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Brainwave Neurofeedback Mind-Hacking

for Mental Enhancement, Art, and Meditation - Hack y0ur bRaiN!

solar powered wireless open source Biofeedback + EEG
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SCIENCE: bio-electrical signals + brain-waves

EMG

ECG

EEG
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**SCIENCE**: brainwave frequencies

- **External focus**: Awake, normal alert consciousness
- **Relaxation**: Relaxed, calm, lucid, not thinking
- **Meditation + dream**: Deep relaxation and meditation, mental imagery
- **Deep trance / sleep**: Deep, dreamless sleep

MeTaVoluti0N ~ meta @ c-base.de
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**TECHNOLOGY:** binaural beats

White/pink/brown noise generator – variable stereo delay

Auditory sensory processing artifacts

Brain perceives frequency difference as oscillation
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**TECHNOLOGY : blinking lights** *classic*

frequency of light pulses stimulate brain resonance
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TECHNOLOGY: blinking lights modern

- fullscreen monitor backbuffer flipping
- programmable strobe flasher
- DMX light control
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**APPLICATION**: mind machines

combine binaural beats and flashing lights to stimulate brain
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**APPLICATION : Neurofeedback**

Direct feedback of brainwave distribution
visual, auditory, haptic feedback of mental state
brainwaves somewhat naturally oscillate

reward when closer to desired state (frequency distribution oscillation)

harmony vs. disharmony sounds

classic conditioning / pavlovian dogs
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OpenBCI hardware overview

- silver electrodes
- noise filter
- amplification
- AD conversion
- microcontroller
- USB / bluetooth serial port
- TCP network stream
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EEG bio-signal amplifier hardware

ModularEEG

OpenMind

MonolithEEG
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**Neuro-Headsets**

- modular adjustable design
- saline solution electrodes
- replaceable active dry electrodes
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wearable technology

Lillypad Arduino
heart-lung-sensor belt/shirt
brainwave hats with silver fabric
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hackable commercial devices

Emotiv   NeuroSky   IBVA

expensive to get raw data access
has mostly been reverse engineered
but not really hackable
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MetaMind software overview

Neuroserver
TCP network stream

Brainbay  Java, Python

Signal processing
filters averagers metrics
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**ANALYZE:** digital signal processing

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Wavelet-Transform

- event correlated potentials

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Fourier-Transform

- sliding window FFT
- bandpass filter
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clustering + data-mining

databionics

neural nets

PCA

simulated annealing

ESOM

dynamic time warping
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data-flow bio-signal processing framework
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**applications + use cases**

- control computer/electronics with mental states
- generate MIDI sounds for music synthesizers
- self-control mental state (relaxation / focus),
  sleeping-induction, lucid-dreaming, fast-learning
- increased mental capacity (brainwave synchronicity)
  - consciously control mental states
  - increased brain self-regulation ability
- Neurofeedback Accelerated Learning
- Neurofeedback Meditation
- Personal-Development + Self-Hacking
  - synchronous activity, stimulating inter-neuron connectivity
brain areas - electrode placement

- Frontal cortex left-right (conscious direction + reflection)
- Spacial motor cortex map (imaginative movement)
- Wernicke's areal (speech)
- Visual cortex
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*tech evolution + trends + innovations*

**industrialized tech**
**moore's law effect**

**Internet Communication**
- open communities
- social groupware
- cloud computing
- crowd sourcing

**+ precision**
**+ processing power**
**+ usability & comfort**

**- physical size**
**- material cost**
**- energy need**

*contact-less measurement*
*wearable computing*
*immersive gaming*

*personal-coaching AI*
*exo-skeleton*
*self-transformation RPG*
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participate + contribute

Open-BCl.org

international open-community

links news updates
free experimentation demos
hackerspace workshop tour
custom devices and software

> check out the wiki website
> Join the Facebook Group
> be friends on social web
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open community projects

collaborative work - share projects – improve together

build a kit => have fun + learn
hack project => adapt + improve

upgrade hardware design
bio-signal software framework
[web] application-building SDK

secure chosen-anonymity distributed
“brainwave social network”
individual empowerment
reprogram mental patterns

become aware

brainwave sniffer
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