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Design Accessible Web Sites

Thirty-six Keys to Creating Content for All Audiences and Platforms

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It's Not Polite to Flash the Audience

For thousands the world is a freak show, the images flicker past and disappear, the impressions remain flat and disconnected in the soul.

► Johann Wolfgang von Goethe

We need to watch out for the presence of flicker when we add video and multimedia content to our web sites. Flicker can be anything from a strobe effect, the transition of color on a passing high-speed train, or even something as subtle as the movement of shadows on a light-colored surface. Flickering video certainly has the capability to be irritating or bothersome, but our foremost concern here is that flickering also has the potential to be severely harmful to our users.

Photosensitive Epilepsy

Photosensitive epilepsy results in seizures of varying nature and severity upon exposure to certain visual stimuli. The most common triggers are stroboscopic light, repetitive patterns, and flickering video. Some developers argue that photosensitivity is a relatively rare condition and minimize the importance of flicker prevention. In 1997, however, photosensitive epilepsy was brought to prominent public attention when the Pokémon episode “Dennou Senshi Porygon” was broadcast in Japan, triggering seizures in hundreds of viewers. Clearly, when large audiences are targeted, as we do on the Web, even relatively small percentages translate into large numbers of susceptible viewers. Even if the numbers *were* minimal, the importance of preventing potential harm to our users is still worth significant effort on our parts.

What Is Flicker?

Flicker is the rapid switching back and forth of any form of visual input from high to low brightness. With respect to photosensitive epilepsy, we are specifically concerned about flickering at a rate of 2–55Hz. The concept of flicker is often misunderstood, however. You may have noticed that video runs at a frame rate of 12–30 frames per second (12–30Hz). Does this mean we can't have video at all? Absolutely not. Although any kind of motion has the capability to flicker, motion itself is not, in and of itself, a concern.

Stumbling in International Competition

In June 2007, flicker struck again in a video meant to introduce the 2012 London Olympic Games. A segment in the video featured a multicolor flicker that went untested and caused seizures in some viewers. Fortunately, the impact was much smaller than the 1997 Pokémon incident, affecting fewer than a dozen people. I'm not as concerned about the reported numbers as by the potential damage, though—in the end, 23,000 people in the United Kingdom were put at risk of seizures caused by this video.

It's often easy to lose perspective and view photosensitivity as a minor factor that affects only a few people. It's never just a few people—a small fraction of percent of the total population still adds up to thousands of people. This perspective is also a pretty bad way to do business. At the time, London mayor Ken Livingstone had these comments:

- “If you employ someone to design a logo for you and they haven't done a basic health check, you have to ask what they do for their money.”
- “Who would go into a firm like that again and ask them to do that work? This is a pretty basic thing.”

These are important things to think about. As web developers, we make our livings by serving an audience. If we allow harm to come to that audience, we allow harm to come to ourselves as well.

The motion also has to have the previously mentioned back and forth switching. What we really need is a way of understanding whether the type of motion is potentially harmful.

The Flash Threshold

WCAG 2.0 gives us a way of measuring flicker, though it is anything but simple.¹ What we're really looking for are changes in brightness. For this we'll need relative luminance formula that we used for evaluating contrast in *Thinking in Terms of Black and White*, on page 158. This time, instead of looking for the difference of brightness by location, we'll be looking at it as time passes.

1. <http://www.w3.org/TR/WCAG20/#general-thresholddef>

A flash is defined as a sequence of two shifts in relative luminance of more than 10 percent. Both Dim → Bright → Dim and Bright → Dim → Bright are possible flash transitions. Three or more of these in a one-second period is the threshold for a flicker problem. When counting the number of flashes in an interval, it is important to remember that the flash components can overlap. This means that Dim → Bright → Dim → Bright → Dim counts as three flashes. There is also a *red flash threshold*, where the luminosity is assessed in terms of fully saturated red rather than fully saturated white.

Unfortunately, it gets more complex. Small flickering parts of the screen are not generally considered to be harmful, while larger ones are. The recommended metric is that if the total flashing occupies more than a quarter of the pixels in any 341×256-pixel rectangle anywhere on the display when viewed at 1024×768, there's a problem. I didn't react very well to that recommendation the first time that I read that, and I am betting that you aren't either. On first impulse, this looks very complex and difficult to measure. In this case, the first impulse is spot on—particularly because the 341×256 rectangle mentioned can be *any* subrectangle on the screen.

This is obviously the kind of evaluation that we do *not* want to do by hand. Luckily for us, the TRACE Center offers the Photosensitive Epilepsy Analysis Tool (PEAT).² PEAT analyzes a video file for flicker problems. For an analysis of a full web page, we need to create a screen-cast video of the page with a tool such as iShowU³ or Camtasia⁴ and analyze it with PEAT.

Wherever possible, it is best to simply avoid creating content that uses flashing elements. Beyond the risk of triggering a seizure, they distract the user and generally reduce usability.

When the Flicker *Is* the Content

What about videos of lightning or stroboscopic photography where flickering effects are an essential part of the content? There is very little we can do to change the nature of the content, but we can create an alternate path to the information. The video should be loaded in a stopped state, which is a generally good idea anyway, and a warning should be

2. <http://trace.wisc.edu/peat/>

3. <http://shinywhitebox.com/>

4. <http://www.techsmith.com/camtasia/>

added before the video that informs the user about its nature and that people with photosensitivity should not watch. Additionally, we need to provide a transcript of the video that gives the essential information presented in the video. More about transcripts will be discussed later in this chapter in *Describe It to Me*, on page 191.

Act on It!

1. Get a plan in place to have your video tested for flicker.
2. Try out the PEAT tool, and get a feel for how it works on a variety of videos.
Note—if you have any suspicion that you yourself are photosensitive, *DO NOT TRY THIS!* (Not that I thought you would.)

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