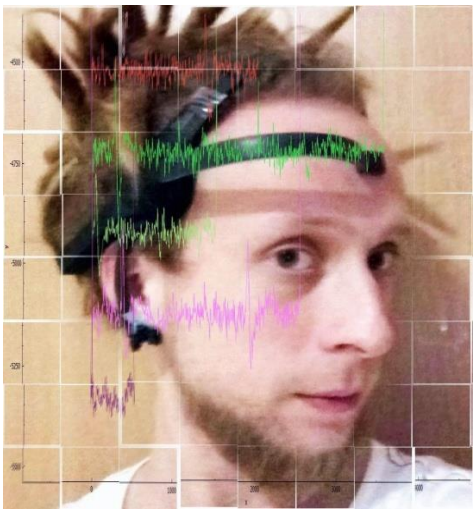
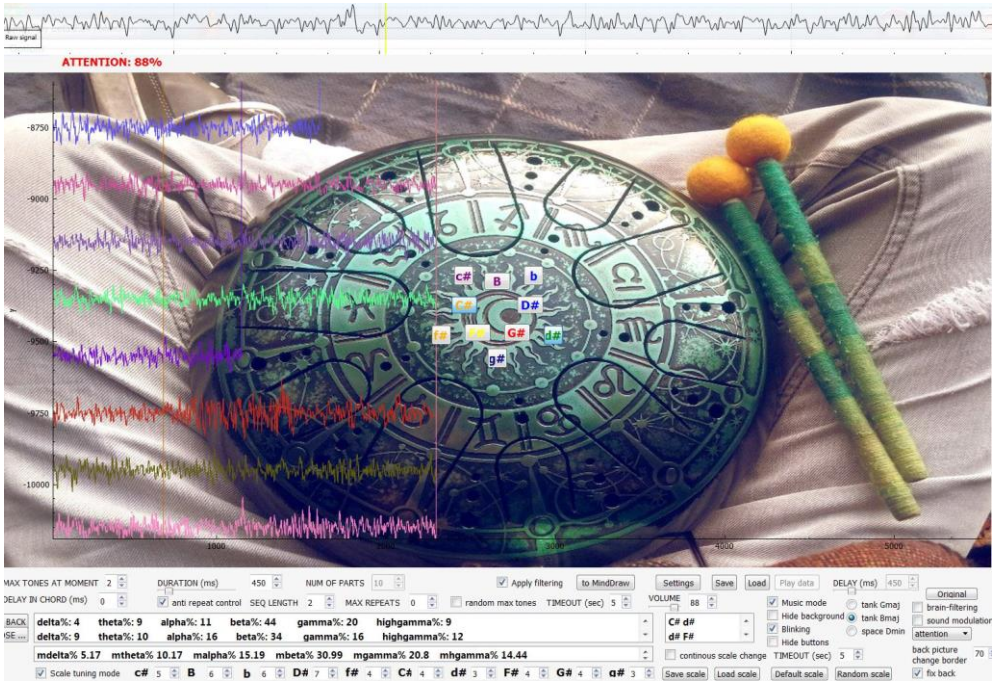


MindDrawPlay – is a project of experimental interactive audio-visual art, representing translation of brain waves to drawing, graphical and musical space controls. It has been grown on a base of a research work in the direction of Brain-Computer Interfaces. Combining both latest technology advances – such as mobile EEG devices and musical knowledge – such as pentatonic scales, it allows everyone literally to see, to hear his brain activity represented by set of sounds and to use brain waves as a brush for drawing, as parameters for image filtering or changes in a graphical flow and in a simple puzzle gathering and identical pictures recognition games.

Pic.1 Mobile EEG device (MindWave NeuroSky, http://neurosky.com), using as a data acquisition device for brain waves

Thanks to mobile EEG, it is simple in usage, does not require any preparation procedures (like with traditional EEG devices), just wear, observe and play with your mindspace. Application allows user to control many different parameters, for example, in case of music – duration of tones, number of tones in a moment and their distribution (how often which tones play), in case of drawing – different color modes of brush and amplitude of brain signals as a brush, in case of graphical space flow – how many pictures in a puzzle will change and how fast. Moreover, you can observe in real time dynamics of your brain waves on plots, your attention/meditation level changes and how actions in application or your mental activity states influence brain waves. Therefore, essentially, MindDrawPlay is form of an interactive art, neurofeedback application and a tool for exploring brain activity patterns.

Basically, there are two windows in the application, on the top of both there is a plot with real-time brain signal from EEG device. 1st window is “MindPlay”, allowing translation of brain waves to music by playing samples of tones from 2 tank drums and 1 hang drum with any background image (.jpg). The image can be filtered at the same time with effects (blurring and change of colors) with parameters related to brain activity: higher attention/meditation level correspond to stronger effect. Music by brain waves can be combined with usual playing of samples by user. Here and later exemplary screen pictures illustrate work of application, as well as video on links.



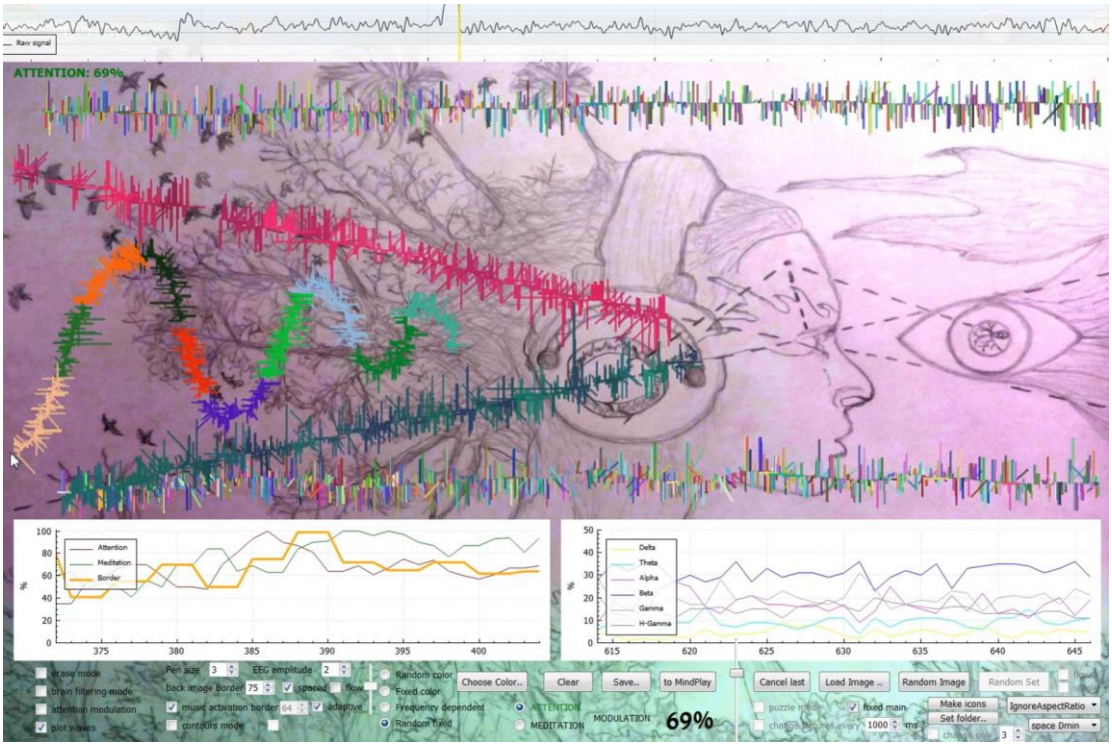
Pic. 2 Screen of “MindPlay” window with brain waves flow,
video examples: https://vimeo.com/363065676, https://vimeo.com/373804169, https://vimeo.com/341203496

How does it work?

In short – it gets brain signals (electrical activity in microvolts) from 1 electrode (on frontal lobe area, Pic.1) and transmits it via bluetooth to the application, where it is processed in a short intervals (1, ½ sec or less) and frequency distribution for every interval is analyzed. Different musical tones are connected to different brain waves (delta, theta, alpha, beta, gamma, high gamma), depending on which of them are more expressed in relation to deviation from its average value – particular corresponded tones will play. Thanks to pentatonic scale (which is used in hang or tank drums), the sounds are always in harmony. Your attention / meditation levels, which are estimated by build-in algorithm in EEG device (one value per second, http://developer.neurosky.com/docs/doku.php?id=esenses_tm) are related with volume control: when you are more focused – sounds play louder, and optionally with tones duration, where with a higher level of attention – tones play longer. Brain waves are visualized by those short intervals in a flow, which you can scale and move.

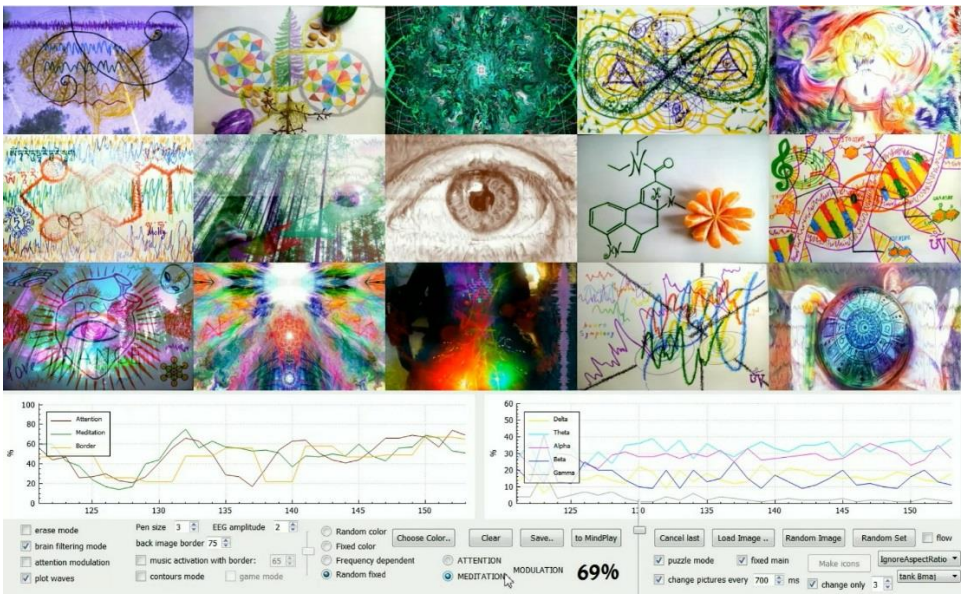
2nd window is "MindDraw" with 4 different modes representing various graphical spaces and controls of them. In all modes there is an option to show in real time brain waves and attention / meditation levels on the plots. It represents your brain activity patterns, when you simply look on the application window or do something there (or wherever within limits of bluetooth connection). Therefore, you can see how your interactions influence your brain activity, for example, when you start drawing a line – your attention and beta waves usually increase, when you are closing eyes or relaxing – alpha waves usually get higher. Moreover, there is an option for combining drawing with music – when your attention/meditation level is higher than some value (like 80% or adaptively computed value) – musical space is activating and you hear sounds from "MindPlay" window.

1st mode – drawing with brain waves as a brush, the idea is that when you press and move the mouse – signal from your brain (amplitude of brain oscillations from EEG device) is projecting on a plot with direction always orthogonal (90°) to mouse movement. There are several options and parameters, such as color control (brain frequency dependent, random, fixed), amplitude (fixed, attention/meditation modulated), modes for instant drawing and drawing by contours. As in "MindPlay" window, you can use any image as a background layer also with a filtering option. Screenshot and short videos on the link below demonstrate it.



Pic. 3 Screen of "MindDraw" window in "drawing mode",
video examples: https://vimeo.com/374172719, https://vimeo.com/331878650, https://vimeo.com/363152405

2nd mode – puzzle flow representation of any images set. Here the idea is that you have 15 small puzzles with images and you can control with your attention/meditation levels how many of them and how fast will change, for example, when you are focusing – less puzzles are changing and slowly.

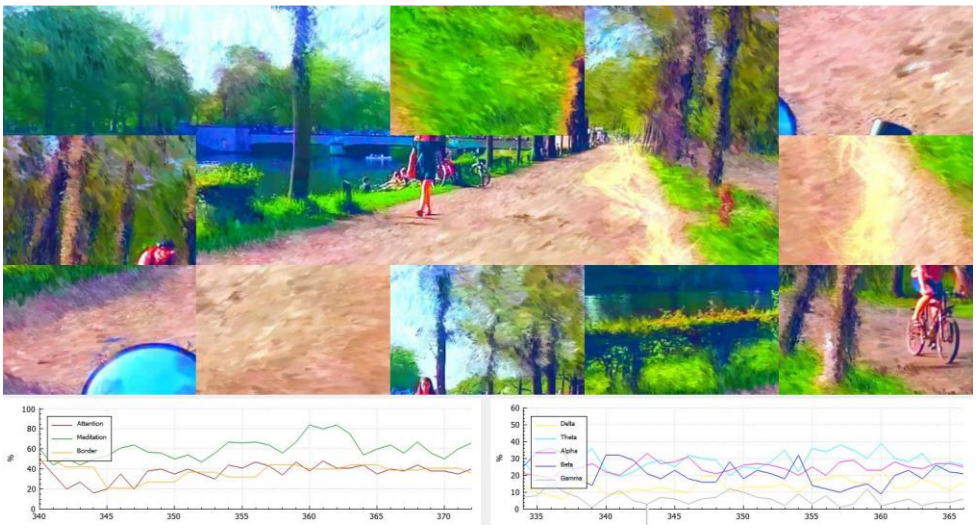


Pic. 4 Screen of “MindDraw” window in “puzzle mode”,
video example: https://vimeo.com/374183779

"Draw" and "Play" windows can be switched and used with the same picture and all options available in two windows, so you can observe pictures from a set, choose the one you like and go for drawing or playing, then go back to the set, choose another one or just observe the flow, video example: https://vimeo.com/332093098

3rd mode – simple puzzle gathering game, where with your attention/meditation level you need to complete the picture from 15 randomly shuffling fragments. There are 2 options in this mode, when puzzle has fragments only of the one picture or when it is represented by the background picture and a set of small randomly changing overlapping images. The idea is that, when you are more focused / relaxed – the puzzle is more complete, less fragments are in the wrong positions (or less overlaps with background picture) and changing slowly.

4th mode – an identical pictures recognition game, where you need to find two the same pictures among 15, when all of them are blurring depending on attention, when you are more focused – pictures are more clean and it’s usually easy to find the same (example: https://vimeo.com/372210884).



Pic. 5 Screen of “MindDraw” window in “puzzle gathering” mode,
video example: https://vimeo.com/362443658

MindDrawPlay is a part-time hobby project written in C++/Qt and currently is tuned for MindWave EEG device. However, it can be adapted for other mobile or full EEG systems. There are a lot of ideas and ways for development and improvement. Author is interested and opened for any potential collaborations.

Examples of drawings and pictures made with the app: https://www.artstation.com/neur0forest/albums/1338653
Screen recordings demonstrating work of the app: https://www.artstation.com/neur0forest/albums/1425498