



# *MULTIMODAL SCANNING OF CULTURAL HERITAGE ASSETS FOR THEIR MULTILAYERED DIGITIZATION AND PREVENTIVE CONSERVATION VIA SPATIOTEMPORAL 4D RECONSTRUCTION AND 3D PRINTING*

## PURPOSE

Scan4Reco will develop a novel portable, integrated and modular solution for customized and thus cost-effective, automatic digitization and analysis of cultural heritage objects (CHOs), even in situ.

A multi-sensorial 3D scanning - facilitated by a mechanical arm – will collect multi-spectra data and then, a hierarchical approach for 3D reconstruction of CHOs will be applied, The goal will be to create highly accurate digital surrogates of CHOs, that will be either exhibited in a Virtual Museum and/or 3D printed.

Material analyses will be applied and uni-material models will be spatiotemporally (4D) simulated, such as to collectively render impending degradation effects on multi-material CHOs, enabling prediction and creation of their future appearance, including the automatic restoration, going all the way back to their original condition.

Project results will be validated on real case scenarios involving heterogeneous objects of various sizes and materials, in two real-world pilot use cases.

## VISION

Scan4Reco brings revolutionary innovations in the field of automatic documentation, digitization and conservation of cultural heritage assets:

- Develops cost efficient tools and effective methods for the modelling and understanding of Europe's cultural heritage
- Offers portable, customizable and cost-efficient solution for seamless digitization of a plethora of cultural objects, also in-situ ones
- Promotes interoperable formats for analysis, and representation of cultural heritage objects
- Creates high precision and realistic digital surrogates of cultural assets close to their original form using highly realistic 3D printing.
- Models past condition of cultural objects and predicting their future states, offering novel and effective means of their conservation.
- Safeguards sustainable collaboration, both in development and for future research, among cross-sector stakeholders
- Puts the human in a loop by creating a comprehensive list of realistic tasks, keeping information up to date, clarifies ambiguous situations and enhances flawed data.

## OBJECTIVES

- **Objective 1:** To provide a portable solution for accurate multi-sensorial 3D scanning and efficient automatic digitization of Cultural objects even in situ.
- **Objective 2:** To apply a hierarchical approach for 3D reconstruction of the object via multi-sensorial data making thus, possible, to render the object in a multi-layered way.
- **Objective 3:** To create digital surrogates of the objects by also providing detailed insight on their composition to the unaided eye either
- **Objective 4:** To apply systematic study targeting the extraction of the appropriate parameters able to accurately describe context-dependent ageing models per material.
- **Objective 5:** To spatiotemporally (4D) and simulate the cultural objects in time in order to recreate the appearance of the cultural objects in the future or even in the past.
- **Objective 6:** To interactively detect & indicate the spots in eminent conservation need and to provide suggestions about appropriate conservation method.
- **Objective 7:** To validate the aforementioned actions on real case scenarios.
- **Objective 8:** To enhance the accessibility of the digitized cultural objects via a VR museum.

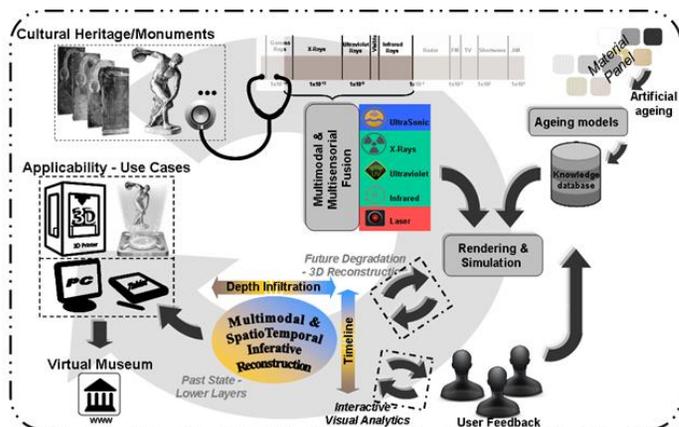
# Scan4Reco offers “a novel portable, integrated and modular solution for customised and cost-effective, automatic digitization and analysis of Cultural Heritage objects, even in situ”

## ARCHITECTURE

Scan4Reco project will deliver a multi-modal, modular, scalable and extendable open-architecture platform able to offer multispectral scanning of a variety of cultural asset (e.g. wall-paintings, painting, metallic objects of various sized, carved marble, statues, etc.) non-destructively.

The concept architecture contains:

1. Multispectral, multi-modal scanner
2. Data fusion for material and stratigraphy identification
3. Multi-material and multi-colour pallets for investigating physiochemical factors before / after artificial ageing
4. Rendering, 3D reconstruction and VR modelling
5. Context-aware, environmental spatiotemporal mock-up
6. Decision support and viewing objects in their original condition (i.e. back in time) and degradation over time
7. Presentation and 3D printing of reconstructed objects to aid conservation, restoration and educational needs.
8. Virtual Museum for raising public awareness



## EVALUATIONS

Pilot evaluations will focus on two types of use cases:

1. **Paintings:** will test infiltration capabilities, volumetric rendering, reconstruction and simulation capabilities of the integrated system, pursuing to reveal over- and under-painted drawings, their degradation over time, 3D representation and printing of underneath layers, and validity of conservation-related guiding.
2. **Metallic objects:** aimed to test surface exploration and reconstruction of cultural objects, including infiltration and system insight to the first underlying layer. Surface rendering and reconstruction abilities of the integrated system, corresponding degradation over time via simulation, 3D representation, 3D printing and validity of the conservation-related guiding, will be evaluated and validated.



## CONSORTIUM

Scan4Reco brings together a consortium of nine (9) partners from five (5) European Countries, Greece (Thessaloniki, Ormylia-Halkidiki), Germany (Darmstadt, Lübeck), Italy (Verona, Firenze, Cagliari-Sardegna), Switzerland (Balgach), and United Kingdom (London)



## KEY FACTS

- Reference no: 665091
- Consortium: 9 partners from 5 countries
- Kick-off: 1st of October 2015
- Duration: 3 years (36 months)
- Programme: H2020-REFLECTIVE-7-2014
- Budget: 3,763 million €
- WEB portal: <http://www.scan4reco.eu>



Project reference number: 665091  
[http://cordis.europa.eu/project/rcn/197123\\_en.html](http://cordis.europa.eu/project/rcn/197123_en.html)



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