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Augmented Reality Towards A Simplified Pedagogical Scenario Case of Teacher Training in the Regional Centers for Education and Training in Morocco

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Abstract

Augmented reality to qualify a new form of interaction between the user and the machine based on the association of real objects, from the user's environment, and virtual. In Morocco the use of this technology in the learning context remains in the embryonic phase that tries to overcome several issues (Profile of the designers, Users, and the learning scenario). Scripting is primarily a work of content design, resource organization, activity planning and mediations to induce and accompany learning. The integration of augmented reality (AR) requires the contribution of the different specialists who work on the design and realization of the scenario. While the CRMEF AR project. CRMEF is at the end of a first phase of development, this contribution answers the following research question: What are the steps of the scenario of learning with augmented reality? How to harmonize the mastery of data integration in scientifically validated 3D in the context of learning and the use of learners? For this purpose, the project aims to model and simplify the integration of AR in Regional Centers for Education and Training through anAR BANK OF OBJECTS validated by the National Scientific Committeein 3D format.

Keywords: Learning Scenario, Augmented Reality, Training Teacher, Intelligent tutoring, Immersive Learning**.**

Introduction:

During our CRMEF AR project, we encountered several obstacles to the technological implementation of augmented reality in the learning environment. For this we wanted to capitalize on the simplified scripting experience implemented during this work. To this end, this article presents the models that we have developed to specify a scenario and the approach to be taken to carry out the scriptwriting work in a collaborative way. Our proposal consists in offering a methodology and an augmented reality resource environment allowing an educational engineer or teaching instructor to assist teachers in the production of Augmented Reality (AR) training modules.

The plan for this article includes the following parts. In section 2 we present a feedback on a scriptwriting approach used to set up a training of future teachers in the CRMEF. This real use case allows us in section 3 to position our work vis-à-vis the state of the art in the fields [1] of the educational scenarios and [2] scriptwriting methodologies. Section 4 details the models we propose to

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support both aspects. In section 5, we present a platform implementing advanced propositions to support the collaborative design of immersive teachings. Finally, we conclude this article by opening perspectives on the work to be continued.

Screenwriting experience in CRMEF Taza:

Following the increased lack of teachers in Morocco, the Ministry of National Education, Vocational Training, Higher Education and Scientific Research has launched a recruitment of more than 75,000 teachers during the last three years, of which are invited to complete an accelerated training which lasts less than 6 months, during this training the future teacher receives several information in a limited time. So, the adaptation of training modules and technological transmutation in the learning context was essential. We conducted a scripting process on which we base our experience with AR. The project aims to strengthen personalized learning for each future teacher through the return to the RA in case of difficulties during and after learning a training unit.

This experiment was conducted by three pedagogical engineers driving 12 trainers from the Regional Center for Education and Training of the region (CRMEF) Fez-Meknes to create training modules with content in AR. The approach adopted by the instructional engineers comprises three main stages.

The first step takes the form of a contact materialized by a questionnaire of 32 questions for the author of the course to identify his relationship with the RA for the pedagogical engineer to identify the practices non-necessarily expressed educational scenarios that characterize the teacher's way of doing things.

The second step concerns the general structure of the course. It is a question of detailing the target audience and the prerequisites, the knowledge and skills to be acquired, the material, the resources of AR and any necessary software, the methods and means of evaluation envisaged, and an initial list of pedagogical sequences.

Based on the above synthetic description, the third and last step details the scenario constituting the course. It is a question of establishing a division of each chapter into pedagogical activities, to define the pedagogical resources in AR necessary for the implanted ones in the learning medium (Paper / Digital).

State of the art:

(Paquette and Leonard, 2013) define a scenario as an ordered set of pedagogical activities, governed by actors who use and produce resources (or "learning objects"). In this context, a learning scenario can take several forms (text, audio or video, AR, VR) that describe the objectives, the actors, the steps and sometimes the instructions, the tools and documents used or to be produced.

For "Augmented reality is a scientific and technical domain exploiting computer science (1) and behavioral interfaces [2] in order to simulate in a mixed world [3] the behavior of artificial elements [4] that interact with each other. real time[5] between them, with the natural environment and with one or more users in natural or pseudo natural immersion [6] via the sensorimotor channels. Bruno Arnaldi & al. (2003) on virtual reality, Olivier Hugues (2011).

Although SAM's iterative approach is based on the Agile approach: Evaluation, Design and Development, with a set of iterations throughout the process, which offers flexibility to the development process, we preferred we press ADDIE. Indeed, while SAM can give rise to the questioning of the result obtained and to take the evaluation step at each milestone, the structuring nature of the ADDIE model requires the validation of each step before moving on to the next step. although each step can be iterated for refining. This was necessary in view of the configuration of the project team: the piloting of 12 trainers who did not know each other and worked totally with the environment of the RA.

So, our contribution is aimed primarily at educational engineers wishing to develop scripting approaches to facilitate the work of designing course modules with AR. So, our action is articulated at the level of screenwriting approaches and more specifically on the design of augmented reality resources and the adaptation of these resources with our approach. In this sense, our concerns are closer to the methodological aspects addressed by ADDIE and SAM.

As part of future investments, the digital resource banks for CRMEF are made available free of charge for all teachers of future teachers. They are available for use and reuse within the educational framework.

They are accessible via the "CRMEF AR" platforms.

Pedagogical scenario models:

Beyond the modeling of the elements constituting a scenario, we wished to capitalize the approach. To this end, we first formalized the scripting approach used to facilitate its reuse. In a second step, we generalized the concept of scripting approach to allow the pedagogical engineers to adapt the approach used in the framework of the CRMEF AR or to develop new approaches.

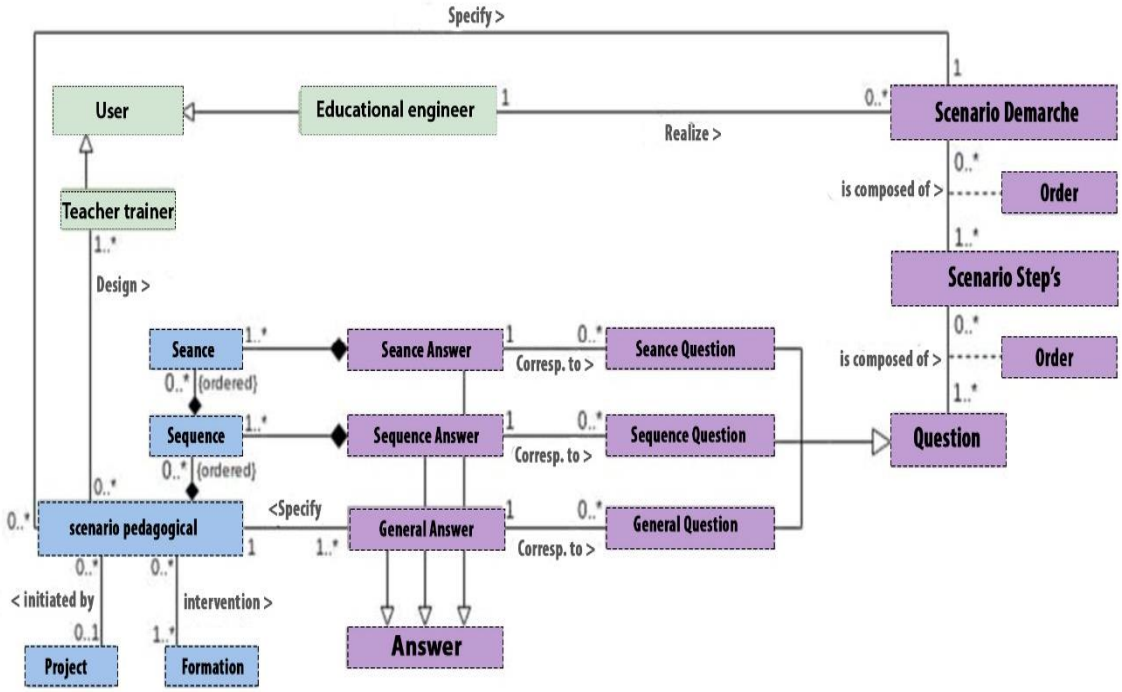

Figure 1-General Model

The blue part (bottom left) is relative to the components describing a teaching scenario. An educational scenario (or course module) consists of a set of chapters (or pedagogical sequences). Each chapter breaks down into sessions in which the learners use resources (QCM AR, 3D AR, ANIMATION AR ...) to carry out a given activity. We made the voluntary choice to start from a simple scenario model.

The purple part (on the right) defines the elements of a scriptwriting approach. As part of our study, a scripting approach is composed of a set of ordered steps each aimed at specifying a part of the scenario. The specification objectives for each stage are defined by the instructional engineer. It is also the pedagogical engineer who defines, according to the degree of progress of the scriptwriting work, if the next step is currently accessible or not to the teacher. A stage of scripting is composed of a set of questions whose content and order are defined by the engineer. These questions are asked to the teacher to specify the properties of the instructional scenario. As a scenario is composed of sequences, themselves composed of sessions, the questions defined by the pedagogical engineer must lead the teacher to specify these elements. Our model thus distinguishes three types of questions:

- General questions: they do not have a direct link with the scenario to be developed. They allow the pedagogical engineer to better identify the teacher-trainer (scripting skills, level of knowledge on the subject ...) Or prepare the teacher to identify sequences and sessions composing his scenario;
- Sequence-type questions: they aim at precisely specifying the sequences composing the developed scenario;
- Session-type questions: they aim to specify the sessions of each sequence.

The answers to the questions of sequence and session type will correspond to the specification of the sequences and sessions of the scenario to be deployed later on the educational platform.

The green part (top left) highlights the roles of the two main players, the instructional engineers and the teachers. According to our approach, the pedagogical engineers are in charge of developing new scriptwriting approaches that will be implemented in collaboration with teachers, one of whom will act as a referent to his colleagues to specify the approach.

The design of scripting approaches based on this model is flexible and can be conducted in a descending, ascending or mixed way. In a top-down approach, it includes the definition of the objectives of the approach, the elaboration of the steps that make up the process and then the specification of the questions to ask teachers at each step.

In a bottom-up approach, conversely, it includes the development of a set of relevant questions to specify a scenario and then the distribution of these different questions within stages.

Finally, in a mixed approach, it is possible, for example, to create a first step and then define associated questions, then to create a second step and associated questions, etc. The necessary flexibility of the process of constructing a scripting approach was born from the experience of the CRMEF AR. Given the scripting module, the number and the profile of the teachers involved in the scriptwriting, we as many pedagogical engineers had to adapt the scriptwriting process by sometimes adding preparatory steps or questions in certain stages. This on-the-fly adaptation was carried out as modules were designed and it seemed important to us to maintain and integrate this adaptability within our platform. Our model thus makes it possible to organize the scripting approach from any starting point so as not to be an additional constraint for the teacher, which could constitute a source of rejection or non-adherence to the approach.

Collaborative design platform for immersive training modules:

To support this flexible design approach, but also to evaluate the relevance of the models developed, we propose an augmented reality banking platform (Figure-2), the proposed interactive environment allows teachers to enrich their content with objects. in 3D validated by the scientific committee and listed by discipline and in alphabetical order.

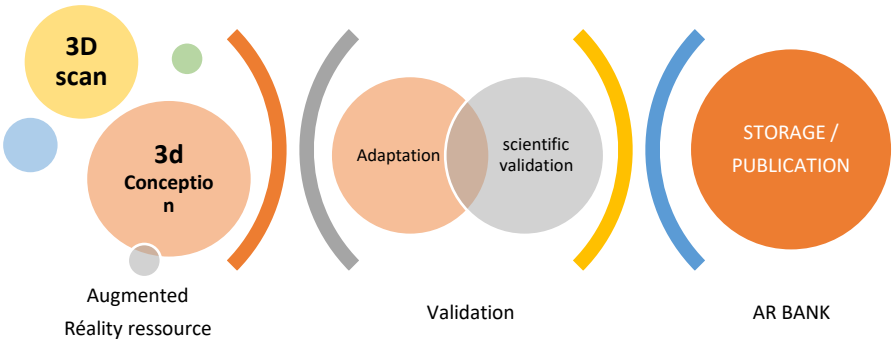

Figure 2-CRMEF « AR BANK »

Modelization

Two types of modeling of objects in 3D proposed:

3D Scan: a beginner level is requested, using the "Qlone" application that offers the ability to scan real-world objects using a smartphone that runs on an Android or IOS system. Scanning is very easy. Fast and real-time on a Smartphone, Includes AR View with ARKit / ARCore, so that 3D models can be returned to the real world.

Scanning is very easy with "Qlone", and just place the object in the middle of the carpet and the AR dome will guide you through the scanning process. Re texture of your selected pose.
There are even merged two different poses of the same object to obtain a better overall result. "Qlone" gives the possibility to clean and modify the 3D model - Texture, Art, Sculpture, Clean and Resize. Export possible in various formats: OBJ, STL, USDZ, GLB, PLY, X3D.
3D design: an intermediate and experienced level is required to design 3D objects using several software (AutoCAD, Cinema 4D, Blender, Rhino, Sketchup ...) several extensions are available at the time of export.

Validation:

The CRMEF AR has a scientific committee that validates the integration of objects in 3D, after the respect of several scientific criteria (Dimensions, Aspect, Colors, Shapes, Animation, Process, ...) if the object requires a modification, the committee writes a report detailing the change applied before validation.

Storage:

The AR Bank platform publishes objects in scientifically validated 3D and listed by disciplines and in alphabetical order, these objects can be downloaded in the form of a diagram for the integrated paper or digital presented to future teachers.
Other programs ranging from beginner level to current RA practitioners, we offer applications that can help trainers get started without coding skills:

- **Curiscope:** Using the Virtuali-Tee (a t-shirt with embedded code) and the application of students can thoroughly examine the human body. They can explore the body's systems and deepen their understanding of anatomy.
- **Experience Real History (ERH):** Starting with Alamo in 1836, ERH uses maps and reality maps, in addition to the app, to help users get acquainted with the story. Maps, for example, show individuals from the period, and when two maps are viewed in the application, users learn how people interact.
- **3DBear:** This program allows students and teachers to create their own RA experiences by superimposing 3D models to reality. It is not specific to a level or subject and can be used in many disciplines. It also includes some lessons to help teachers get started.
- **Metaverse:** another application that allows the user to be the creator, Metaverse users develop storyboard experiences that they can share with each other. Teachers organized quizzes, treasure hunts, rest rooms and much more with the program.
- **Cospaces:** This AR creation app has basic and pro levels that allow educators to create lessons across topics and levels. There are development modes for beginner and experienced coders, so the RA can be as sophisticated as the teacher wants.
- **Orb:** This application allows children to build on top of the real world as if they were dressing up a scene. They can also share their creations with others through the app.
- **Merge VR:** Merge VR technology uses helmets and a special MERGE cube to develop and deliver RA experiences from 10 years old.
- **Global Brush:** Users rely on the real world and can share their creations with others.
- **MoatBoat:** With this app, students and teachers can type or say instructions, and the program will create it

Conclusion and perspectives:

In this article we presented a scenario model and a model of scripting approaches. We also presented an Augmented Reality AR Bank platform. This environment has been implemented to produce interactive media. This design platform has also been experimented with developing new teaching modules for new training. It turns out that the environment meets the needs of the educational engineer who works with a new team of teachers. It would be interesting, however, to experiment with new pedagogical engineers wishing to implement their own scriptwriting approach. A limitation of our models lies in the fact that the educational resources designed by sophisticated software for those involved in each learning sequence are not directly specified during the instantiation of the models. An evolution perspective is therefore to extend the scenario model to support the specification of these resources.The extension of the scenario model also supposes the extension of the model of scripting

steps to be able to specify this dimension of the scenario. To cover a wider spectrum of pedagogical practices, including the integration of pedagogical roles identified in (Paquette, 2002) or (Basque, 2016) - responsible, author, scriptwriter, mediator, tutor ... - the general model will also have to be extended. More broadly, it is necessary to define more precisely the type of scripting approaches that can be designed with our models. We hope to be able to identify educational practices that are not covered to evolve our models.

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