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Cryptographic Verification Method for an Emergency Vehicle to Non-Emergency Vehicle Communication

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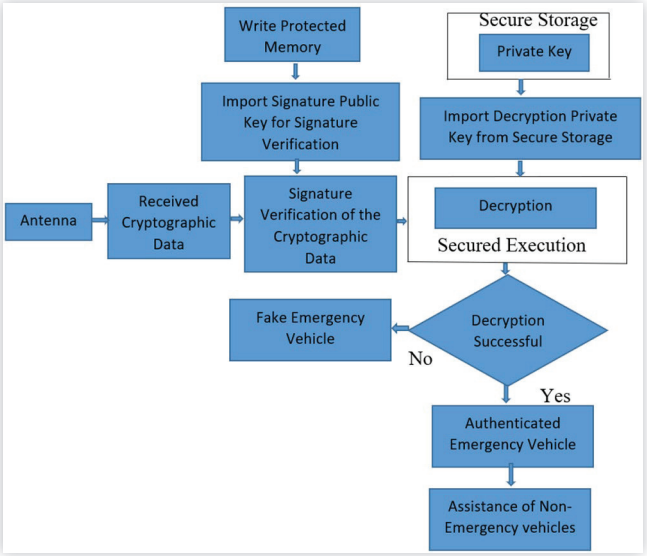
Abstract

An emergency vehicle is one of the critical vehicles designed by the Original Equipment Manufacturers (OEMs) to support the emergency assistance and maintenance for different emergency situations such as fire, health, etc. These vehicles are provided a special provision by the legal authorities to bypass the road traffic scenarios and guidelines. The special provisions mainly include a co-operation of the non-emergency vehicles on the road for providing a smooth provision for the emergency vehicles to move, bypassing of traffic signals, etc. Sometimes, the intruders utilize these provisions to hide their original identities by utilizing the emergency vehicles for their transportation. The vehicles utilized by intruders for this purpose are the illegitimate ones, which are carried by attackers for illegal purposes, but they possess the same external appearances and special alerting system as the legitimate emergency vehicles. Hence, these fake vehicles pose a serious challenge to the legal authorities as well as the other vehicles on the road who got fooled by assisting them using their special co-operative assistance system. In this regard, here an approach is proposed to detect these emergency fake emergency vehicles using the cryptography verification associated vehicular communication system. In the proposed system, the non-emergency vehicles verify the authenticity with the emergency vehicles using the cryptographic verification over the Vehicle to Vehicle (V2V) channel before assisting them for emergency movement. Finally, the proposed system help the non-emergency vehicles by not assisting the intruder emergency vehicles and by assisting the legitimate vehicles on the road infrastructure.

Introduction

An emergency vehicle is any vehicle that is designated and authorized to respond to an emergency in a life-threatening situation. These vehicles are usually operated by designated agencies, often part of the government, but also run by charities, non-governmental organizations, and some commercial companies. Often emergency vehicles permitted by law to break conventional road rules in order to reach their destinations in the fastest possible time, such as driving through an intersection when the traffic light is red or exceeding the speed limit. Many emergency response vehicles (especially those of the main police, fire and ambulance services) are likely to be fitted with audible and visual warning devices, which are designed to facilitate their movement through traffic to reach their destination, and to provide some protection on the scene. Emergency vehicles are designed separately by Original Equipment Manufacturers (OEM's) by keeping the safety goals in mind. The design of the ambulance by OEM's support multiple number of emergency operations within the vehicle with a communication with the nearby hospitals, and also the design of the fire engine also comes with a measurable number of safety concerns. The emergency management authorities such as hospitals, fire stations etc. purchases the emergency vehicles from OEM's and customizes them as according to their requirements with the adequate safety measures.

FIGURE 8 Algorithmic reception mechanism in non-emergency vehicles



Conclusion

The driver assistance system is moving in a fast pact towards the final levels of the autonomy by equipping itself the situational intelligence. One of the noticeable situations among them are handling the emergency vehicles on the road which possess special alert signals to the non-emergency vehicles on the road. The alert signals are sensed by the other vehicles on the road and provides a special lane assistance and traffic assistance for the emergency vehicles to move smoothly. The black hat emergency vehicles used by the intruders will become successful in utilizing the associated vulnerability of the non-emergency vehicles in providing the special provision to the alerted emergency vehicles without knowing it's legitimate. Hence, here a security approach is proposed to harden the vulnerability of the non-emergency vehicles to verify the authenticity of the emergency vehicles before providing the special assistance provision. In the future work, the other advanced security techniques are considered for the cryptographic verification and the issues associated with the maneuvering of the vehicles after the detection of emergency vehicle is studied.

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Definitions/Abbreviations

V2V - Vehicle to Vehicle

OEM - Original Equipment Manufacturer

ID - Identifier.

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