Furthermore, the invention can take the form of a computer program product accessible from a computer-usable or computer-readable medium providing program code for use by or in connection with a computer or any instruction execution system. For the purposes of this description, a computer-usable or computer readable medium can be any apparatus that can contain, store, communicate, propagate, or transport the program for use by or in connection with the instruction execution system, apparatus, or device.

Examples of the medium include an electronic, magnetic, optical, electromagnetic, infrared, or semiconductor system (or apparatus or device). Examples of a computer-readable medium include a semiconductor or solid state memory, magnetic tape, a removable computer diskette, a random access memory (RAM), a read-only memory (ROM), a rigid magnetic disk, and an optical disk. Current examples of optical disks include compact disk—read only memory (CD-ROM), compact disk—read/write (CD-R/W), DVD, and Blu-ray.

A data processing system suitable for storing and/or executing program code will include at least one processor coupled directly or indirectly to memory elements through a system bus. The memory elements can include local memory employed during actual execution of the program code, bulk storage, and cache memories which provide temporary storage of at least some program code in order to reduce the number of times code must be retrieved from bulk storage during execution.

Computer program code for carrying out operations of the present invention may be written in a variety of computer programming languages. The program code may be executed entirely on at least one computing device, as a stand-alone software package, or it may be executed partly on one computing device and partly on a remote computer. In the latter scenario, the remote computer may be connected directly to the one computing device via a LAN or a WAN (for example, Intranet), or the connection may be made indirectly through an external computer (for example, through the Internet, a secure network, a sneaker net, or some combination of these).

It will be understood that each block of the flowchart illustrations and block diagrams and combinations of those blocks can be implemented by computer program instructions including software and/or means. These computer program instructions may be provided to a processor of a general purpose computer, special purpose computer, or other programmable data processing apparatus to produce a machine, such that the instructions, which execute via the processor of the computer or other programmable data processing apparatus, create means for implementing the functions specified in the flowcharts or block diagrams.

The various embodiments described above may be combined in a variety of ways with each other. Furthermore, the steps and number of the various steps illustrated in the figures may be adjusted from that shown.

It should be noted that the present invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, the embodiments set forth herein are provided so that the disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. The accompanying drawings illustrate examples of embodiments of the invention.

Although the present invention has been described in terms of particular example and alternative embodiments, it is not limited to those embodiments. Alternative embodiments, examples, and modifications which would still be encompassed by the invention may be made by those skilled in the art, particularly in light of the foregoing teachings.

Those skilled in the art will appreciate that various adaptations and modifications of the preferred and alternative embodiments described above can be configured without departing from the scope and spirit of the invention. Therefore, it is to be understood that, within the scope of the appended claims, the invention may be practiced other than as specifically described herein.

VI. Industrial Applicability

The invention can be utilized in a variety of settings to provide information as to whether an individual is becoming drowsy or has fallen asleep to avoid problems developing as a result. For example, an air traffic controller monitoring radar would receive notification along with a supervisor if the air traffic controller was becoming drowsy or fell asleep. Another example of an industry that would benefit from this invention is the trucking industry, because the driver may not be aware of their condition and this would provide a notification that they have become drowsy.

The invention can also be utilized as a research tool, for example, to see the impact of sleep schedules and/or pharmaceutical products and/or drugs on individuals. In these circumstances the invention may be coupled with cognitive tests to be performed by the individual.

I claim:

1. A method comprising:
- transforming a EEG signal to the frequency domain with a Discrete Fourier Transform using a processor,
- obtaining an amplitude of each frequency component using the processor,
- summing all of the amplitudes of frequencies in the range of 201-500 Hz to obtain a high frequency amplitude using the processor,
- summing all of the amplitudes of frequencies in the range of 1 to at least 15 Hz to obtain a low frequency amplitude using the processor, and
- calculating an Index based on a ratio of the high frequency amplitude to the low frequency amplitude using the processor.

2. The method according to claim **1**, further comprising smoothing the Index using the processor.

3. The method according to claim **2**, wherein smoothing the Index using a 10 point moving average.

4. The method according to claims **2**, further comprising obtaining a slope value of the Index using the processor.

5. The method according to claim **1**, wherein the low frequency amplitude is obtained for frequencies in the range of 1-20 Hz.

6. The method according to claim **1**, further comprising:
- obtaining an EEG signal, and
- converting the EEG signal from analog to digital.

7. The method according to claims **6**, further comprising smoothing the Index using a 10 point moving average using the processor.

8. The method according to claim **7**, further comprising obtaining a slope value of the Index using the processor.

9. The method according to claim **1**, further comprising summing all of the amplitudes of each frequency component to obtain a total amplitude using the processor.

10. The method according to claim **9**, wherein obtaining the amplitude of each frequency component includes grouping the frequencies into frequency bands using the processor.

11. The method according to claim **10**, wherein the frequency bands include 1-15 Hz, 16-50 Hz, 51-100 Hz, 101-200 Hz, 201-300 Hz, 301-400 Hz, and 401-500 Hz.

12. The method according to claim **10**, wherein the frequency bands include 1-20 Hz, 21-50 Hz, 51-100 Hz, 101-200 Hz, 201-300 Hz, 301-400 Hz, and 401-500 Hz.