An Architecture for Creating Simulators for Training Global Software Development

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The evolution in Global Software Development (GSD) has led to the need for universities and practitioners to train their students and engineers.

Managers of multinational companies frequently complain that recent graduates lack the skills required in GSD.

Communication and collaboration problems derived from cultural and language differences.

Participants must be trained in the problems of GSD. However, this training is rarely part of their education.
Training the skills needed in GSD is not easy - it necessitates providing real experiences.

Reproducing the complexity of real settings is difficult in educational environments.

Companies are not always willing to invest their resources in training programs.
Related Work

Academic courses

- Classes in universities.
- Masters programs on GSD.

Problems:

- Coordination and collaboration problems between institutions.
Learning Environments

- Collaborative learning platforms.

Problems:

- If a distant member fails, they harm the whole team.
Teaching GSD in enterprises

- Experiences of multinational organizations which offer their engineers GSD training courses.

Problems:

- Companies are not always willing to invest time and resources in these training programs.
Students involved in these training programs usually experience a lack of motivation, scheduling problems and communication difficulties.

We present an architecture for teaching and training GSD skills based on simulation.

Using this architecture the students will *learn by doing*.

The aim is to avoid the problems of the previously mentioned proposals.
Skills Needed

- Formal and informal communication skills
- Ability to communicate with a multidisciplinary team
- Use of a common language, communication protocols and customs
- Ability to manage ambiguity and uncertainty
- Use of typical GSD tools
- Leadership, negotiation skills, conflict resolution and time management skills
Some of the cultural problems in GSD are:

- Being too direct can seem very rude in some cultures.
- Participants do not speak during team discussions until invited to do so.
- Team behaviour and the manager’s authority are understood in different ways in different cultures.
- People from some cultures tend to say that they have understood something when they have not really.
- Mum Effect: tendency to cover up critical information or to distort negative news towards more positive information.
The language knowledge considers typical problems, such as:

- the incorrect use of “false friends”
- incorrect plural formations
- incorrect past tense and past participle formations
- avoidance of passive forms
- the absence of the third person –s
- the if-part of conditional clauses with would
- misuse of prepositions
VENTURE: a virtual training tool that enables learners to get immersed in realistic GSD scenarios.

- The **Virtual Agents** simulate stakeholders of different nationalities, by displaying emotions and personality (anger, annoyance, nervousness, etc.).
- The **Virtual Colleague** corrects the learner by concentrating on the language and cultural knowledge associated with the scenario definition.
The virtual meetings are designed to reflect typical problematic or controversial situations of GSD.

Learners must interact with the VAs playing a specific role.

They must get as much information as possible in order to complete the exercises.
The virtual meetings are defined by a workflow model. Each phase contains the contextual information required.

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The **conversational knowledge** is used for the VAs to answer the learner’s questions.

- It is defined by using AIML (*Artificial Intelligence Markup Language*), interpreted by a chatbot engine.
- Each phase it is defined at a high granularity level containing the details of a concrete part of the conversation.
The cultural and linguistic rules are triggered by detecting patterns in the conversation.

When a rule is triggered, the Virtual Colleague will provide feedback to the user.

These rules can be imported from a repository in which they are stored for their reutilization.

A rule can also contain additional metadata: type of cultural or language problem, its severity, emotions and gestures.
The Requirements Elicitation stage is particularly affected by distance.

A Spanish learner, playing the role of analyst, interacts with a virtual customer from USA.

The Virtual Colleague will introduce the problem to be solved.

Virtual Customers will answer in order to give the software requirements.

Learners will eventually fill in a requirements specification document.
A Requirements Elicitation Scenario

Virtual Customer: We should focus on security issues

Student: Who is the person responsible for establishing the security policy?

Virtual Colleague: “Politic” is a false friend in Spanish, Do you mean “policy”?

Student: Who will establish the security policy?

Virtual Customer: Security will be managed by the person responsible for our Administration Department

Virtual Colleague: We should have a meeting with the person responsible for the department, but we don’t know who it is.

Student: Who is the person responsible for the Administration department?
A Requirements Elicitation Scenario

Workflow definition

Main workflow

Introduction

Functional requirements

Identify storage requirements

Sub-workflow detail

Identify storage requirements

Determine relevant information

Security policy

Phase detail

Security policy

Conversational Knowledge

Virtual Colleague: We should focus on security issues. We first should know who must we address?

Virtual Customer: <pattern>Who * security policy *?<</pattern>

<template>Security will be managed by Mr. Edwards, who is responsible for our Administration Department</template>

Language problem

Type: false friend

Pattern: “politic”

Definition: “Politic” is a false friend in Spanish. Do you mean policy?

Cultural problems

Type: qualification

Pattern: “? Edwards” Trigger: “? <> Mr.”

Definition: You should refer to Mr. Edwards using his title (Mr.).
- Provides rigorous training in the skills required in GDS by focusing on cultural dimensions.
- Avoids coordination and collaboration problems between institutions and students.
- Explains the consequences and rationales.
- Customization of the existing training scenarios.
- Learners can play different roles.
- Learners can play the same scenario again and again.
- Controlled environment: learners actions monitored for improvement.
- Reutilization and management of cultural and language rules.
Future work

- Provide a wide set of training scenarios oriented towards several stages of GSD.
- Define scenarios in which more than one learner can be involved.
- Evaluate the architecture: by comparing the performance of members of a company involved in GSD projects.
Thank you very much for your attention

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