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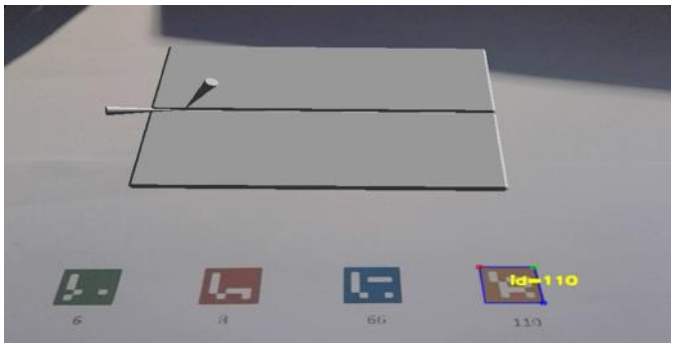
Project Nr: **2016-1-RO01-KA202-024508**

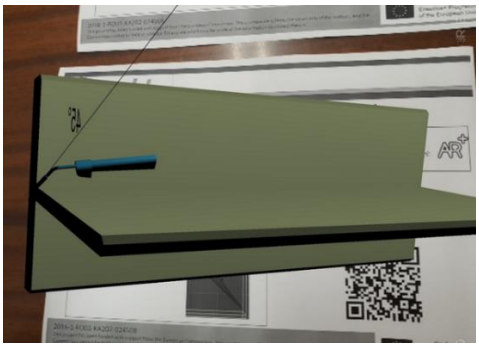
"A Digital Training Toolbox for Fostering European Experts in Welding Technologies" – eu-WELD

Report on Intellectual Output 8

Eu-WELD Augmented Reality Case-Studies

Activity Leading Organisation: MECB





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Intellectual Output 8: Eu-WELD Augmented Reality Case-Studies

Contents

1.0 Introduction

This report details the work carried out as part of Intellectual Output 8 with the aim of developing a set of eu-WELD augmented Reality case studies. To achieve this aim the methodology illustrated in Figure 1 below was utilised. This started with the development of possible scenarios which could be developed using AR technology which included the development of the 3D models and animations to be utilised. The appropriate AR hardware and software was identified to achieve the aims of the AR case studies and the case studies were then converted and implemented into AR. Finally the AR case studies were integrated into the e-Learning courseware and tested during the pilot studies.

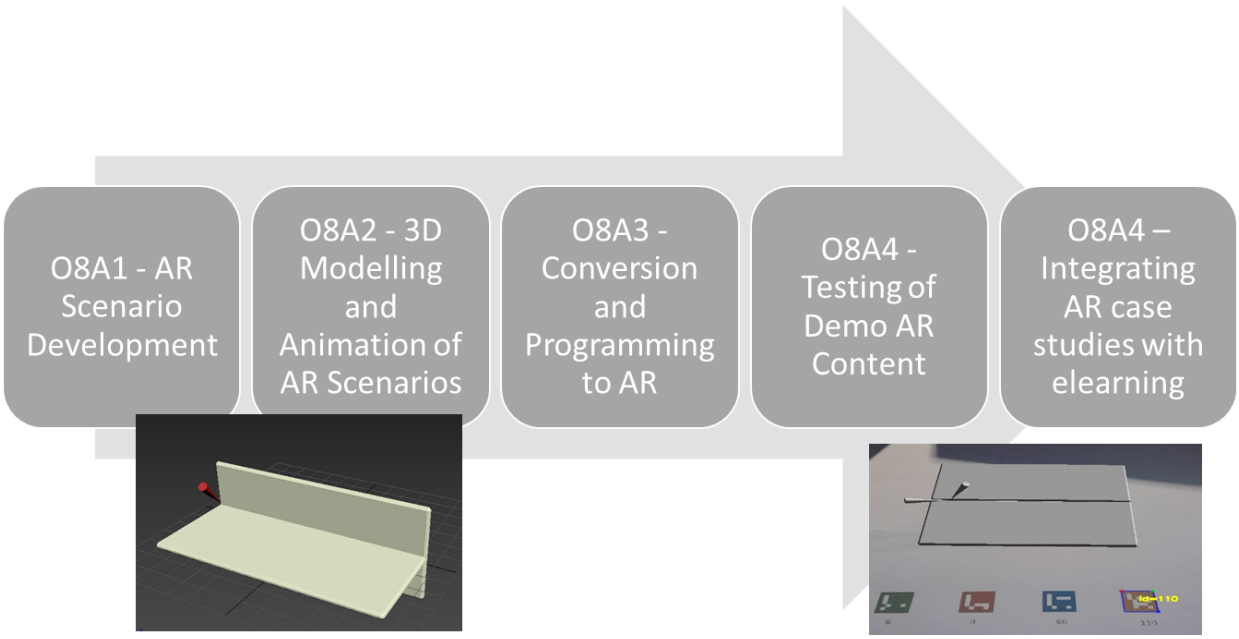

Figure 1 - Methodology for developing AR content

2.0 Intellectual Output Tasks

O8-A1 – Identification of welding case-studies for implementation as AR examples

As part of the eu-WELD project, the consortium needed to develop a number of welding case-studies employing Augmented Reality technology. Through these case studies the remote participants of the e-Learning content should be able to view and interact with 3-dimensional (3D) examples of different type of welds, e.g. groove and fillet welds.

Furthermore to integrate with the learning content and to explain better the differences between different welding methods it was decided to select two of the most common welding processes. For these welding methods two different types of welds were identified, these being the groove and fillet weld, since these need to employ different work and travel angles.

For example as illustrated in Figure 2, for a Fillet weld, the gun should be held at a 45-degree angle, or equal distance from each piece. When making multiple weld passes, the work angles change slightly. This helps avoid uneven weld beads and undercuts.

On the other hand the travel angle is defined as the angle relative to the gun in a perpendicular position. Normal welding conditions for MIG welding in all positions call for a travel angle of 5 to 15 degrees.

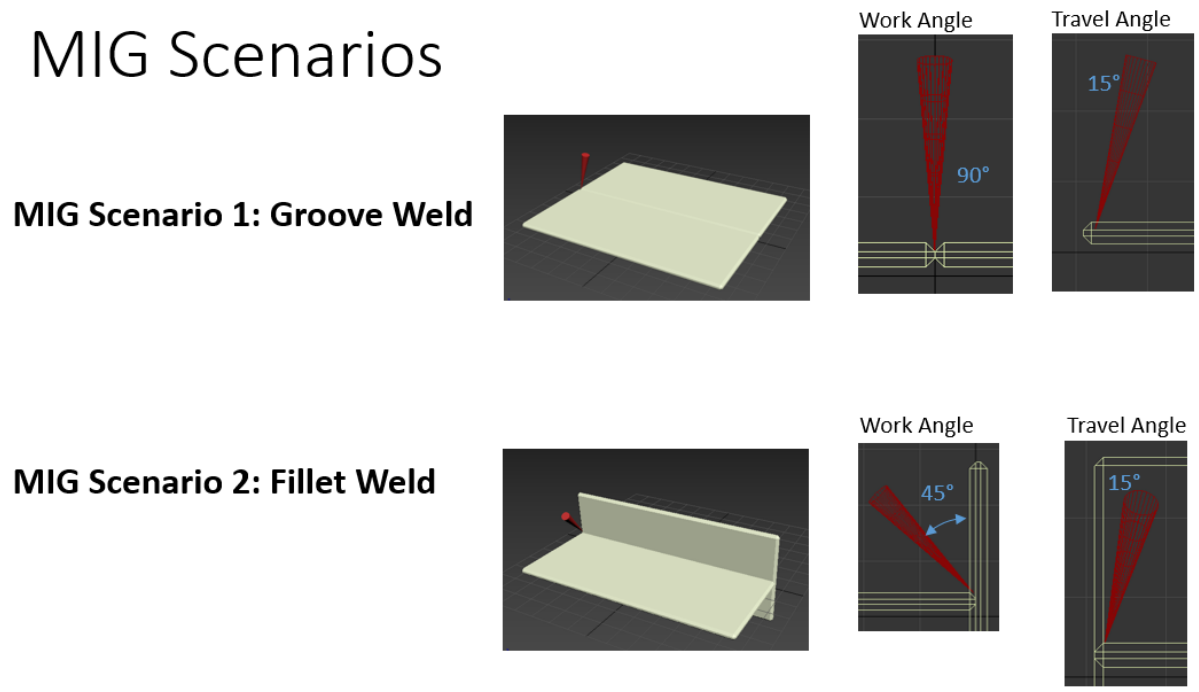

Figure 2 - MIG welding scenarios

O8-A2 – Setting up of the appropriate AR hardware and software

In addition, the partners need to be able to convincingly demonstrate how this technology can be used by VET trainers as well as learners. A report was therefore developed with the intent to guide partners is selecting the necessary equipment.

As explained in the previous section the AR case studies developed for the eu-WELD project and following preliminary demos carried out in the kick-off meeting in Bucharest and the second meeting in Wales, UK, the case studies can run employing freeware software. Therefore no specific software license needs to be purchased or rented.

On the other hand as illustrated in Figure 3, the report detailed a range of devices that can be acquired by the partners. The list is only indicative and consists of typical devices that can be used to run the AR case-studies and demos to be created in the project.

For further details refer to report O8-A2: Setting up of the appropriate AR hardware and software (EUWELD-MECB_O8.A2).

Figure 3 - Report on Hardware and Software

O8-A3 – Implementation of the identified case-studies into AR

The first step of implementing the identified case-studies into AR content was to develop the 3D models and associated animations. As illustrated in Figure 2 this consisted in modelling the workpiece in different configurations (e.g. butt weld, tee joint, etc.) and also the welding torch. This had to than be configured at the correct weld angles depending on the type of welding process being utilised (e.g. TIG or MIG), and finally animated at the correct speed.

A number of freeware AR platforms were than tested during the development of the AR case studies. The aim was to develop an AR experience of the welding process. For this a number of software platforms were trialled, including hp-reveal, OpenSpace 3d (illustrated in Figure 4) and AR Media.

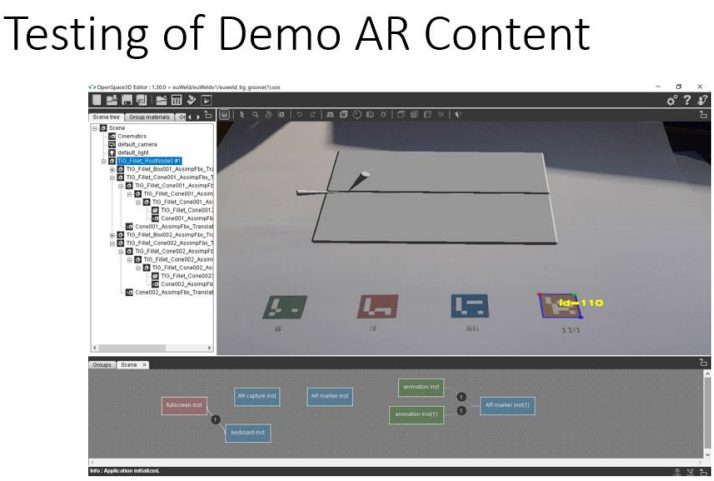

Figure 4 - AR platform testing

Following a number of tests and consultation with the other partners during the transnational project meetings it was finally decided to adopt the hp-reveal AR platform (Figure 5, Figure 6, Figure 7), since this provided an open-source capability which could be utilised on a wide range of mobile devices (including both android and apple phones).

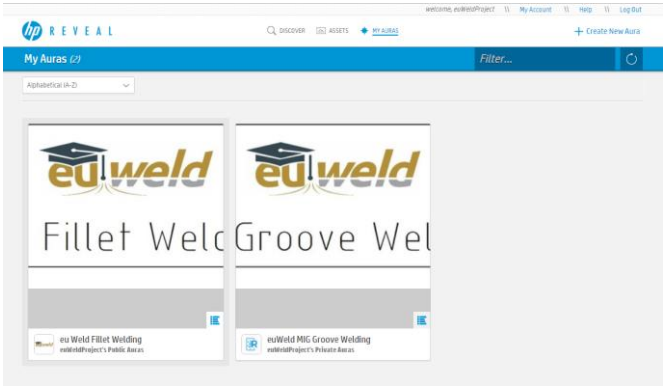

Figure 5 - eu-WELD setup on the hp-reveal AR Platform

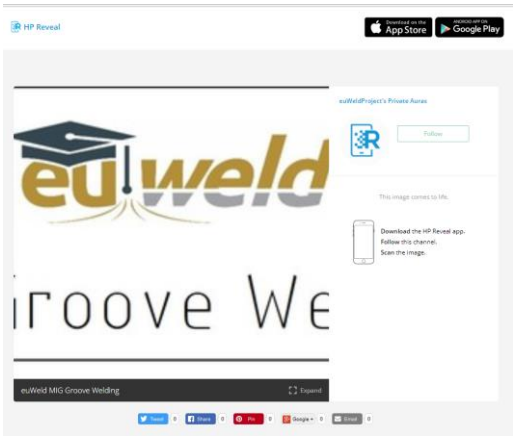

Figure 6 - eu-Weld HP Reveal Channel

Figure 7 - eu-Weld AR Case Studies

O8-A4 – Integrating the established AR case studies with the e-Learning content

As illustrated in In order to integrate the AR case studies with the e-Learning content it was decided to integrate the AR markers into a sheet which included a set of information, including the demonstration instructions but also information about the case studies and on which lessons in the e-Learning content the participant could follow to acquire further information.

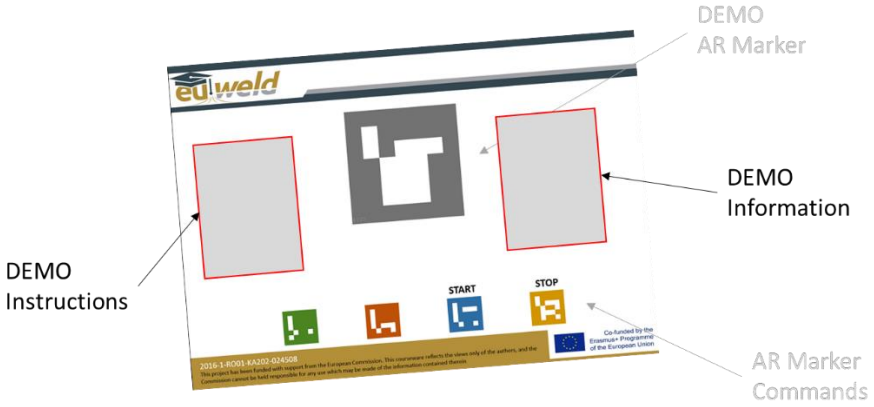

Figure 8 - Concept for integrating the AR Case studies to the eLearning content

After various iterations and in consultation with the eu-WELD consortium partners the final sheet which allowed for the integration of the eu-WELD AR case studies with the e-Learning content was developed as illustrated in Figure 9. This included the:

- AR Marker for use with hp-reveal
- Instructions of how to utilise the AR Marker
- Link to the e-Learning platform
- Welding knowledge on the particular AR case-study

Figure 9 - Finalised AR sheet

3.0 Conclusions

A number of tasks have been successfully completed during this output. To summarise the results of this Intellectual Output:

- The AR Case studies and scenarios have been developed including the 3D Modelling and Animation of the AR scenarios,
- A report was compiled on the software and hardware requirements for the AR case studies.
- The AR case studies were converted and programmed using freeware software and an eu-WELD hp-reveal channel was created.
- The AR case studies were integrated with the e-learning content.