ACSP, an intranet forum supporting a concurrent engineering design life cycle

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ABSTRACT

Design a new product progresses from needs and functions specifications to detailed description of its physical components. The design activity involves a lot of actors all along the product life cycle starting from his specification to his destruction. This paper present a cooperative product design tool : ACSP. This tool is based on a distributed design approach integrated in a concurrent engineering design life cycle.

INTRODUCTION

ACSP is a Web environment developed to support a concurrent engineering approach based on a cooperative product design life cycle (GOMES and al., 1998, SAGOT et al., 1999). This approach promotes cooperation between all the design actors involved in the product design project (marketing, ergonomics, mechanical engineers, users, manufacturing operators, etc.). The designed product can be a mass market product, a mechanical system or an industrial machine. To reach these objectives, new mediating objects (VINCK and JEANTET, 1995 ; BOUJUT and JEANTET, 1998) describing the global Man-Product-Environment interaction in different life situations (using, manufacturing, recycling, etc,) have been integrated into ACSP to complete technical data such as CAD files, technical sheets and specifications describing the product properties. These cooperation supports are, for example :

- video recorded data extracted from users activities on current products,
- virtual animated pictures presenting future predicted usability of the future product in different future using, manufacturing, recycling, etc. situations.

Other data are stored in a Web server in order to organize the cooperative activities of the design actors. Some of these data are linked to the project, to the product, to design actors personal information, to design tools and methods information that can be useful in each project.

ACSP is available in a Intranet web environment built in a Client-Server architecture linked to a multimedia database.

THEORICAL AND METHODOLOGICAL FOUNDATIONS

ACSP is a web-based application developed to support a design life cycle centered on cooperation between the various design actors involved in each project. This product design life cycle is considered as a concurrent engineering design process also involving product users and manufacturing operators (BOSSARD et al., 1997 ; GOMES et al., 1998). This design life cycle has been applied to different design projects and has generated a number of data. We can give as an example :

- **personal information** introduced by each design actor to present himself,
- **project data** such as tasks planning or human, material and financial resources,
- **product and process data**, considering the global Man-Product-Environment interaction, such as multimedia documents linked to current products (current product pictures, video

recorded data from user activities of current products, etc.), design specifications for the future product, geometrical models of the future product made with CAD tools, virtual movies of future predicted situations when using the future designed product, manufacturing specifications, virtual pictures of human working activities in future manufacturing situations, etc.,

- **design tools and methods information** that could be applied in each project.

In this context, we have decided to develop a web-based application, as a distributed design environment, in order to structure the project's data and to organize the cooperative activities of the design actors. This web-based application, supporting the previous concurrent engineering design life cycle, has been called ACSP (*Atelier Coopératif de Suivi de Projet* - Cooperative Project Management Workshop). This application has been defined as a Human Computer Cooperative Work system HCCW, also called Computer Supported Cooperative Work environment CSCW (ERCEAU and BOURGINE, 1994).

The specificity of ACSP is to let users browse among data, representing new cooperation supports based on product usability and human manufacturing, recycling, etc., activities. These cooperation supports help all the design actors to identify problems, to search for new solutions, to evaluate concepts, etc., during creativity sessions.

ACSP STRUCTURE AND MAIN FUNCTIONALITIES

ACSP is divided into four main modules, managing project data, personal information, product data, design tools and methods information.

Project data

To help people to manage their projects, ACSP is linked with Project 98, a project management software from Microsoft. First, project managers may use Project 98 to split the project into different tasks and assign human, material and financial resources. Then, design actors can see the project data in ACSP. They are also informed on the tasks they have to perform. It is then possible, for each task, to add and share information in the system (multimedia files, CAD files, ...).

Personal information

Security levels have been defined in order to manage users access. A login name and a password represent the main security level.
Each design actor can use ACSP to define his own skills in order to be chosen to perform specific projects tasks.

Product data

During the project, the design actors will deal with different products. In ACSP, each product can be defined in three ways describing the structural, functional and dynamic aspects.

Considering the structural aspects, the product is divided into parts, which can be described with multimedia and CAD files. ACSP allows the user to define each part with a CAD file (AutoCAD DWG file format, for example) and a low-sized file format such as VRML, in order to be visualized directly in Internet Explorer 4. Users can also extend the description of each part by adding other files such as Microsoft Word documents.

The functional aspects are defined after a requirement analysis. The functions of the product are defined and divided into sub-functions. It is later possible to study the relationships between structural and functional aspects of the product using, for example, a Quality Function Deployment approach.

For the dynamic aspects, it is necessary to describe the global Man-Product-Environment system in several situations such as using, manufacturing, recycling, etc., the future product (Figure 1). For each of these situations, the Man and Environment structural aspects are specified in order to detail the dynamic states and scenario of the system. These dynamics aspects are managed through MANERCOS software (GOMES et al., 1999).

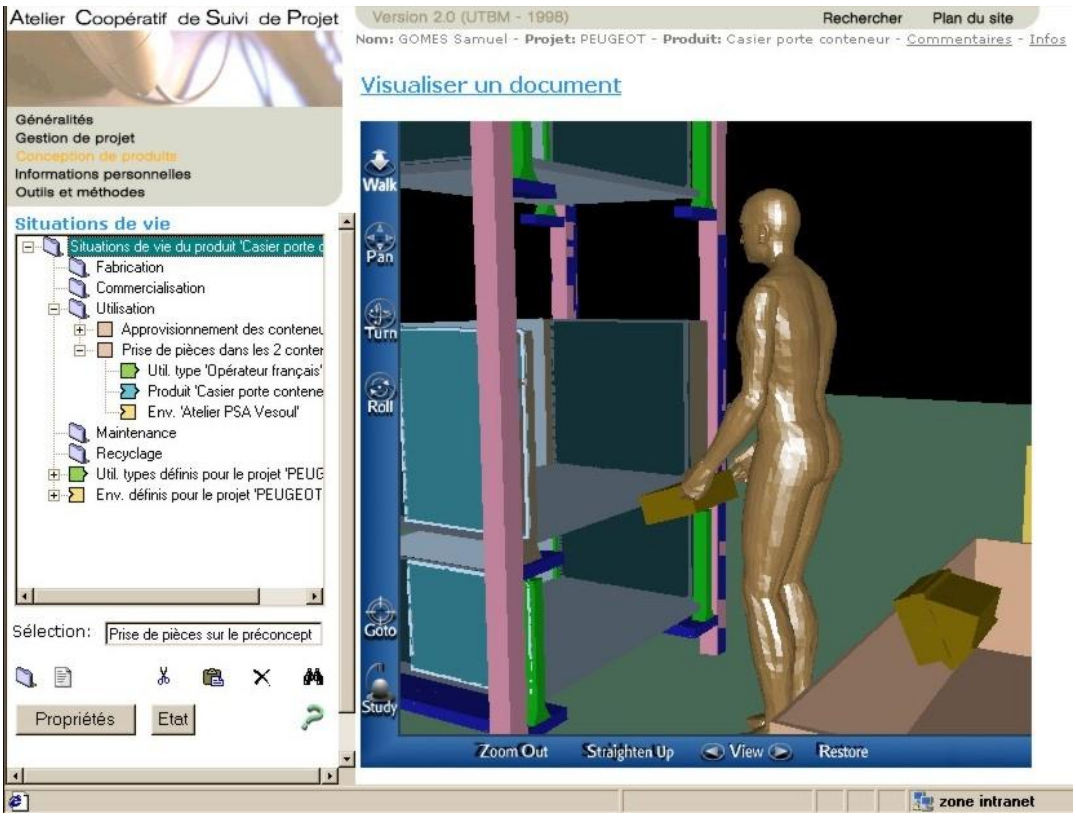

Figure 1 : Example of a VRML file describing a manufacturing situation available in the ASCP environment

Design tools and methods information

To perform particular tasks, the design actors often need information on specific design methodologies and tools. The ACSP can guide them through different tools and methods by giving them some brief descriptions and examples. These collections can be completed by past experiences extracted from the different projects.

CONCLUSION

ACSP is actually applied in different products and process design projects. In these projects, all the design operations performed in ACSP are stored in a database in order to build statistical analysis. This Computer Supported Cooperative Work environment represent also an interesting tool for researches on designers activities.

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