



Sensors

Enhanced Auditory Alert Systems

Methods and Systems for Enhanced Auditory Alert Perception

Auditory warning systems for human interfaces are often designed around criteria that depend primarily upon signal loudness. By making an alert signal substantially louder than the measured background noise level, one can insure that an alert signal will be detectable. Such auditory alert systems have been used in the aviation industry for a number of years in order to raise the awareness of the crew for terrain proximity for example. However, if an alert signal amplitude is too loud, the alert signal may produce a startle effect that hinders performance in some high stress situations. This invention provides an alternative approach that uses other features, like spatial modulation, to improve the detectability of an alert signal, without substantially increasing the amplitude level of the alert signal beyond the background sound level. This invention provides several different but compatible approaches to enhance the detectability of an alert signal.

BENEFITS

- Reduced overall level of alert sounds
- Reduced fatigue
- Improved detection of alarms
- Raised awareness
- No startle effect

technology solution

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THE TECHNOLOGY

In a first approach, an existing auditory alert signal is supplemented with a brief burst of selected spectral components, chosen to exceed an auditory masking threshold and lying in a broader frequency bandwidth, 0.1-10 KHz, than the frequency bandwidth of the alert signal that is at least 3-10 dB above a general background of auditory signals including noise. An alert prefix signal, preceding or contemporaneous with an alert signal, is issued that has one or more selected tones within each of several critical frequency bands, at a prefix signal level at least 3-10 dB above the background; and alert signal detectability is thereby increased. A second approach uses spatial modulation in a binaural signal delivery system to make a signal appear, to the subject, to move from one location to another within a selected time interval. In a third approach, a microphone for example provides a sound level that would otherwise be present at each of the subjects ears, averages these signals, and delivers the averaged signal to each ear through a pair of stereo earphones, as a more or less homogeneous background signal that the subjects ears interpret as being present in the center of the subjects head. A binaurally differentiated signal, such as the spatially modulated, spectrally altered alert signal is then more easily distinguished from this coherent background signal.



Enhanced Auditory Alert Perception

APPLICATIONS

The technology has several potential applications:

- Aviation
- Vehicles with stereo systems
- Personal cars or trucks
- Naval vessels
- Ceramics and composites
- Monitoring activities as in power plants
- Games
- Headset for visually impaired
- Workers in loud environment

PUBLICATIONS

Patent No: 7,346,172

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NP-2015-02-1370-HQ

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ARC-14556-1

