How Do We See What We See

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We look at a Gothic cathedral in a different way than we gaze at a standard apartment block, and when we scrutinize paintings, our gaze slides along differently than when we look at a datasheet with numerals to be memorized. And how are training materials - manuals, video films and websites - perceived, when as much information should be gained from a glance? How should they be made up to work most effectively? Specialists of the Institute of Cognitive Neurology (Modern University for the Humanities) have been researching these questions.

Recording eye movements, the researchers found the way to impartially assess informational significance of video materials. To this end, they applied the method of video oculography. The main advantage of the method is that it is noninvasive, i.e., does not require any intervention in the organism – neither application of electrodes or putting on contact lenses.

The image of an eye where a dark pupil is distinctly distiguished is recorded by an ordinary video camera. Displacement of the pupil's center along the eye image corresponds to displacement of a gaze along a visual stage. The system determines the pupil's coordinates with accuracy of about 0.5 degrees of arc and with high frequency, and represents the eye movement along the image on the computer monitor in the form of a track.

In the first experiment, 35 students of the Modern University for the Humanities at the age of 19 through 23 were tested. The students under investigation were offered to scrutinize various images on the computer

monitor. The images included a copy of painting by Shishkin, a fragment of videocollection on psychology, a photo, text from a manual, a Web page, pictures with hidden image and others. The eyes' movement was registered during contemplation of images and fulfillment of some visual tasks with the help of video-oculographic system.

Quick movement of eyeballs – saccades – accompany sight of any image. They are needed to transfer look at a new object, since discerning of fine details of the object necessary for its perception requires its projection onto the central part of retina. This is explained by the fact that it is in the central part of retina that light-sensitive photoreceptors - cones – are placed with high density. The process of image scrutinizing consists of eye focusing on some objects and transition to other objects. This process is recorded in the course of experiment.

Having laid the eyeball movement tracks (obtained with the help of the program) upon images, the researchers have determined what parts of the image bear the most information to the looker. Obviously, the gaze is focused the longest on the most informationally significant objects. The method also shows at what rate the brain perceives and processes obtained visual information, and how quickly a person under investigation can embrace the entire image, switching from one object to another.

Applied to a website, such information indicates its quality without bias. If according to the designer's idea, the user should pay more attention to some objects, but in reality the user's look does not dwell on these objects, it means that the website does not work as it should. It is very important for educational video materials what strategy the user applies for data search. That accounts for success of learning the material. The method will undoubtedly be very useful when creating new video products and for expert judgement on available materials.

The method has one more use, which the researchers investigated in the second experiment. Its goal was to evaluate the eyes' movement in the course of mastering knowledge, for example, when memorizing foreign words from a sheet, which was suggested to 19 persons under investigation. To remember a word, it is necessary to hold up a glance on it. It can be assumed that efficiency of memorizing the word will depend on the time the glance is fixed on it. Subjects were asked to learn by heart as many Latin words as possible, for this purpose, a list of words with the Russian translation was shown to them for 5 minutes. Then followed testing in the course of which the persons were to insert in the table the words they had memorized.

The persons under testing remembered from 1 to 12 words, or 4.53 on the average. The analysis proved that the time of gaze focusing on the words the persons had memorized was positively longer than on those they had failed to remember. The researchers believe that the method is applicable for control of training process effectiveness.

Source: Informnauka