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ONLINE DISTANT LEARNING USING SITUATION-BASED SCENARIOS

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Abstract: This paper is an overview of our work to deal with scenario representation and management model in Online Distant Learning domain. Our approach is based on scenario structuring using the notion of “situation”. A “situation” is an elementary building block dividing the interactions between actors into contextual scenes. This pattern not only supports the scenario execution, but also its creation and evolution. After discussing the global methodology to manage ODL applications and introducing the situation-based scenarios, we show how our methodology and situation structuring can be applied to and enhance ODL.

1 INTRODUCTION

Online Distant Learning (ODL) is now becoming a mature research domain (Lionarakis, 2009). We witness the development of online training applications and the use of generic online meeting applications for training purpose to create online virtual classrooms. But generic interactive applications are not well suited to a training context, and specialized ones can require too much learning time to master (Murphy and Manzanares, 2008)/(Kinser, 2003), slowing down their acceptance by the users (Jung et al., 2006)/(Pigliapoco et al., 2008). Moreover, users expect new learning possibilities through the use of these applications (Hay et al., 2004).

ODL is not simply an unfolding of a “video conference” or “online meeting”. A learning session can be seen as a “scenario” that organizes the educational activities. However, scenario organization for training purpose in online learning is still rarely used or studied. We want to structure and organize learning sessions into scenarios in an effective way. To achieve this, we propose the use of “situations” blocks. Each “situation” is a sequence of interactions between application’s actors within a given shared context (Pham et al., 2012). Furthermore, the situation-based scenario uses interactive storytelling techniques as well as consistency management (Pham et al., 2011) in dynamical execution to ensure robustness and interactivity for online learning. It also facilitates the adaptability during the training session and improves the training quality by analyzing feedbacks and results.

We aim to obtain a complete generic situation-based adaptive scenario management system, including authoring tool, execution environment, and scenario evolution control all along its lifecycle, since users are looking for a system that can adapt itself to its context and environment (McKee, 2010). The resulting system has to be accessible for everyone, without requiring particular training or equipment, as these are the main problems associated with the implementation of ODL systems (Cardoso and Bidarra, 2009). This paper gives a quick overview of our situation-based model and details its application to ODL case study.

2 ODL METHODOLOGY

Our scenario management system uses a three-step cycle, namely Before (scenario’s construction), Throughout (scenario’s execution) and After (execution’s analysis). Using this cycle, users involved in scenario’s lifecycle are given tools and clues to improve it between each execution. This cycle can be applied to other interactive systems with scenario-based execution.

We must at first determine system’s actors and their environment. In ODL, we define three different types of real actors: learners, trainers and training organization. Each of them is involved in one or several
steps of the scenario’s lifecycle in ODL, and may take
on one or several roles, such as auditor, presenter, moderator and designer. Figure 1 shows how each
involved actors and roles steps into this cycle, rep-
represented by a three-segment arrow, representing the Before, Throughout and After steps.

The seven points illustrated in the figure 1 are: the
definition of quality standards (1), the definition
of the training’s content (2), the choice of associated re-
sources (3), the execution of the training session (4),
the events recording (5), the events analysis (6) and
the feedback to the actors (learners, trainers, and or-
ganization) (7).

The “training organization” is responsible for
the training’s quality: Before the execution, it defines
rules and imperatives of the training. The “evaluator”,
in the After step belongs to the training organization
as well. He points out the most meaningful events
reported by some observation mechanisms, and dis-
patches them to the concerned actors in order to im-
prove the training prior to the next execution.

3 APPLICATION STRUCTURING

In the interactive domain, story or plot structuring has
been studied in many areas, such as games, interac-
tive drama and storytelling (Magerko, 2005)(Mateas
and Stern, 2005)(Paul et al., 2011), but also simula-
tion and educational applications. Interactive applica-
tions from our point of view always have a scenario
defining the interactive environment and tasks that ac-
tors have to do. In order to provide a story model, we
propose the notion of “situation” (Pham et al., 2012).
The situations are the narrative basic blocks that fa-
cilitate the story planning and management by char-
acterizing and confining the interactions.

A situation is a sequence of interactions between
two or more actors in a precise context to achieve a
predictive objective. It is characterized by the follow-
ing set of elements, illustrated in figure 2.

- Pre-conditions: set of conditions that must be sat-
   isfied to enter the situation.
- Post-conditions: set of conditions or results that
  must be completed in order to leave the situation.
- Progression: presents a frame where actors
  behave and interact using local resources and
  launching different tasks according to their objec-
tives. Situation progression involves:
  - Actors: real (human, physical) or virtual (sys-
tem components, agents, non-player character).
  - Application’s designer logic: what the system
    is allowed/supposed to do. It will orient the ac-
tors’ activities and tasks along the progression.
- Event management: deals with the incom-
ing/outgoing events from/to the external world or
others simultaneous situations.
• Resources managers: system’s actors responsible for resources access and utilization with respect to actors’ needs. Resources can be local or global.
• Consistency management: mechanisms handling actor’s inconsistency (Pham et al., 2011).

We distinguish 3 kinds of situations: elementary situations (basic situations introduced above), composite situations (abstract situations that recursively include other situations) and usable situations or parameter situations (ready-to-use situations, pre-designed and instantiated with common parameters) (Pham et al., 2012).

An application scenario is finally represented as an ordered sequence or directed graph of all possible situations that can happen between actors.

4 APPLICATION TO ODL

We applied our proposition to our Online Distant Learning framework. This framework deals with activities structuring in distributed virtual classroom. We use our situation-based structuring to organize class learning activities. We have first identified the corresponding situations and build the situations library. Then we have defined the scenario situation graph that allowed us to assess the methodology feasibility and perform adaptivity tests.

4.1 Building scenarios using situations

Our methodology of scenario specification is based on the decomposition of pedagogic activities encountered in a classical face-to-face classroom. A classical course is regularly unfolded into several activities, such as lesson lecture, exercise working, going to the blackboard, examinations... Each activity consists of a set of actions and interactions between the trainer and the learners using appropriate content and resources.

This lecture structuring into activities in a face-to-face class justifies the situations construction in our work. Our concept of situations is well suited to represent learning relatively independent activities in ODL because these scenario structuring blocs allow actions and interactions contextualization.

Generally, the situations library is determined by application designers from the development point of view. They have to satisfy reusability and generalization. The ODL sessions are then created from the situations library by the course designer or the trainer himself. The scenario structuring is thus based on the main activities and steps in a real classroom.

The elementary situations defined for our virtual classroom are: Presentation, Moderation, Discussion, Individual working, Collaborative working, Browser sharing, Survey and Grade. We also defined the composite situations: Lesson lecture, Class working, Going to the blackboard and Evaluation; and the usable situations: Group work and Examination. The figure 3 gives three examples of situations.

4.2 Advanced scenario management

To validate our proposition, we defined a standard typical scenario structured with situations for a lesson session. The basic scenario contains the following steps: Start of the lesson, Classwork, Going to the Blackboard, Discussion and Survey. This five-step scenario is “converted” into situations and organized into a graph, as shown in the figure 4.
exactly as he intended initially. Therefore, although
the scenario is predetermined, it must be adaptive to
be easily modified or customized during the course.
Our approach gives this freedom to the trainer by al-
lowing the trainer to interchange situation blocks.

We could also mention the adaptation resulting from
consistency management, external events or other types of adaptation. These are further discussed in
other papers. Please see our case study for examples
of adaptation, scenario’s execution, and more de-
tails about the architecture and the adaptive scenario
management (Trillaud et al., 2011)\(^1\).

5 CONCLUSIONS
We have presented the methodology overview of our
situation-based adaptive scenario management sys-
tem. The situation model is used not only to con-
struct scenarios, but also to improve them through the
3-steps lifecycle, namely before, throughout and af-
ter. The situations support the scenario creation be-
fore system execution beginning: the automatic nav-
igation, dynamic adaption and consistency manage-
ment in the throughout step; and scenario improve-
ment after its execution. The notion of “situation” is
proposed to be a reusable model to all types of in-
teractive applications for which the execution can be
organized as a scenario. This methodology allows us
to build robust system architecture.

Since the Online Distant Learning is organized as sequence of learning activities, it is well suited to
situation-based structuring. We have categorized
ODL actors with their different roles; these roles can
be changed during training session. Form the iden-
tified activities, we have defined the library of situ-
aturess that is used to structure lessons in ODL. This
may allow best interactive online training, compared
to most existing online training or meeting applica-
tions: the trainer gets a permanent feedback on the
training execution; keeps control over the scenario
and can adapt it in a flexible way (a comparative study
has been carried out and will be the subject of upcom-
ing publications (Trillaud et al., 2011)).

Finally, we gave a glimpse of what the scenario
adaptation can be within situation-based scenario, but
there is much more to say about it, through tracks
analysis, consistency management or interactive sto-
rytelling. This will be covered in future publications.

We are now completing our works through sev-
eral aspects: development of the authoring system
supporting scenario creation and improvement, use
of traces analysis to support the scenario’s lifecycle,
complete integration of scenario management within
our ODL framework, and live tests with real online
trainers and learners. Our final aim is to estimate and
prove the performance and pertinence of our scenario
management methodology for different scenarios in
various interactive applications fields.

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