Abstract

The Automated Collision Emergency System (ACES) is a device that automatically calls 911 in the event that the airbag is triggered by a collision, insuring that medical attention arrives on the scene as quickly as possible. ACES consists of a cellular modem, global positioning system (GPS) receiver, and a controller module. The controller module receives GPS coordinates and using the cellular modem relays these coordinates to the 911 operator by a synthetic or pre-recorded voice stored in the controller module. The user will have a set time in which to cancel this call by pressing a button the dash if the accident is not serious enough to warrant emergency medical intervention. With over 6 million car accidents in the United States each year this product would ease drivers' worries as well as save many lives because of the timely response of emergency medical personnel to the accident.

Technical Description

Automobile accidents concern everyone; they are one of the leading causes of injury and death in the United States. While new safety measures in cars have helped to prevent casualties in accidents, the biggest factor in preventing fatalities or serious injury is the quick response of emergency medical personnel to the scene. Determining fault in an accident can also a difficult task, because of the lack of concrete information such as car speed and direction before an accident. What if an emergency response team could be called the second an accident occurred? With ACES (automated collision emergency system), essential location information can be relayed to a local emergency operator who can dispatch a team to the site of an accident as quickly as possible. ACES would consist of a GPS and a CDM-820-B controlled by an embedded processor board. The CDM-820-B is a wireless data modem which complies with JSTD-018 and IS98A as well as the IS-707 and 99 data services. It would interface with the car's onboard computer using the CANBUS standard to retrieve all the information it stores as well as determine when a call for help needs to be placed.

What makes ACES different then current technologies (such as OnStar) is that it is an after-market add-in that could be used in cars all over the United States, with the potential to be programmed for foreign markets as well. It also would have no monthly fee for use and be relatively inexpensive. Not only will it call for help in an accident, it will also store collision information (like a "black box") which can then be used by insurance companies, and possibly the legal system if necessary. ACES could also send this information via e-mail (or upload it to a webpage) to the owner and their insurance company. For businesses it could be used to monitor the well-being of a company vehicle.

Market Potential

According to Car-Accidents.com, there are an estimated 6,000,000 car accidents in the US each year. There are about 3.2 million injuries and 40,000 fatalities in auto accidents each year based on data collected by the Federal Highway Administration. GM's OnStar system currently serves over 2 million customers and is adding about 4,500 new customers each day. Over 300 of these customers contact OnStar each month regarding an accident, which resulted in an air bag deployment according to Foster's/Citizen Online. Obviously, with the high rate of accidents and GM's burgeoning business, there is a quite a market for integrated safety devices like the OnStar system. However, GM can only add customers who are buying cars already equipped with their technology, leaving at least 4 million other drivers (according to accident statistics) who will need our product. This doesn't include the potential market of millions of other people who also drive cars that are not equipped with the OnStar.

ACES would appeal to all safety conscious drivers, as well as delivery and trucking businesses. For example, a truck company would be able to monitor engine and tire conditions to make sure their truckers are safe on the road. It would also help to easy the worry of many parents with young drivers, because they would be assured that help would arrive quickly if there was an accident. ACES would be of interest to anyone who drives daily or in high risk areas where accidents are common, as well as those who have to drive over long distances or in remote places where an accident would not be noticed right away and called in by a passer-by.

Risks and Contingencies

The following risks have been identified and addressed in the design of the product; part availability or delay in shipment, difficulty getting the cellular modem board and other boards working together, and difficulty in communicating with onboard car computer (if one exists). Part availability should not be a factor as potential boards have been researched and will be ordered long before the construction of the prototype has begun. Heavy research on how the parts work and interface with other parts will be done beforehand. Help will also be provided by the faculty advisor. If a difficulty communicating with the car computer arises, other ways of checking to see if the air bag has deployed will be researched.

Social and Environmental Impact

ACES will benefit all drivers who do not have vehicles with an already installed safety system as well as people who could not afford a more costly system. It will greatly decrease the seriousness of accidents by ensuring that emergency personnel will arrive quickly because the accident has been reported immediately; this will result in fewer collision related fatalities and permanent mutilations. Also, it will make insurance claims and court cases easier to try because of the data it collects, resulting in less time and money spent on court cases. ACES will not have any impact on the environment.

Team Members

XXX: XXX is a Junior Computer Engineering major who has taken classes in designing digital circuits as well as processor design. He is familiar with several high-level programming languages as well as Verilog.

XXX: XXX is a Junior Computer Engineering major who has experience with several programming languages including C, C++, and Java as well as the machine language

Verilog. He also taken classes in digital circuit design as a well as some in analog design.

XXXX: XXX is a Junior Computer Engineering major whose interests lie in the field of robotics, embedded systems, autonomous vehicles, and communications. He currently serves as project manager for the aerial robotics team, and has had design experience producing off the shelf embedded systems with minor additional hardware for the autonomous helicopter. He also has experience talking with companies in order to obtain appropriate hardware components.

XXXXX: Rose-Hulman Electrical Engineering Associate Professor and faculty advisor to this project. He is knowledgeable in the areas of digital and analogue signal processing, and be used as a consulting resource. He has work experience at Intel with the design of digital circuits in the Itanium processor.

Timeline

This Gantt Chart shows the proposed schedule for the development of the device. This schedule goes over 3 full terms, with the first being devoted to detailed design and the rest being used for construction and testing of the prototype. A patent search and detailed market analysis will be prepared during this time.

	Spring Term										Fall Term										Winter Term									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Team Formation	■																													
Development of Ideas	■	■	■	■																										
Webpage	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
PDS				■	■																									
Timeline Development						■	■																							
Patent Research				■	■	■																								
Market Analysis					■	■	■																							
Business Plan					■	■	■	■																						
Project Proposal								■	■	■																				
Presentation										■																				
Basic Design							■	■	■	■	■																			
Detailed Design											■	■	■	■	■	■	■	■	■	■										
Hardware Development												■	■	■	■	■	■	■	■	■										
Hardware Testing													■	■	■	■	■	■	■	■	■	■	■	■						
Software Development												■	■	■	■	■	■	■	■	■	■									
Software Testing													■	■	■	■	■	■	■	■	■	■	■	■						
Full Testing/Debugging																	■	■	■	■	■	■	■	■						

Budget

Item	Unit Cost	Quantity	Total
Patent Search	$600	1	$600
Detailed Market Analysis	$500	1	$500
Patent Related Legal Expenses	$2000	1	$2000
Training/Travel Expenses	$2000	1	$2000
Software	$1000	1	$1000
Prototype Materials			
Cellular Engine	$500	1	$500
PC104 Processor Module	$250	1	$250
GPS module	$150	1	$150
Integration Devices	$100	N/A	$100
Device Enclosure (Bolt Aluminum)	$100	1	$100
Battery	$10	1	$10
Total			$7,210