National Aeronautics and Space Administration

Visual Instrument Sensor Organ Replacement (VISOR)

Device that converts visual signals to audibly perceptible signals

Humans rely heavily on vision to sense their environment. However, visual sensing is generally available only for a limited visible range of wavelengths, roughly 400 nanometers (nm) to 720 nm. The range of wavelengths at which interesting physical and /or chemical effects occur, is 180 nm through about 10,000 nm. Audible sensing, over an estimated audible range of 200 Hertz (Hz)-20,000 Hz, is similarly limited, but this range is a larger fraction of the audible range of 10Hz-105 Hz. The Visual Instrument Sensor Organ Replacement (VISOR) device translates visual and other passive or active sensory instruments into sounds. The sensing super-position device increases the image resolution perception and is obtained via auditory and visual representation. The VISOR device provides a mapping or association between signals representing a selected region of a received visual image and audibly perceptible signals that are mapped one-to-one onto a selected set of distinguishable audible signal parameters. External multi-spectral sensors are translated into audible signals targeting the same human vision field.

VISOR provides the ability to sense beyond the human visible light range, to increase human sensing resolution, to use wider angle visual perception, and to improve the ability to sense distances. It also allows compensation for movement by the human or changes in the scene being viewed. Using the invention, a wide variety of tasks that are difficult or cumbersome to accomplish can be met. The system operates in real-time, using limited capabilities of the human user.

BENEFITS

- **Enables user to simultaneously focus attention on multiple aspects of a visual field**
- **Extends the vision system of human beings**
- **Increases human sensing resolution**
- **Enriches image detail**
- **Operates in real time**

technology opportunity

Visual Instrument Sensor Organ Replacement (VISOR): Technology Detail

The Visual Instrument Sensory Organ Replacement (VISOR) is a system to augment the human visual system by exploiting the improved capabilities of the human auditory system. In order to increase the visual image resolution obtainable via an auditory representation, a mapping is performed to distribute an image in time. Three-dimensional spatial brightness and multi-spectral maps of a sensed image are processed using real-time image processing techniques and are transformed into one or more two dimensional maps of an audio signal as a function of frequency and of time.

VISOR converts visual signals with at-least one associated wavelength, the visible and or the infrared, to one or more audibly perceptible signals with associated audio parameters that can be recognized and distinguished by the human ear. These signals include an audible indication of change, or change rate with time of one or more visual parameters. The radio signals provide monaural and /or binaural signaling that is analogous to depth clues provided by visually perceptible images. The audible signal parameters have an intuitive connection with the visual signal parameters to which the audible signal parameters corresponds. A visual image region that is likely to experience interference, signal distortion, signal attenuation can be converted and presented as a sequence of audio signal attributes that are more easily and accurately perceived or interpreted. The VISOR device was developed to augment the current state-of-the-art head-mounted (helmet) display systems.

APPLICATIONS

- **Hazardous environment (where fluids are opaque)**
- **Unfavorable atmospheric conditions (rain, snow, hail, sleet, fog)**
- **Noisy or life threatening environments (chemical spills, battlefields)**
- **Aviation and other vehicle cockpits**
- **Control room monitoring (process plants, transportation or utilities)**
- **Detecting micro-fractures in materials**

Patents

This technology has been patented (U.S. Patent 7,873,181).
Reference: ARC-15578-2.

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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