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Improving mechanical engineering training by using a serious game

C. LELARDEUX* (Université Champollion), O. Baptista (Université Champollion), B. Bacuez (Université Champollion), M. GALAUP (UMR EFTS), S. Torki (IRIT), F. Viallet (UMR EFTS), P. Torguet (IRIT), P. Lagarrigue (ICA - Université Champollion) & P. Châtellier (KTM-advance)

SUMMARY

Mecagenius is a serious game for students attending mechanical engineering training. The player will discover, through fun activities, a mechanical engineering workshop, learn how to use a NC machine tool and then will have the opportunity to manage a manufacturing project inside a virtual company. The Mecagenius project is an on-line multiplayer game, based on a distributed architecture integrating collaborative services (chat, share files, webcam, whiteboard...). It targets as well beginners and advanced students in initial training, as professionals in continuing education. World of Mecagenius will be accessible to a very large number of players simultaneously by the Internet and via a simple browser.

This innovative project gathers multi-disciplinary skills to ensure the success of the project. CUFR Champollion has partnered with the Clément Ader Institute (the laboratory of research in mechanical engineering), IRIT (the laboratory of research in computer science from Toulouse), "didactic phenomena" team of the UMR EFTS (the laboratory of research in social sciences), and the SME KTM-Advance to put into practice expertise and technological know-how of each participant.

MECAGENIUS project: <http://mecagenius.univ-jfc.fr>

Mecagenius is an on line serious game, designed for students attending a mechanical engineering training. Multiplayer, the game takes place in a virtual mechanical engineering workshop and integrates virtual meetings rooms (chat, file sharing, webcam, whiteboard...) to simulate the industrial context in training.

Used as a catalyst for learning, Mecagenius is **a virtual worker for learning by action**. The aim is to allow students, through fun activities, to discover a workshop production, to learn how to use a numerical command machine tool and to manage a manufacturing project inside a virtual company. MECAGENIUS targets beginners, advanced students in initial training, and also professionals in continuing education.

This project also aims to attract students in this field of activity and thus answers to the SME's problematic to find specific qualified people.

Depending on the role of the player, the pedagogical objectives are different:

Objective of the game for new students:

Becoming familiar with a mechanical engineering workshop: recognizing the devices in the workshop: tools, tool holders, machines tools... Learning how to use a machine (2, 3, 5 axis milling machine, lathe...).

Objective of the game for advanced students:

- Learning how to specifically recognize different devices using a standardized nomenclature.
- Learning to set up a NC machine tool in respecting the safety rules.
- Learning how to manufacture parts using machining strategies different in this case, the game will provide assistance to the knowledge of the business of the operators, rig with that engineers are obliged to work.

Objective of the game for experienced students:

To produce a mechanical assembly using parts machined in the virtual workshop
In this case, the game can be used to qualify a level of expertise of the operator.

Mecagenius is a game to make the user aware of green-machining:

Taking into account pollution generated by a machining (toxicity of dust generated by machining, influence of the coolant...) allows to educate players on this criterion.

Mecagenius: a game to simulate crisis situations:

Mecagenius allows you to place users in a crisis context, which is impossible on a real NC machine, because of the costs. This borderline cases learning represents a significant opportunity compared to a classical training.

Mecagenius: a game to gain professional experience during the training Period:

Many jobs require from candidates an experience in business. Through the use of Mecagenius in a virtual enterprise, the game allows students getting a concurrent engineering experience: business experience is a virtual one, but collaborative experience is a real one.

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