The i-Treasures project: Information and Communication Technologies (ICTs) in support of Intangible Cultural Heritage Education (ICH)

Introduction

In the last years, ICTs (Information and Communication Technologies) started to be adopted in Cultural Heritage Education (Branchiesi 2006), but if they already plays an important role in the field of Tangible Cultural Heritage (Ott & Pozzi 2011), they are less adopted in ICH education; this is probably due to the nature of these expressions and their typical transmission modality, that usually happens in informal contexts by experts or so-called Living Human Treasures[1], who own the knowledge and pass it through apprenticeship.

In order to widen educational opportunities to different publics (not just apprentices), the i-Treasures project (an Integrated Project co-financed by EU under the ICT theme of the FP7th) wanted to go beyond the current practice by developing "*an open and extendable platform providing access to ICH resources enabling knowledge exchange between researchers and contributing to the transmission of rare know-how from Living Human Treasures to apprentices*" (Dimitropoulos 2013). Therefore, i –Treasures aims to go beyond the simple ICT-enhanced dissemination and the mere digitization of cultural contents; it, rather, wants to provide new contents and learning opportunities by analyzing and modeling the different ICHs and making this specific knowledge available through innovative tools (game-like applications).

i-Treasures makes an in-depth use of cutting- edge ICT technologies in order to capture the hidden knowledge of experts in a selected number of cultural expressions (10) belonging to the fields of: dancing (Tsamiko, Căluș, Walloon and contemporary dances), singing (Cantu a Tenore, Canto in Paghjella, Byzantine music and Human BeatBox), music composition (contemporary music composition) and craftsmanship (pottery).

The core of i-Treasures lies in the identification of specific patterns (e.g. gestures, audio, affective states, etc.) in ICH performances and in the use of multi-sensor technology (e.g. 2D/3D optical/inertial/ultrasound sensors, microphones, electroencephalograms, etc.) in order to capture the data related to the basic features of these patterns.

Besides other research scopes, these data serve as an input for creating 3D models of the performers and use them for teaching and learning purposes (Yilmaz et al. 2015).

All the information collected and resources developed in the framework of the project are made available on the platform, which is structured in 4 main areas: Home page; Use cases (this area is mainly oriented to the general public and includes information about the 10 cultural expressions studied); Educational Processes (this area is oriented to learners and includes a set of tools and resources); Repository search.

In the following, we provide a short overview of one of the technology made available for supporting the transmission of the considered cultural expressions: the 3D game-like applications.

3D applications for transmitting experts' know how

During the project 8 novel game-like educational applications were developed. All the games combine data from multiple sensors (such as Microsoft Kinect v1 and v2, Leap Motion, Animazoo, Emotiv and sensors for the vocal tract).

The games allow to learn what up until now could be learnt just face to face during an apprenticeship, namely moves or how to emit a sound.

Games consist in 3D models re-producing specific moves or sounds peculiar of the considered cultural expressions. They were nurtured with the data gathered during recordings sessions with the experts,

[1] Living Human Treasures are persons who possess to a high degree the knowledge and skills required for performing or re-creating specific elements of the intangible cultural heritage (UNESCO definition, see http://www.unesco.org/culture/ich/en/living-human-treasures)

organized in order to capture the main features of each ICH expression; Raw data from the sensors were, then, analysed and fused.
In the game, the learner/user's performance is tracked with the same sensors adopted for capturing and compared with the experts' inputs in the database, so to evaluate the user's performance and give back a feedback. The games structure recreates a realistic learning situation (a dance, pottery or recording studio) where the expert/teacher firstly displays some moves (steps, sounds, etc.) and then asks the learner to try to reproduce it. Given the complexity of the ICHs considered, experts have identified some basic stages that could be taught using the game.
When one enters an i-Treasures game, the main page leads to an introductory activity ("Getting started") followed by a sequence of training activities with increasing difficulty levels. The last one is a final challenge to be faced at the end of the training activities.
In the "Getting started" the user is guided by a virtual tutor, providing information about the use of sensors and the game functionalities. Each training activity is structured in two phases: "Observe" and "Practice" in order to guide the learner to observe the target move (or listen to the target sound) before trying to reproduce it. In the practicing phase the learner is requested to put on the sensors and to reproduce what she has seen in the "Observe" phase. The performance is compared, thanks to an algorithm developed on purpose (Yilmaz et al. 2015), with the expert's performance. The user gets back a feedback in form of score and comments provided by the virtual tutor.
The games were accurately designed and a special attention was devoted to the learning process in the game itself**.** Moreover, in order to make their use more meaningful in a learning experience, their adoption for learning purposes was planned in the context of educational scenarios, namely exemplar educational interventions entailing a sequence of learning activities (Dagnino et al, 2016). For example, the Tsamiko dance game was included in an educational scenario conceived for a formal situation (a dance school). In the scenario, the game is introduced after an initial training based on video resources oriented to develop in the learner the ability to recognize the basic steps of the dance. Within the game, the learner can train her ability to reproduce the basic steps and get a feedback about the level of accuracy of the performance; moreover, the game gives the opportunity to record the performance and watch it in order to identify the main problems in the performance. Therefore, the game can provide useful information both to the teacher and to the learner.
Another example of use is the scenario drafted for the Walloon dance game. The scenario envisages its adoption in the context of an exhibition in a museum (non formal learning). In this case, the scope is not teaching the steps to an apprentice but providing a first practical approach with the Walloon dance steps to the general public, opportunity not easy to get during live experience, let alone in "traditional" museums exhibitions. The scenario envisages a path with multiple workstations endowed with sensors (Kinect 2) for making the visitors experience the different steps (maclotte, passe-pied, etc.).
The 3D applications can be accessed directly through the Educational Processes area of the platform, nevertheless, the access to this resource isolated and without a clear objective runs the risk to despoil the applications of their educational power. This is the reason why their use was planned in the context of educational scenarios, where clear objectives were stated and their use is combined with other resources. As for the games, the educational scenarios are available for experts/teachers and users on the platform.

A video about the project and the games is available at
https://www.youtube.com/watch?v=linH7ihGMvg

References

Branchesi, L. «La pedagogia del patrimonio e la sua valutazione: ambiti di ricerca, metodologie, risultati e prospettive». In Branchesi, L. (ed.). *Il patrimonio Culturale e la sua pedagogia per l'Europa*. Roma: Armando Editore. 2006

Dagnino, F.M. et al. « Serious Games to Support Learning of Rare ‘Intangible’ Cultural Expressions». In Proc. of the 9th INTED Conference, pp. 7184-7194, Madrid, 2nd-4th March, 2015
Dimitropoulos, K. et al. «Capturing the Intangible - An Introduction to the I-Treasures Project». In Proceedings of the 9th VISAPP Conf., pp. 773-781, Lisbon, 2014.
Ott, M. and Pozzi, F. «Towards a new era for Cultural Heritage Education: Discussing the role of ICT». Computers in Human Behavior, 2011, 27 (4) pp. 1365-1371.
Yilmaz, E., Ugurca, D., Sahin, C. et al, «Novel 3D Game-like Applications driven by body interactions for learning specific forms of Intangible Cultural Heritage,» in Proc. of 10thVISAPP Conf., pp. 651-660, Berlin, 2015.