May 2017

Volume 1, Issue 1

1st iMARECULTURE Newsletter

EDITORIAL

Dear reader,

We are pleased to welcome you to the first issue of the iMARECULTURE newsletters. Started on 1st November 2016, iMARECULTURE is a three-year EU project, funded by the European Commission under the H2020 research and innovation programme under grant agreement No 727153 and it involves 11 partners from 7 EU member states and one associated country.

Project's iMARECULTURE scope is to raise public awareness of European identity by focusing in maritime cultural heritage, which by default bridges different civilizations. In particular, iMARECULTURE aims in bringing inherently unreachable underwater cultural heritage within digital reach of the wide public by implementing virtual visits, serious games with immersive technologies and underwater augmented reality. Scope of the project is to design, analyze, develop and validate pioneer applications and systems in the context of Virtual Museums through collaborative and innovative research from a diverse group of scientists, researchers, archaeologists, experts and museums.

At this stage of the project (M7), systems requirements were extracted by the potential users of the systems to be developed and pilot test sites were selected. Additionally, progress is reported in the data collection processes, the Serious Games, and the VR and AR applications.

This newsletter is the first issue of a project communication tool we plan to publish every 6 months, offering you an easy and quick way to keep in touch with iMARECULTURE project activities.

Dimitrios Skarlatos

iMARECULTURE Project Coordinator

On behalf of the iMARECULTURE Consortium

HORIZON 2020

iMARE Culture

Advanced VR, **iM**mersive serious games and **A**ugmented **RE**ality as tools to raise awareness and access to European underwater **CULTUR**al heritag**E**

www.imareculture.eu

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 727153

Please visit the iMARECULTURE website at www.imareculture.eu and sign up for the six-month newsletter at the contact page.

You can also keep up with even more of what is happening at iMARECULTURE project by following us on:

YouTube

SELECTION OF PILOTS TEST SITES AND CONFIGURATION OF THE TRIALS

During this stage, the definition of pilot sites, and trials to be performed on them took place. The selection of the test sites was done based on their depth, archaeological uniqueness, disturbance, visit ability, and existing data. Furthermore, test and trials activities planned are described and justified in relation with the chosen test site.

The three different test sites (**Mazotos shipwreck, Xlendi shipwreck and Villa con ingresso a protiro of Baiae underwater park**) are selected in order to implement the multidisciplinary approach of the project and accomplish the objectives. The selected pilot test sites are representative of different kind of Underwater CH, of different states of environmental and geomorphologic conditions and of different periods, in order to present the users a wide range of the common European maritime culture. Additionally, as a demonstration of how VR may affect the experience of a visitor in an museum, holographic displays are going to be used in Thalassa Museum. Regarding the technical planning of the pilot tests and trials, the state of the art of the technologies to be tested on each test site was described, analysed and finaly selected. **AR** implementation will be tested in **Villa con ingresso a protiro** of Baiae site, where conceptual data exist and it is accessible by tourists. **VR** implementations will involve mainly **dry interactive visits at home or in museums**, using various immersive technologies. For museum and home dry visits, VR technologies will be utilizing full resolution **authentic 3D data**, while the dry visits from home will use downscaled data because of bandwidth limitations and IPR concerns. For applications under controlled environment, such as labs and museum areas, full scale resolution and detail will be used.

Villa con ingresso a protiro. Copyright ISCR

Xlendi shipwreck. Copyright the University of Malta/COMEX/CNRS

REQUIREMENTS FROM USER COMMUNITY

During this period of the project, emphasis was given to collecting requirements from the user community.

A common shortcoming of the current systems is that there is little interaction and personalized experience during the visit, while there is limited authenticity to the visitor experience. Self-motivated learning is also limited at any given museum visit.

The project iMARECULTURE goes beyond the state-of-the-art by designing and developing systems that will educate, entertain and inspire the wider public through creative storytelling and self-motivating learning.

As a pre visit experience, a Seafaring Serious Game will developed in order to educate the general public about the ancient routes, harbors and cargo. During museum visits, additional experiences such as dry visits in our test sites will be offered exploiting a VR Cave, Holographic displays and HMDs. During the underwater visit in Villa con Ingresso a Protiro at Baiae underwater archaeological park, the diver will be able to use an AR application enhancing his underwater visit. As after visit experiences, 3D puzzles will be available for 3D printing at home. VR dry visit to Xlendi shipwreck and Baiae site using HMDs, as well as an underwater excavation/digging serious game on a randomized test site will be offered as after museum visit experience. This user-centered approach followed in iMARECULTURE project, aiming in the development of the aforementioned applications with a high degree of usability, and thus collection and analysis of end users requirements is performed in order to achieve a deep understanding of their needs and motivations. To this end, different motivations, goals and needs are defined in this deliverable through a number of meetings.

"For at least the first two years, VR will be for hardcore gamers and enthusiasts who are willing to invest in high-end computers capable of running the Rift." Palmer Luckey, Oculus Founder.

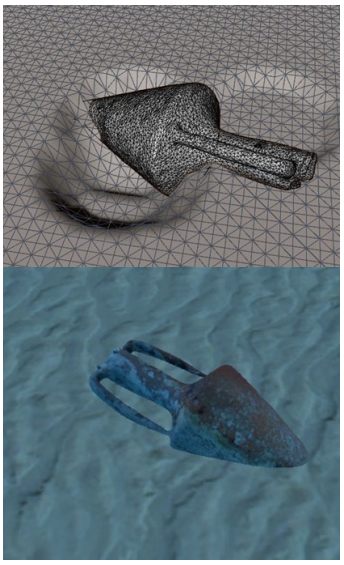
"*iMARECULTURE envisages to literally change the way we look, observe, understand and interact with our underwater cultural heritage*", Dimitrios Skarlatos, project coordinator.

"*At the formal lunch at UNESCO's top floor restaurant, I ended up doing an impromptu presentation of iMARECULTURE to all speakers and distinguished UNESCO officials there.*", Alexandre Monteiro, Invited speaker at the International Meeting on the Protection of Underwater Cultural Heritage Sites, UNESCO Headquarters, Paris (22-23 September 2016).

THE UNDERWATER VIRTUAL REALITY SERIOUS GAME

For the underwater VR serious game the aim is to raise people's archaeological knowledge and cultural awareness. Two applications have been designed and are under development currently. **The 1st application** is a virtual underwater visualisation and exploration of the Mazotos shipwreck site in Cyprus, which is located 44 meters underwater. The underwater exploration is composed of a variety of sea elements including: plants, fish, stones, and artefacts, which are randomly positioned. Users can experience an immersive virtual underwater visit in Mazotos shipwreck site and get information about the shipwreck and its contents, which will help them to interactively gain knowledge about the site and the on going excavation.

The 2nd one is an educational VR game for underwater excavation. Users will be trained side by side with experienced archaeologists on the specifics of underwater excavation and familiarize themselves with the instruments in use, such as the airlift, without the constraints of the underwater environment, which, apart from the time limitations include the difficulty in verbal communication between the student and the instructor. Users will also be able to learn how to document and study wreck site formation processes.



Underwater excavation of amphorae

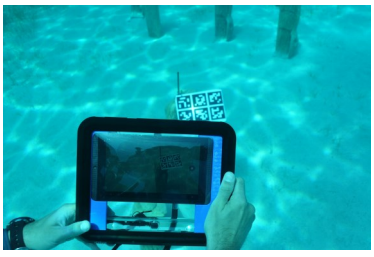
"Vision underwater is degraded by several factors, mostly by turbidity and absorption of lighting. To improve the underwater scene, our system improves the vision of divers and augment the reality"

THE UNDERWATER AUGMENTED REALITY INTERFACE

The augmented reality interface running on the tablet is the way through which the diver is able to live a unique experience rather than a classic immersion. The augmented reality interface superimposes an information layer over the images captured by the tablet main camera. However, vision underwater is degraded by several factors, mostly by turbidity and absorption of lighting. To improve the underwater scene, our system improves the vision of divers and augment the reality. This allows divers to experience a unique underwater experience of the environment.

In the future, it will also include additional information about the archeological site using augmented reality. The superimposed information will be textual descriptions and 3D models (of the reconstructed underwater site, or of single artefacts) with the aim of helping the divers to better understand structural information of the archaeological site.

The initial and dehazed underwater video



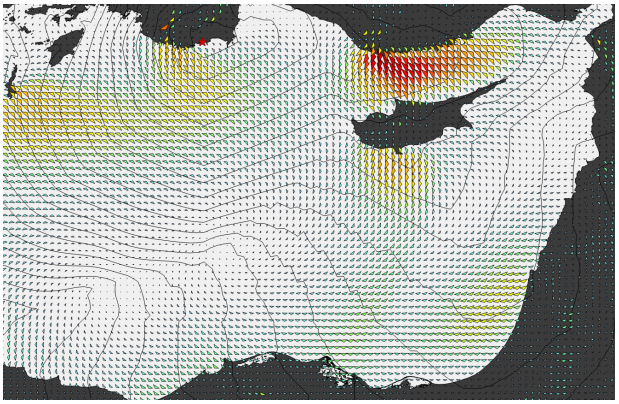
The underwater tablet

Moreover, during the last month (M7), the Underwater Augmented Reality Dehazing tool was tested using a Nvidia Shield tablet. Tests were performed in order to check and evaluate whether the dehazing improves the target detection and tracking performance or not. Tests were performed at 4.5 meters and 9 meters depth.

Underwater Augmented Reality Dehazing tool test

MEDITERRANEAN SHIPPING ROUTES

Mediterranean connectivity via shipping routes is of major importance for the EU funded project iMARECULTURE. Within the project, a software is developed that facilitates the task of calculating ship routes through the Mediterranean Sea. Input data of the software are the weather conditions, starting and ending point of a sea route, vessel characteristics. Result of the software is the respective number of travelling days between the given points. Moreover, given only the starting point the software returns the respective day isochores describing how far the ship may travel from the starting point in 1-2-3-4 etc. days. Several assumptions mentioned in related bibliography are exploited so far, in order to implement this work. However these assumptions are far from being objective and may change according to several factors. Therefore the experts employed realistic weather conditions from real data provided for the area under study. Moreover, is panned to incorporate knowledge from naval engineers, regarding the achieved ship speeds related to wind speed and sea currents and thus make the assumptions more realistic. The developed algorithm, it is planned to be released to public and experts, as a web service, requiring minimal GIS knowledge to use and extract valuable results. Using this software, one may calculate all possible routes from any Mediterranean port to every other destination.



24 hours Isochores produced using main assumptions of [1] and real weather data. Origin is marked with a red star.

"Using the developed software, one may calculate all possible routes from any Mediterranean port to every other destination"

"Virtual Museums and Social Platform are accessible for everyone, breaking the restrictions of geography and time. … VM & SP will support access to culture and citizens' engagement with culture in less developed regions. Researchers and scholars will benefit from the new possibilities to shape, access and study European Culture.

Synergies between virtual and traditional museums and cultural institutions will support the economic growth of the sector …", from CULT-COOP-08-2016 call on the topic "Virtual museums and social platform on European digital heritage, memory, identity and cultural interaction."

SEAFARING SERIOUS GAME

Commercial ship routes joining Europe with other cultures are vivid examples of cultural interaction. In this work we present a **Serious Game** which aims to provide better insight and understanding of the ancient seafaring practices in the Mediterranean Sea. The game incorporates probabilistic geospatial analysis of [what is believed were] the ship routes during the classical and Hellenistic period through the re-use and spatial analysis from open GIS maritime data, ocean and weather data. Naval engineering and sailing techniques along with these ship routes, are used as underlying information for the seafaring game.

The Seafaring serious game

DATA GATHERING

Information and data necessary for the development and content of the two **Serious Games** – the **Seafaring Game** and the **Underwater Excavation Game** - have been gathered. . More specifically, the information being gathered for the **Seafaring Game** includes the following subjects: navigational techniques, seaborne trade mechanisms, commodities, ports and harbors, temples at harbors, agents of trade and piracy. Interesting characters and narratives are subjects also explored. The wrecking processes, types of site, site formation processes and excavation methods are being investigated for the purposes of the Underwater Excavation Game.

"Information being gathered for the Seafaring Game includes the following subjects: navigational techniques, seaborne trade mechanisms, commodities, ports and harbours, temples at harbours, agents of trade and piracy"

STORYTELLING

The pilot Kyrenia application

An interdisciplinary team of experts from computer science, visual arts, literature, film directing, psychology, communicology and human computer interaction discussed the novel trends in IDS and created a pilot application about Kyrenia, the ship which sunk close to Cyprus around 288 B.C.

The Kyrenia interactive digital story consists of 6 short stories about the ship, its history, life on board, beliefs and superstitions of sailors, cargo it was transporting, as well as the interactive 3D model of Kyrenia in which the user can embark after watching the stories. Data released through storytelling have been gathered and processed by our group of expert archaeologists. Screenwriters, directors, actors and visual artists have been employed to create the final videos. The whole application has been used as an internal experimentation platform for innovative storytelling.

DISSEMINATION ACTIVITIES

7th International Workshop 3D ARCH—3D Virtual Reconstruction and Visualization of Complex Architectures, Nafplio, Greece, March 1-3, 2017

The banner of the project was placed in the room of the Underwater Special Session of the conference "7th International Workshop 3D ARCH—3D Virtual Reconstruction and Visualization of Complex Architectures". Additionally, the iMARECULTURE trifold was given to all the participants of the workshop.

iMARECULTURE at 3D ARCH 2017

iMARECULTURE presentation to FBK Trento, 3DOM research unit

iMARECULTURE presentation to FBK Trento, 3DOM research unit, Trento, Italy, May 5, 2017

The iMARECULTURE project, and some initial results, have been presented to 3DOM group in FBK, Trento, Italy, 5th May. 3D Optical Metrology group, is active and has interest in underwater & maritime photogrammetry, which iMARECULTURE exploits to create 3D site models for VR museums. Useful exchange of experiences and future collaboration have been discussed, during the visit of the iMARECULTURE coordinator o 3DOM.

The project i-MareCulture is unique, innovative and promising, contributing fully to the H2020 Framework and the Digital Agenda for Europe, a H2020 initiative, for New Skills and Jobs.

In addition, this project abides by the EU's strategy to become a smart, sustainable and inclusive economy by implementing the knowledge triangle by connecting the Education, Research and Industry by supporting and boosting innovative enterprise to develop their technological breakthroughs into viable products in the area of Virtual Museums and Digital Heritage, with real commercial potential.

PRESENTATIONS IN RELATED EVENTS & CONFERENCES

6th International Conference, EuroMed 2016, Nicosia, Cyprus, October 31 – November 5, 2016

A paper entitled "Project iMARECULTURE: Advanced VR, iMmersive Serious Games and Augmented REality as Tools to Raise Awareness and Access to European Underwater CULTURal heritagE" was presented in EuroMed 2016: Digital Heritage. Progress in Cultural Heritage: Documentation, Preservation, and Protection.

7th International Workshop 3D ARCH—3D Virtual Reconstruction and Visualization of Complex Architectures, Nafplio, Greece, March 1-3, 2017

A paper entitled "3D MODELLING AND MAPPING FOR VIRTUAL EXPLORATION OF UNDERWATER ARCHAEOLOGY ASSETS" was presented by the coordinator of the project, Ass. Prof. Dimitrios Skarlatos

Presentation at the 2016 Archaeological Research Unit workshop

Dr Stella Demesticha also had the opportunity to present iMARECULTURE and its objectives, at the 2016 Archaeological Research Unit workshop.

UPCOMING EVENTS

Workshop in VS-Games 2017

Serious Games and Cultural Heritage Workshop is organised in cooperation with the H2020 project iMARECULTURE in the context of the 9th International Conference on Virtual Worlds and Games for Serious Applications (**VS-Games 2017**,6-8 September, 2017 - Athens, Greece)

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