RESIST Pilot Demonstrations

Newsletter N°5 - June 2022

Editorial

Welcome to the fifth RESIST Newsletter!

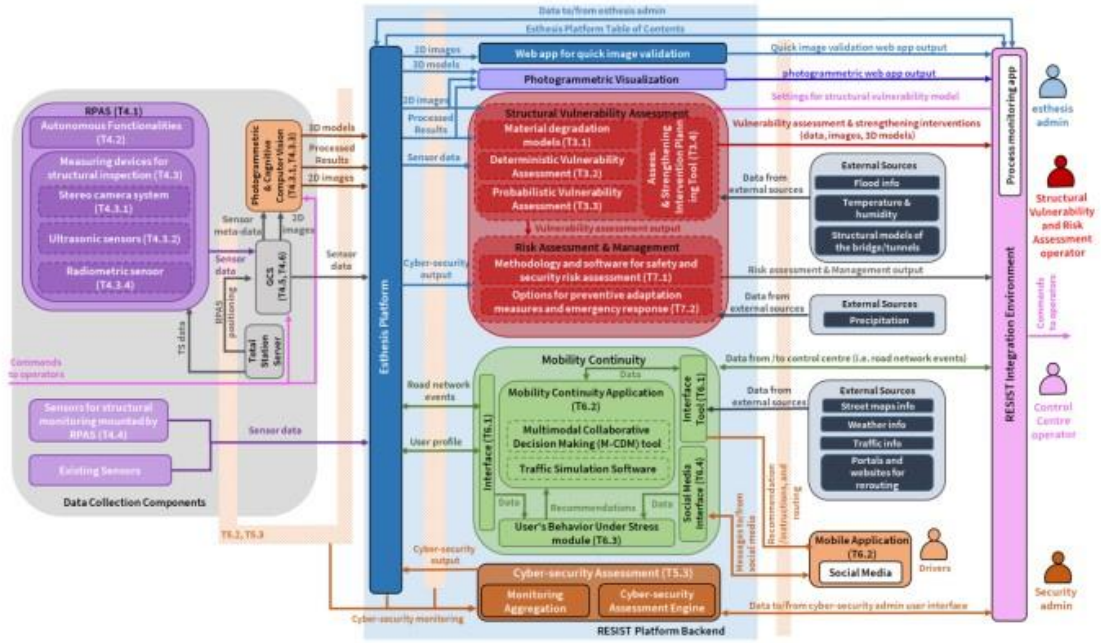
The RESIST project is a Research and Innovation Action that has received funding from the European Union's Horizon 2020 Research and Innovation Programme, under the Grant Agreement No 769066.

RESIST (RESilient transport InfraSTructure to extreme events), a 46-month project that started on 01 September 2018, aims to increase the resilience of seamless transport operation to natural and man-made extreme events, protect the users of the European transport infrastructure and provide optimal information to the operators and users of the transport infrastructure.

This is the fifth issue of our newsletter, which presents the preparation and execution of the pilot demonstrations that took place at the premises of the project's end users, as well as the results and outcomes of the field testing.

RESIST Integrated System

RESIST integration is based on the RESIST system architecture. The figure below presents the final version of system architecture, as implemented in the pilot demonstrations.



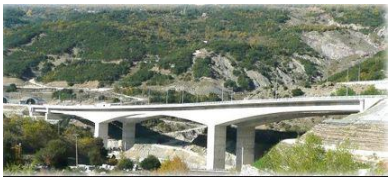
The integrated **RESIST system** was tested in two pilot demonstrations:

1st Pilot - T9-T11 bridge in Egnatia Odos, Greece (Peristeri/Epirus).

2nd Pilot - St. Petronilla Tunnel near Bussoleno, near Turin.

RESIST 1st Pilot

The 1st pilot demonstration took place at the T9/T11 bridge in Egnatia Odos, Greece (Peristeri/Epirus) in March 2022. The whole system was tested in a detailed inspection process after a seismic triggered landslide scenario, affecting the integrity of the end supports and of the superstructure of the tall balance cantilevered ravine bridge T9/T11. The aerial robots (drones) took measurements, both visual and contact, which were transmitted to the vulnerability and risk assessment modules for analysis. Any stress or displacement or even inclination of the bridge was assessed with the help of sensors installed by the Egnatia Odos monitoring network, but also by additional sensors placed at critical points of the bridge by the robotic drones. The processing of the collected images led to the creation of the three-dimensional model of the infrastructure through the computer vision system, while at the same time ultrasonic and rebar measurements were performed. At the same time, the ability of the mobility continuity module was tested on live conditions to see the ability to reroute traffic and properly disseminate information to users of the road. Subsequently, artificially loaded load tests were performed to assess the general condition of the bridge.

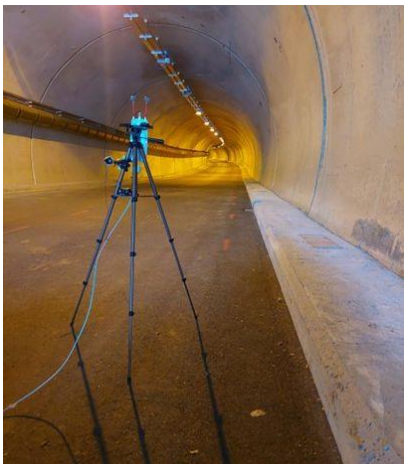


In general, the pilot demonstration in T9/T11 bridge was successful and led to very positive conclusions, as the operation of RESIST system in a real environment was very efficient. RESIST components were presented in a workshop that took place before the field demonstration, where all developed functionalities were analysed, along with the benefits of RESIST system as a whole. During the scenario testing, several cracks were detected and assessed using ultrasonic measurements, with none of them to be evaluated as significant or dangerous for the bridge integrity. In this demonstration, the timely prediction of problems in the structural condition of the bridge was achieved, as well as the immediate restoration of road traffic. It is noteworthy that RESIST system executed the inspection process successfully without the involvement of

technical staff in difficult conditions, as in typical inspections with existing conventional methods.

RESIST 2nd Pilot

The focus of the 2nd Pilot which took place in May 2022 was the St. Petronilla Tunnel near Bussoleno, 50 km away from Turin.
St. Petronilla Tunnel is a regular size tunnel used as escape way from a longer 5 km highway tunnel. Its length is about 600 m. The tunnel is normally closed to traffic, and it is safe for tests and simulations.
The St. Petronilla tunnel of the A32 Highway was used to evaluate the RESIST system in a different type of infrastructure and test the performance of the aerial robots (RPAS) and communication solutions in a GPS-denied environment. In this case, a scenario triggered by an accident inside the highway tunnel was performed, where the road operator should close the road and reroute traffic in order to inspect the structural condition of the tunnel. Similar tools and metrics as in the 1st pilot at bridge T9/T11 were included in this demonstration, while in addition the performance of a new “Wi-FI In Motion” technology that Tecnositaf is developing for tunnels with poor or absent Gsm/3G connections was compared with RESIST communication solutions.
More specifically, the scenario started with the receipt of the alert about the event by RESIST platform and the decision of the operator to close the road and initiate a detailed inspection process. Through the computer vision drone, images of the affected areas of the tunnel were collected, processed and annotated based on the cracks detected, while the 3D point cloud of the tunnel was created. Based on their assessment, additional ultrasonic and rebar measurements were performed by the contact drone, while the structural vulnerability and risk assessment was conducted. After the completion of the inspection process, where no significant cracks were detected, the road was re-opened.



The second pilot demonstration at St. Petronilla tunnel in Turin was also very successful. Prior to the field testing, a dedicated workshop was conducted, where all components and tools of RESIST system were presented, along with the recording of the step-by-step scenario execution. During the inspection, some severe cracks were detected, but after their assessment through RESIST system, it was concluded that they had no significant effect on the structural integrity of the tunnel. In general, the feedback from the participants was very positive, as they could follow the whole inspection process, understand how each component performs and identify the added value of RESIST system in the inspection of complex infrastructure in real conditions. After the workshop, the field demonstration took place, where the participants that attended in person were able to watch the actual flights of the computer vision drone and the contact drone in both manual and automatic navigation modes. The feedback was again very positive,

with the achievements of RESIST project to be considered very useful in both the reactive and preventive maintenance of critical structures and the increase of the overall resilience of transport operation. In general, the validation of RESIST system was very successful with all components performing as expected and providing a secure and time-saving solution for the in-depth structural damage inspection and the communication among stakeholders.

RESIST Training Workshop

Date: Tuesday, 14th June 2022
Time: 10h00 – 13h00 (Brussels Time)
Format: Virtual
Aim: Present RESIST components to stakeholders and provide high-level training about their functionalities.

Kindly confirm your participation, registering here
This virtual event is free of charge but registration is mandatory.

RESIST Final Event

The RESIST project final event will take place on Friday, 24th June 2022 from 10h00 – 13h00 (Brussels Time).
It will be a virtual event. The results of the 46-month project will be presented at the event.

Kindly register here
This virtual event is free of charge but registration is mandatory.

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