Algorithmic effects on occupancy detection under crash conditions

Many vehicles have sensor systems built in that are intended to obtain occupancy information to determine the proper deployment of occupant protection systems during specific vehicle crash modes.. Some of these built in sensors are incorporated into the front driver and passenger seats and operate in a variety of ways to obtain the size and weight of the occupant. However, many crashes have been recorded where it would be appear that the occupant protection system or airbags fail to activate despite the occurrence of a moderate to severe crash resulting in severe injury and death.

In this paper we describe an example of the electronic process through which this can occur and identify some of the crash conditions that result from a misclassification of occupant information. Virtual vehicles, seats and dummies are used to evaluate the effects of selected crash conditions and the performance that can be expected from these sensors under those crash conditions. The results indicate that a common algorithm programmed into a module can fail to recognize the accurate size and weight of the occupant from these sensor systems if unloading of the seat by the occupant occurs during the ignition cycle. Solutions to address these sensors that would prevent the failure of airbags to deploy are discussed.

keywords: algorithm, defect, airbag, sensor, occupant protection