SenSE4Metro

Sensor-based Security and Emergency management system for underground Metro system during disaster events

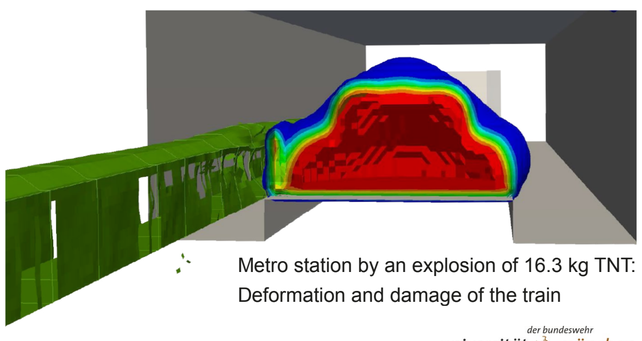
OBJECTIVES

To improve the security of persons in urban underground trains and underground stations in emergency situations and catastrophes, resulting from:

- terrorist attacks on underground trains and train stations
- natural disasters such as earthquakes and flooding

VULNERABILITY ANALYSIS

Vulnerability studies of real-life underground infrastructure and numerical analysis of these structures under extreme loads inform design solutions for reducing the vulnerability and increasing the security of persons in underground structures.

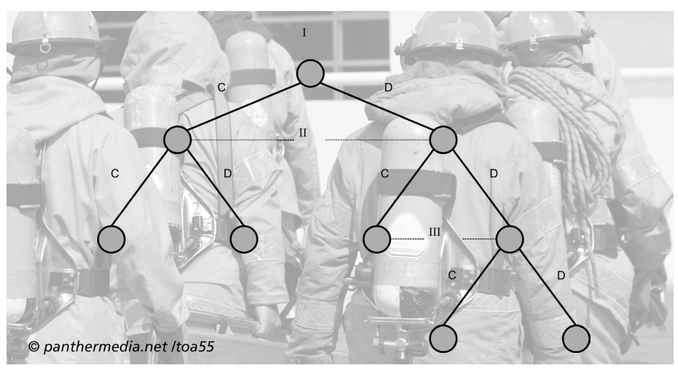


Metro station by an explosion of 16.3 kg TNT: Deformation and damage of the train

der bundeswehr universität münchen

EXPERIMENTAL EXAMINATION

Laboratory-based behavioral games involving rescue forces and civilian groups assess the traits of altruism, cooperation and coordination in order to evaluate and improve rescue protocols and measures.



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STUDIES OF SOCIAL BEHAVIOR

The cross-cultural evaluation of social behavior during past emergency events is used to develop better eventspecific communications strategies before and during extreme events.

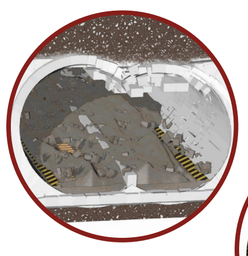
SMERS

The **S**ecurity **M**anagement and **E**megency **R**esponse **S**ystem is designed to deliver the necessary real-time information to the necessary parties in order to minimize casualties in emergency situations.

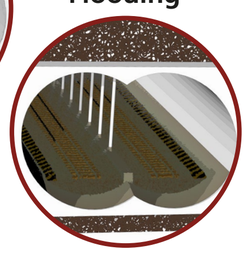
Event Scenarios

SMERS is designed to respond to a variety of emergency event scenarios, including intentional attacks as well as natural disasters.

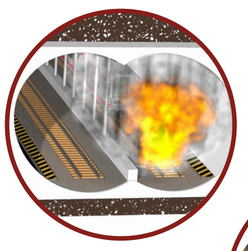
Earthquakes



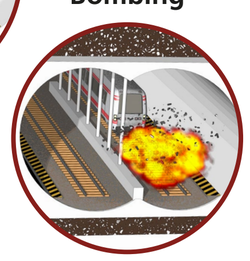
Flooding

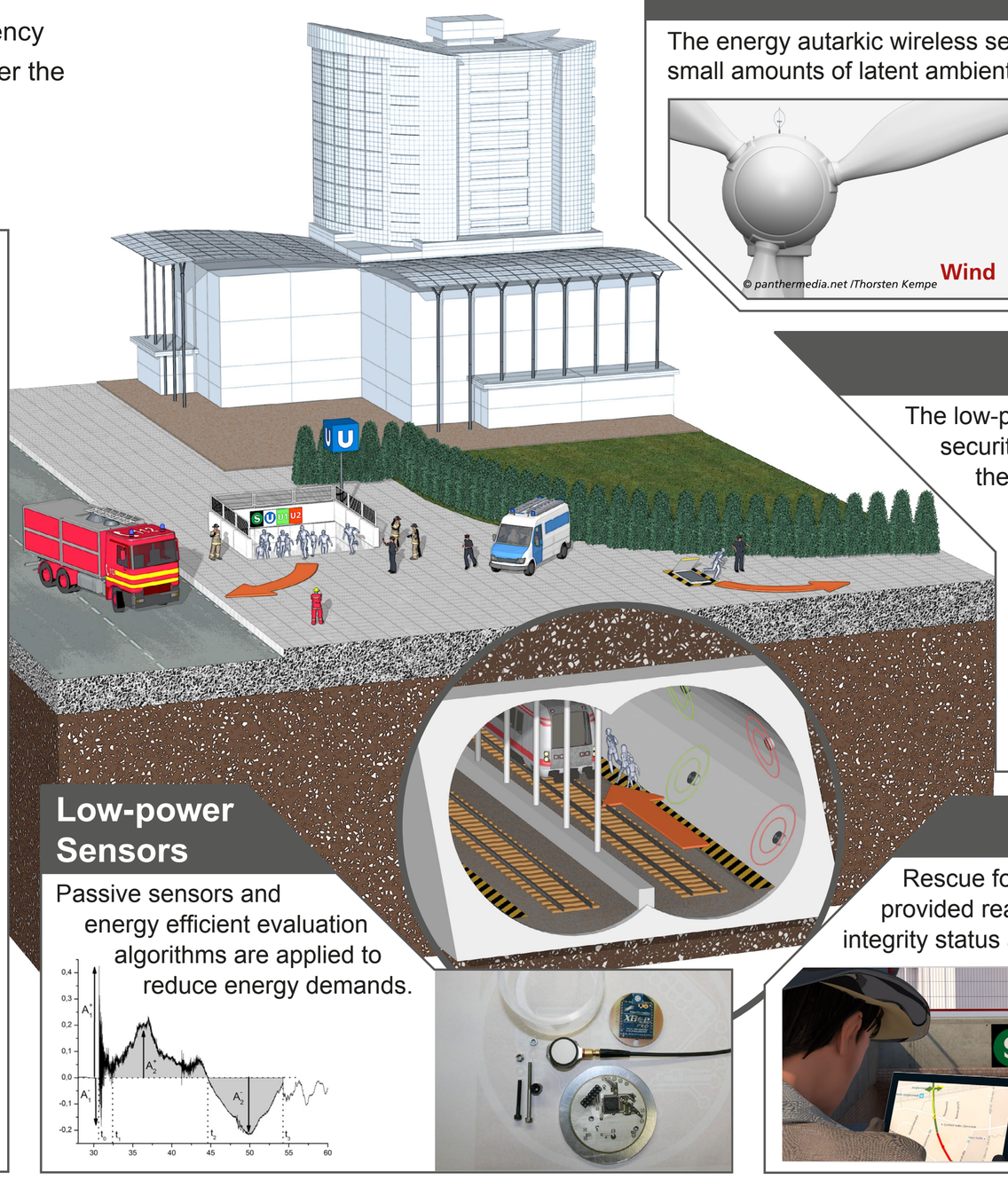


Arson



Explosive Bombing





Energy Harvesting

The energy autarkic wireless sensor nodes are powered by converting small amounts of latent ambient energy from the local environment.

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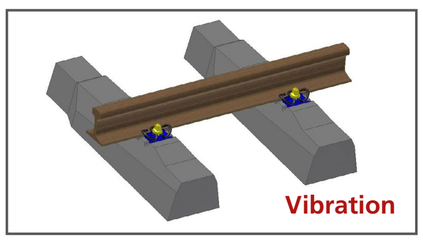
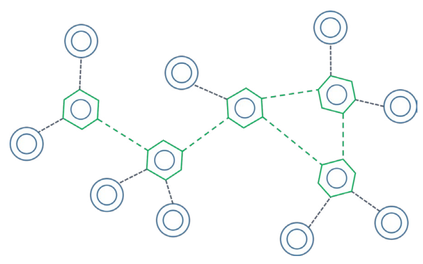
Wind



Vibration

Wireless Sensor Network

The low-power WSN implements state-of-the-art security and reliability protocols for ensuring the transmission of critical infrastructure status to the central security system.



Low-power Sensors

Passive sensors and energy efficient evaluation algorithms are applied to reduce energy demands.

User Interfaces

Rescue forces, operators and passengers are provided real-time event and train data, structural integrity status and optimized escape/access routes.

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