National Aeronautics and
Space Administration

TECHNOLOGY SOLUTION

Optics

Strobing to Mitigate Vibration for Display Legibility

Reducing the visual blur of an object being viewed by an observer experiencing vibration

NASA has developed an innovative method and apparatus for reducing the visual blur of an object being viewed by an observer in a vibration environment. This method mitigates the motion blur introduced when a display, and/or the operator reading it, is undergoing vibration (e.g., during the launch phase of spaceflight). If both the operator and the display are undergoing vibration, their respective motion patterns need not be in phase. This mitigation occurs when the display is illuminated at a strobing rate that corresponds with the frequency of the vibration. This can be done either by strobing the ambient illumination in the environment (e.g., if the operator is reading a reflective surface display), or by strobing the display itself (e.g., strobing the backlighting of an electronic display).

BENEFITS

- Allows clear viewing of a display in situations of significant vibration
- Allows perception in spite of the vibration
- Can work at lower frequency multipliers
- Cost and complexity of display mitigation is greatly reduced

THE TECHNOLOGY

The dominant frequency of the vibration that requires mitigation can be known in advance, measured in real time, or predicted with simulation algorithms. That frequency (or a lower frequency multiplier) is then used to drive the strobing rate of the illumination source. For example, if the vibration frequency is 20 Hz, one could employ a strobe rate of 1, 2, 4, 5, 10, or 20 Hz, depending on which rate the operator finds the least intrusive. The strobed illumination source can be internal or external to the display.

Perceptual psychologists have long understood that strobed illumination can freeze moving objects in the visual field. This effect can be used for artistic effect or for technical applications. The present innovation is instead applicable for environments in which the human observer rather than just the viewed object undergoes vibration. Such environments include space, air, land, and sea vehicles, or on foot (e.g., walking or running on the ground or treadmills). The technology itself can be integrated into handheld and fixed display panels, head-mounted displays, and cabin illumination for viewing printed materials.

Modern High-Speed Train

APPLICATIONS

The technology has several potential applications:

- Aerospace Industry
- Land vehicles
- Avionics Systems
- Industrial Machinery
- Naval Vessels

PUBLICATIONS

Patent No: 8,711,462

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More Information

National Aeronautics and Space Administration

Agency Licensing Concierge

Ames Research Center

MS 202A-3
Moffett Field, CA 94035
202-358-7432
Agency-Patent-Licensing@mail.nasa.gov

www.nasa.gov

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