Visual Cognition

An Imaginary experiment in Neuroimaging

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Computer Vision

- 3D Vision
- 3D TV
- Biometrics
- Color and texture
- Document analysis
- Graph-based Methods
- Image and video indexing and database retrieval
- Image and video processing
- Image-based modeling
- Kernel methods
- Medical imaging
- Mobile multimedia
- Model-based vision approaches
- Motion Analysis
- Non-photorealistic animation and modeling
- Object recognition
- Performance evaluation
- Segmentation and grouping
- Shape representation and analysis
- Structural pattern recognition
- Tracking

Pattern Recognition

- Feature detection
- Machine learning

Main steps in current methods

These approaches work in completely different ways that brain visual cognition works

Objective

- By study of brain visual cognition process we may found a new approach for computer vision or even pattern recognition in general
**Hypothesis**

- Record neuro activity of visual cognition
- Analyze and train machine with these data
- Simulate visual signals form eye from a digital image
- Develop a commuter vision by these data

**Brain-computer interface**

- There are some research in which, machine can learn brain signal activities

**Neuroimaging Techniques**

- Magnetoencephalography (MEG)
- functional magnetic resonance imaging (fMRI)
- Electroencephalography (EEG)

**Training**

- We record brain activity during vision process
- Then try to find a pattern on these data and learn it via machine learning methods
Eye Signals

- Next step is to find a way to produce same signals as eye produce, in computer by a digital image

Result

- If we input these artificial eye's vision signals form an image to our trained machine we can have visual cognition as our brain do

Problems

- There are huge amount of data, we need to know where exactly to look and record
- Machine training with these amount of data needs lots of computing resources and time
- Eye signal simulation
- Even if it is successful it may not be practical due to huge computation cost

Good News

There have been some very interesting experiments which have been able to detect image object category from fMRI and MEG images and even some to reconstruct images and display them on a computer!