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RESIST: 'RESilient transport InfraSTructure to extreme events'

Early version of RESIST integrated platform

During month 24 of RESIST project, the development of the first integrated RESIST prototype was based on the project's system architecture, taking into consideration its elicited technical and user requirements. RESIST system architecture consists of several subcomponents, which operate either on the inspection field or in the RESIST's system backend and are accessible through a single point of access in the control center.

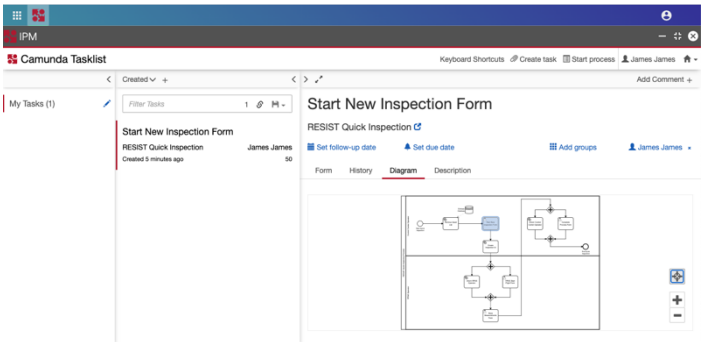
The **RESIST integrated prototype** covers the inspection needs in bridges and tunnels and consists of several subcomponents, which operate either on the inspection field or in the RESIST's system backend. All the inspection data collected from the field (images, point cloud, sensor data, and processing metadata including the location and the type of defects) are transferred to the RESIST backend through the esthesis Platform, which is the actual interface between the components in the inspection site and the RESIST backend system.

From the esthesis Platform, all gathered data are available for further processing by a large set of applications described below:

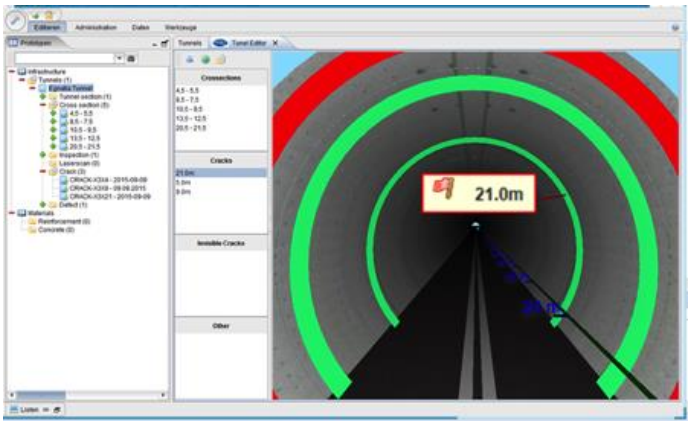
- **UAV systems** capture images and sensor data from the inspection field, while installing new sensors on the infrastructure. The operator of the UAV is able to guide the RPAS according to the provided flight plan from the control center using the GCS (Ground Control Station). After the completion of the inspection flight, the available sensor data are transferred to esthesis Platform, while the collected images are used by the advanced computer vision systems of the project to finally: (a) detect the type and the location of the defects, (b) create 2D annotated images of the defects, and (c) create the 3D point cloud. The output of the computing vision systems will be finally stored and retained in the esthesis Platform.

- **The Inspection Process Management (IPM) application** is used by all actors of an inspection process located in the control center (infrastructure operator) and on the field (UAV operator and operator of the computing vision systems). In RESIST project, the IPM: (a) orchestrates the entire inspection process providing live monitoring of the process with step granularity to the operator in the control center, (b) orchestrates all actors of the inspection located in the control center and on the field, (c) facilitates the communication of all actors located in the control center and on the field, (d) facilitates control center operator to start a new inspection process, while simultaneously managing multiple inspection processes for the same or different assets, and (e) contributes on the standardization of the inspection process, as all actors through the IPM follow a specific protocol to accomplish the inspection operation.

- The **Photogrammetric Visualization application** provides a viewer for the generated 3D data from collected image data, while presenting the annotated damages. It includes several functionalities for the user to view an appealing 3D model of the observed structure, navigate the model and quickly take measurements such as distance measurements, area measurements, and angle measurements.



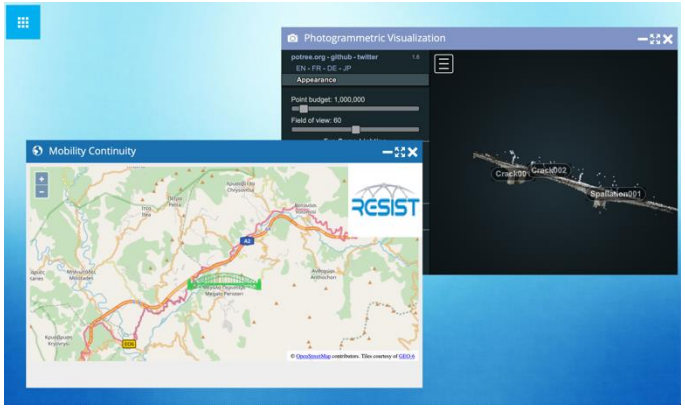
- The **RESIST Mobility Continuity Application** targets at informing commuters regarding events that could happen along their trip. Moreover, it provides recommendations and guidelines to mitigate possible issues. For example, in the case of road closure the system recommends alternative routes. In the case of lane closure the system reports adjacent predicted lane average speed by executing mobility simulations based on statistical data regarding the area of interest. By providing lane speed data, the RESIST mobility continuity module further enhances the level of information available to the commuters so that they can make appropriate adjustments when planning or during their trip. Furthermore, users of infrastructure can be informed regarding the status of the road and possibilities regarding rerouting in case of an extreme event through the **Mobility Continuity Mobile Application**.



- The **Structural Vulnerability Assessment and Risk Assessment applications** contribute to the accurate assessment of the infrastructure condition of bridges and tunnels, while estimating the potential risks and proposing mitigation actions.

- The **Cyber-security Assessment application** is a combination of models, processes and tools to enable the certification of security properties of services and components of RESIST project. Furthermore, within RESIST, the cyber-security assessment application enables the continuous assessment of the cyber-security of the system through the combination of runtime monitoring and dynamic testing. It also collects runtime system events and generate alerts that can be used for identification, prevention and mitigation of cyber-attacks.

- The **Integration Environment** is a web-based application through which any user of RESIST integrated solution has access to the applications through a simple web browser in a secured manner. Also, the Integration Environment is able to create groups of user, and to restrict the access to some applications only to some users or groups.



At the current stage of the project, the preliminary versions of the applications have already been incorporated, in order to create the first integrated prototype. During the next period, several refinements will take place in the applications to cover all requirements and needs of the end-users for a successful assessment of the entire RESIST solution in the two pilots of the project.

For more details on RESIST, visit http://www.resistproject.eu/
or contact the Dissemination and Communication leader Dr Adewole Adesiyun (adewole.adesiyun@fehrl.org).

RESIST on Social Media: Twitter - LinkedIn
Register here to receive the **RESIST Newsletter**.

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Project Fact Sheet

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Call: MG-7-1-2017 Resilience to extreme (natural and man-made) events

Coordinator: Institute of Communication and Computer Systems (ICCS), Greece.

Partners:

ICCS, Greece
EOAE, Greece
TECNOSITAF, Italy
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Project website: http://www.resistproject.eu/

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