ments, the cost of replacing these airbags will be excessive if they all deploy in an accident. The improvements described below minimize this cost by not deploying an airbag for a seat, which is not occupied by a human being. An occupying item of a seat may be a living occupant such as a human being or dog, another living organism such as a plant, or an inanimate object such as a box or bag of groceries.

[0014] Side impact airbag systems began appearing on 1995 vehicles. The danger of deployment induced injuries will exist for side impact airbags as they now do for frontal impact airbags. A child with his head against the airbag is such an example. The system of this invention will minimize such injuries.

[0015] 2. General Solution to the Problem and Resulting Benefits

[0016] A device to monitor the vehicle interior and identify its contents is needed to solve these and many other related problems. For example, once a Vehicle Interior Identification and Monitoring System (VIMS) for identifying and monitoring the contents of a vehicle is in place, many other products become possible including the following:

[0017] Inflators and control systems now exist which will adjust the amount of gas flowing into and/or out of the airbag to account for the size and position of the occupant and for the severity of the accident. The vehicle identification and monitoring system of this invention will control such systems based on the presence, size and position of vehicle occupants or the presence, position and orientation of an occupied child seat.

[0018] Vehicles can be provided with a standard cellular phone or other telematics communication system as well as the Global Positioning System (GPS), an automobile navigation or location system with an optional connection to a manned assistance facility, which is now available on several vehicle models. In the event of an accident, the phone may automatically call 911, or contact OnStar™ or similar service for emergency assistance and report the position of the vehicle. If the vehicle also has a system as described below for monitoring each seat location, the number and perhaps the condition of the occupants could also be reported and/or photographs of the vehicle interior before, during and/or after the accident can be transmitted. In that way, the emergency service (EMS) would know what equipment and how many ambulances to send to the accident site and prioritize the accident when several accidents occur in the same time frame. Moreover, a communication channel can be opened between the vehicle and a monitoring facility/emergency response facility or personnel to enable directions to be provided to the injured occupant(s) of the vehicle to assist in any necessary first aid prior to arrival of the emergency assistance personnel.

[0019] Once an occupant sensor is operational, the vehicle entertainment system can be improved if the number, size and location of occupants and other objects were known. However, it is not believed that, prior to the instant invention, engineers have thought to determine the number, size and/or location of the occupants and use such determination in combination with the entertainment system. Indeed, this information can be provided by the vehicle interior identification and monitoring system of this invention to thereby improve a vehicle's entertainment system. Once one considers monitoring the space in the passenger compartment an alternate method of characterizing the sonic environment comes to mind which is to send and receive a test sound to see what frequencies are reflected, absorbed or excite resonances and then adjust the spectral output of the entertainment system accordingly.

[0020] As the VIMS improves to where such things as the exact location of the occupants ears and eyes can be determined, even more significant improvements to the entertainment system become possible through the use of noise canceling sound, and the rear view mirrors can be automatically adjusted for the driver's eye location.

[0021] Another example involves the monitoring of the driver's behavior over time that can be used to warn a driver if he or she is falling asleep, or to stop the vehicle if the driver loses the capacity to control it.

[0022] Similarly to the entertainment system, the heating, ventilation and air conditioning system (HVAC) can be improved if the number, attributes and location of vehicle occupants were known. This can be used to provide a climate control system tailored to each occupant, for example, or the system can be turned off for certain seat locations if there are no occupants present at those locations.

[0023] In some cases, the position of a particular part of the occupant is of interest such as: (a) his hand or arm and whether it is in the path of a closing window so that the motion of the window needs to be stopped; (b) the position of the shoulder so that the seat belt anchorage point can be adjusted for the best protection of the occupant; or, (c) the position of the rear of the occupants head so that the headrest can be adjusted to minimize whiplash injuries in rear impacts

[0024] Additionally, using an advanced VIMS, as explained below, the position of the driver's eyes can be accurately determined and portions of the windshield, or of a special visor, can be selectively darkened to eliminate the glare from the sun or oncoming vehicle headlights. This system can use electro-chromic glass, a liquid crystal device, Xerox Gyricon, Research Frontiers SPD, semiconducting and metallic (organic) polymer displays, spatial light monitors, electronic "Venetian blinds", electronic polarizers or other appropriate technology, and, in some cases, detectors to detect the direction of the offending light source. In addition to eliminating the glare, the standard sun visor can now also be eliminated Alternately, the glare filter can be placed in another device such as a transparent sun visor that is placed between the driver's eyes and the windshield.

[0025] 3. Pattern Recognition

[0026] The present invention adds more sophisticated pattern recognition capabilities such as fuzzy logic systems, neural networks, modular neural network systems or other pattern recognition computer based algorithms to the occupant position measurement system disclosed in the above referenced patents and/or patent applications and greatly extends the areas of application of this technology. An example of such a pattern recognition system using neural networks using sonar is discussed in two papers by Gorman, R. P. and Sejnowski, T. J. "Analysis of Hidden Units in a Layered Network Trained to Classify Sonar Targets", *Neural*