

Mitigate radio jamming cyberattacks

Detection and weakening jammers using AI-based signal monitoring, networked detection, and digital twin multi-dimensional mitigation

Invention

Driving assistance systems and autonomous vehicles offer numerous advantages and increase security and efficiency. But wireless communication technology is susceptible to cyberattack, which can impair communication and reduce security. Scientists at the Hamm-Lippstadt University of Applied Sciences have developed a process for detecting radio jamming in good time and mitigating it. Figure 1 shows a malicious radio-controlled drone that can disrupt vehicle-to-vehicle (V2V) communication during left turns – with no line of sight. To mitigate radio interference, V2V communication uses broad-band MIMO communication whose precoding or beamforming is optimized with the spatial information from the digital twins. Figure 2 shows the three basic elements of radio interference detection and weakening.



.....➔ V2V Tx - Rx
➔ Rx Vehicle Turn Left Trajectory

Fig. 1: Detection and mitigation of radio jamming during left turns by means of broad-band MIMO communication with digital twins.

1. Multi-dimensional AI-based monitoring

The characteristics of the received signal are analyzed to identify jamming. Various technologies and configurations can be used in the analysis process, including AI and direction of arrival (DoA) assessment to determine the jammer's physical position.

2. Networked jamming attack detection

Messages about the presence of anomalies are sent to the network to inform the vehicle that an attack has been detected. LOS and NLOS paths are then identified with histogram techniques or DoA methods.

3. Multi-dimensional countermeasures based on digital twins

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Fig. 2: Three basic elements of radio interference detection and weakening.

functionality. A German patent application has been submitted to the German Patent and Trade Mark Office. A PCT application can be submitted within the priority year. We are offering interested companies the opportunity to license and refine the technology in collaboration with the inventors and the Hamm-Lippstadt University of Applied Sciences.

An invention from the Hamm-Lippstadt University of Applied Sciences.

Figure 1 shows a malicious radio-controlled drone that can disrupt vehicle-to-vehicle (V2V) communication during left turns – with no line of sight. To mitigate radio interference, V2V communication uses broad-band MIMO communication whose precoding or beamforming is optimized with the spatial information from the digital twins. Figure 2 shows the three basic elements of radio interference detection and weakening. The first is multi-dimensional, AI-based monitoring, which reduces false positives and false negatives. The second element is networked detection for which more information about radio jamming is used to estimate interference proliferation and select various optimized processes for various parts of the map. The third element is multi-dimensional filtering based on digital twins, which allows prediction of the best route and real-time monitoring of radio jamming. The invention is intended for use with reconfigurable intelligent surfaces (RISs), of course.

Commercial Opportunities

The new technology can greatly mitigate radio jamming in V2X communication so that security is once again established. Jamming attacks on various mobile applications can be detected and mitigated with this technology.

Current Status

Initial laboratory samples have been set up, tested, and measured. They have established the invention's

Competitive Advantages

- Contains all network hubs
- Minimizes information loss
- Increases transmission security
- Jamming attack detection
- Reduces jamming attacks

Technology Readiness Level

1 2 3 4 **5** 6 7 8 9

Technology validated in relevant environment

Industries

- Automotive
- Communication technology

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