High-throughput image detection and retrieval using human brain activity

Technology #m09-082

Accurate detection and classification of objects is a central goal of automated computer vision that has numerous applications. This technology describes a method of mapping out brain activity with image detection. The process involves a human subject being instructed to look for a specific class of objects of interest (OOI) in a series of images or videos. Brain activity signals recorded from an electroencephalogram (EEG) electrode array placed on the subject’s scalp are processed to obtain a score that reflects the subject’s confidence in detecting the OOI. This score is input to a pattern mining algorithm that refines the scores and uses them to classify or retrieve relevant images or videos from a large collection of visual content.

Combining brain states and high processing speeds of computer vision systems to obtain highly accurate, robust signals, and efficient processing throughput over large image collections.

Although current computer vision techniques for content analysis are capable of rapidly processing increasingly large numbers of images, their recognition accuracy is still inadequate for general classes of target images. By leveraging the superior detection and classification accuracy of the human brain, the technology improves upon the detection/classification limitations of purely machine-based systems that cannot easily generalize over generic target image classes and/or are sensitive to noise. Visual pattern mining (VPM) performed using the noisy labels obtained from EEG detection enables the technology to efficiently scale over sets of images that are normally too large to classify manually.

The technology has been tested on sets of satellite imagery (DigiGlobe images) and Internet image collections (Caltech 101) using a 64-electrode EEG recording system operated with standard settings.

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Applications:

- Accurate labeling of large databases of images or videos.
• Sorting of images or videos based upon features.
• Facial recognition.
• Analysis of surveillance videos for forensics or security purposes.
• Annotation of natural imagery (e.g., satellite, geographic, etc.).
• Improved computer-aided medical diagnostics.
• Brain Computer/Machine Interface (BCI, BMI) applications.

Advantages:

• High image recording and categorization throughput.
• Rapid retrieval of desired images from a database.
• Robust to noise.

Patent information:

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Related Publications:


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