Study quantifies errors in 3-D films that cause discomfort for viewers

March 2 2016

A team of scientists lead by Dmitry Vatolin, senior research fellow in Graphics & Media Lab at Lomonosov Moscow State University, spent eight years studying the problem of headaches caused by 3-D movies. In mid-February, the results of the research were presented in San-Francisco at the 27th annual conference of Stereoscopic Displays & Applications.

This problem is widespread. Vatolin cites a French poll in 2011 that collected people's responses after watching 3-D movies. It turned out that only one-third of spectators reported no trouble, while 27 percent felt 'certain discomfort', 22 percent reported worse condition, 7 percent suffered terrible headaches, and the remaining 11 percent reported discomfort due to other reasons. Dmitriy Vatolin himself believes that almost everyone who watched 3-D movies has experienced discomfort at least once, and many refuse to watch 3-D films due to past uncomfortable experiences.

This headache results from the 'wrong' images entering both eyes simultaneously. The brain needs to combine two images to produce a stereo effect, but unfortunately it does not always succeed. Most of the time brain adapts to this 'wrongness' without symptoms, but as statistics show, that does not happen all the time.

Dmitry Vatolin's research team names more than 15 causes of that problem. They can be separated into two categories: imperfections of equipment and errors in the movie. The first kind is explained by the

desire of the distributors to reduce expenses, which inevitably leads to a lower equipment quality. Bad glasses, cheap projectors and other sub-optimal equipment can worsen the quality of the viewer's experience.

The second category comprises more complicated, diverse causes, which unfortunately are not always detectable or preventable. Among them, one of the most painful (and rarest) blunders is reordering of the left and the right views of the 3-D video, which can sometimes happen even in the most professional production. And that is far from the only disadvantage of contemporary 3-D movies. As the main achievement of the study, Vatolin cites the creation of metrics that track such errors.

With the help of these metrics, the research team surveyed 105 recent Blu-ray productions and compiled statistics citing more than 10,000 potentially problematic scenes. In particular, 65 scenes with the left-right view swap were found in 23 different movies. Some problems were discovered even in such top ranking movies as *Avatar*, *The Chronicles of Narnia*, *Stalingrad* and others.

"That means that the probability of buying a Blu-ray 3-D movie with at least one scene with swapped left and right views is about 21 percent, which is quite significant for sensitive people,' explains Vatolin.

Various errors were detected in horror movies, Vatolin says, which can be explained by their relatively low budgets.

"Stereo movies are going through their transition period now," the scientist says. "Cinema producers started preferring stereo format, and it became particularly popular after the fantastic financial success of *Avatar*. Of course, the quality of the movies increases, and so does the quality of cinema equipment. Now the quality is often higher than *Avatar* had, but a significant decrease in problems may take about two to three years more. Right now, looking for good 3-D quality, you need to

choose high-budget movies and properly equipped cinema halls."

Provided by Lomonosov Moscow State University

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