National Aeronautics and Space Administration

# Motion Blur Evaluation Technique

## Visible motion blur: a perceptual metric to display motion blur

Motion blur evaluation technique was developed as a response to the lack of commercial tools and standards that measure motion blur. There are several standards for measuring data quality and voice quality over analog and digital networks, but there is no current standard measure of display motion blur. Motion blur is a significant defect of most current display technologies. Motion blur arises when the display presents individual frames that persist for significant fractions of a frame duration. When the eye smoothly tracks a moving image, the image is smeared across the retina during the frame duration. Although motion blur may be manifest in any moving image, one widely-used test pattern is a moving edge. This pattern gives rise to measurements of what is called moving-edge blur.

A number of methods have been developed to measure moving edge blur, however, none of these metrics attempts to provide a perceptual measure of the amount of motion blur. The perceptual metric for motion blur called Visible Motion Blur (VMB) incorporates three effects: contrast, masking, and visual resolution.

### BENEFITS

- **Eliminate need for human inspection**
- **Improve LCD manufacturing inspections**
- **Mimic human judgment**
- **Enhance reliability and consistency of inspections**
- **Reduce cost**
- **Enable perceptual model**
- **Automated process**
- **Potential industry standard**
- **Accuracy and precision**

***An image before (left) and after (right) simulated motion blur.***

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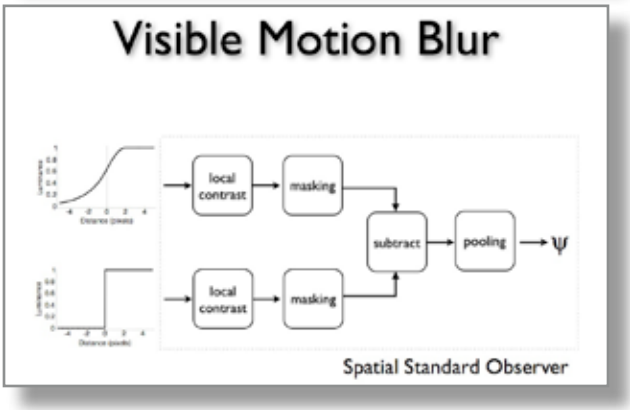
# Motion Blur Evaluation Technique: Technology Detail

Motion blur evaluation technique is a novel integration of technologies that models human sensitivity to moving spatial patterns that can be used to provide measurements of motion blur in displays that tend to respond poorly to rapid motion, such as liquid crystal displays (LCDs). Visible motion blur technology establishes a standard method of objectively measuring motion blur. This measurement technique is regarded as a non-reference method, where it does not compare the original content with the final content. It provides the accuracy and precision of motion picture response time (MPRT) measurements but does not require any pursuit cameras and can be administered by novice users and measurement personnel. It also introduces measures of sensitivity to blur in moving edges and converts MPRT data into perceptual units. It provides methods for estimating the strength of the motion blur artifact in perceptual units of just-noticeable differences (JND). These techniques are based on simulation of the moving edge on the display and by use of NASA's patented technology, Spatial Standard Observer, to estimate visibility. This technology automates the process of flat-panel display inspection, which still relies on human inspectors to distinguish low contrast defects, and therefore, brings consistency and reliability.

## APPLICATIONS

- **LCD, flat-panel display and computer manufacturer**
- **Instrumentation makers for measuring display quality**
- **Video Industry**
- **LCD glass manufacturer**




## Patents

This technology has a patent application pending.
Reference: ARC-15796-1.

## Licensing and Partnering Opportunities

NASA's Technology Transfer Program seeks to transfer this technology out of NASA's space program to benefit U.S. industry. NASA invites companies to inquire about licensing possibilities for this technology for commercial applications.

**Learn More**
*For more information on this technology, and to discuss licensing and partnering opportunities, please contact:*
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