VRML (Virtual Reality Modeling Language) Programming in SAP technologies

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***Abstract*—Nowadays the Internet plays an important role in a promotion campaign. Valorising some products and services through the Internet may be performed by choosing an appropriate Web technology. Due to the fact that in many small and middle-sized enterprises ERP (Entreprise Resources Planning) systems SAP integrated are implemented, we have been preoccupied by the way in which tri-dimensional graphic may be used in order to promote certain products in Web Dynro for ABAP (in shortg WD4A or WDA), the last/ latest SAP technology to develop Web applications in ABAP environment. Not exist reference about using the VRML sources in actual SAP system. This paper presents a simple solution that allows use the VRML sources in actual SAP technologies.**

I. WEB DYPRO FRAMEWORK

Web Dynpro for ABAP [1] (in short WD4A or WDA)is the SAP present-day standard for the development of the Web applications in ABAP environment. The Web Dynpro ABAP framework contains an execution environment and an environment of graphic development with special tools Web Dynpro, integrated in ABAP Workbench (SE80 transaction).

The paradigm according to which the Web Dynpro framework is realised is the MVC (Model View Controller) paradigm. The MVC design is not a new concept (it was made in 1979 by the Smalltalk developers for Xerox). Along time such applications developed in size and complexity, the MVC design being more and more used and accepted.

MVC comes from Model-View-Controller and it is a design pattern (pattern, structure, model) architectural soft that facilitates the decoupling of the view data model (interface with the user) [1].

The controller is an intermediary component that facilitates communication between/ among them. Any framework functions according to the MVC principle. But, in the case of the framework of Web Dynpro, the disjunction of the design data materialises through the objects that generate data and of the objects that consume data, the whole structure being conceived through components.

Thus:

The model is responsible for data processing and return of the data to the controller;

The view is responsible only for the interface that is displayed to the user;

- **The controller** is responsable for the evaluation of demands, sending data and instructions to the model, sending data to the View. In principle it is responsible for the interaction between the View and Model, not a mere component of passage that connects the Model with the View – fig 1 (the continuous line represents the possibility of a direct access, the dashed line, the possibility of reference);

MVC design pattern behaves as a guide to implement the presentation part, control and application logic.

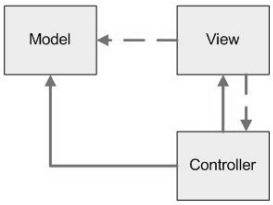

Figure 1. Model View Controller Design Pattern

A view is always a data consumer, whereas a controller may be both a consumer and a data generator. A Model will always be only a data generator.

The user interfaces can be developed in the WD4A framework (Web Dynpro for ABAP) using two techniqes: declarative (when the structure of the interface is known before the execution) and dynamic (when the structure of the interface is partially known during the execution).

Fig. 2 presents the architecture of the Web Dynpro framework [2].

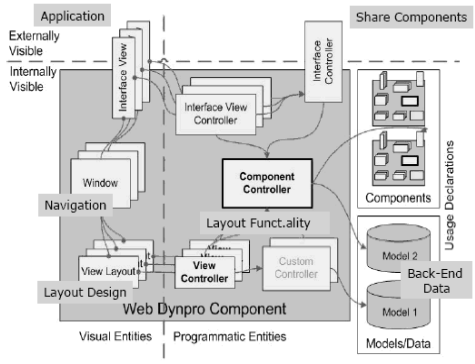

Figure 2. Architecture of the Web Dynpro framework

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The Client implement may be defined for the web browser (Server-Side Rendering), in which case the implementation of metadata and the generation of HTML pages take place with integrated Java Script functionalities. Another XML implementation can be defined which is used at present for eCATT scripts (extended Computer Aided test Tool) as well as for the SP Smart Board type client integration – fig. 3 [1].

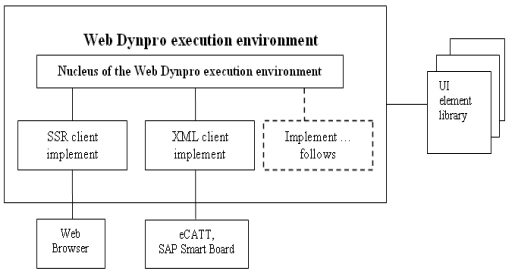

Figure 3. Client implement in Web Dynpro technology

Among the advantages that Web Dynpro offers in developing web applications we mention [1], [3], [4], [5]: the possibility to use graphic tools offers a series of technologies such as HTTP, HTML, CSS, XML, and client-side scripts that are the base of any Web application, the strict separation between the presentation of data and their processing, the possibility of using and reusing the components, the slight change of the application due to the tools that are available, the possibility to access data in the context of the application, which do not change even if the page changes, the automatic transportation of data through data binding, automatic checking of entries, access to the user interface, complete integration in the ABAP development environment.

Currently, for image processing and 3D visualization in SAP technologies are used SAP SAP PLM 7.0 [14]. SAP PLM 7.0 Viewer for 2D and 3D scenes provides basic visualization as a permanently available and fully integrated solution component. Supported 2D and 3D Formats: RH, GIF, JPG, TIF, BMP, DXF. But not exist bibliographical reference about using the VRML sources in actual SAP system. This paper presents a simple solution that allows use the VRML sources in actual SAP technologies.

II. VIRTUAL REALITY MODELING LANGUAGE(VRML)

VRML (Virtual Reality Modelling Language) language [6] permits the description of 3D objects and their combination in virtual scenes and worlds. It can be used to create interactive worlds which contain: images, animations, audio or video clips. In a VRML world it is the user, not the computer, which has the control. Objects in a scene may interact with one another via events or they may interact with user events. The worlds may be connected among them or to other HTML documents. A created world may be distributed via the Internet, seen and explored by several visitors at the same time.

In order to visualise a VRML world, the Internet browser (Internet Explorer, Netscape Navigator, HotJava, Opera etc.) needs a VRML browser (under the form a a plugin) that allows the user (called visitor in VRML) to surf the virtual world, to obtain different views of the scene according to the chosen point of view, to interact with the elements of the scene, etc. The facilities that are offered differ from one browser to another. Among the best known VRML browsers we mention Cortona, CosmoPlayer, CC3D, OpenWorlds and FreeWRL [6].

The future of VRML is ensured by the organisation Web3D Consortium [7] that launched the new standard of the language called Extensible 3D (X3D), adopted as an international standard by the International Organization for Standardization (ISO).

The new standard is based on the concepts of *components* and *profiles*. A component contains one or more nodes from the same category (e.g. geometric nodes, for illumination etc.). Further on, these components are grouped into profiles, the X3 D-1 profile including the basic components for geometry and animation (a real support for an object-oriented programming), while the X3D-2 profile represents the VRML97 language, supporting its whole functionality. The companies specialised in 3D graphic solutions will be able to develop interoperable components and profiles in order to extend the functionality of the standard. According to the definition given by Web3D Consortium, VRML is open to 3D multimedia and virtual worlds shared on the Internet. VRML is included or cited in MPEG-4 standard (Moving Picture Experts Group), as well as in Java 3D or other development standards. VRML is used in modelling medical applications, complex structures in chemistry (of molecules, for example), in design, architecure, games or publicity.

III. OPTIMISING VRML CODES THROUGH THE VISUAL 3D MAX STUDIO UTILITARY

In order to optimise a VRML file that has already been made, one may use a 3D graphic_utilitary, for example Autodesk 3D Max 2010 [8], [9]. Thus, one may create animation in a visual manner, sounds may be added to the virtual space [10], the textures of the surfaces of the objects present in a tri-dimensional space can be changed [11]. In order to do that, the file VRML is imported in Autodesk 3d Max 2010 file vrml and the corresponding tools are used. For example animation is made by help of the button Auto Key and the Time slider. Auto Key registers all the movements and changes that are performed upon the 3D space as long as it is active. Initially the telephone is inclined to 0^o to the axis y with the time slider at 0 frame. To rotate 90^o around the coordinate y the time slider is set to the frame at 25 and the angle of the axis oy to 90^o.

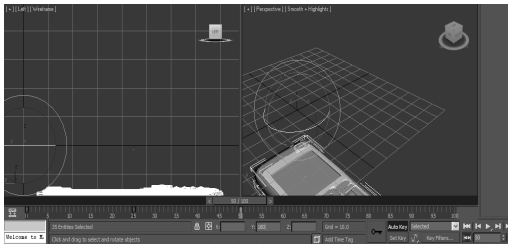

Figure 4. Rotation of a mobile phone 180o around y coordinate

In figures 4,5,6 changes are noticed corresponding to the rotation of a mobile telephone 180°, 270° and 360° around the coordinate y.

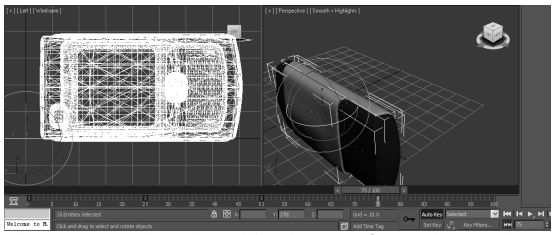

Figure 5. Rotation of a mobile phone 270° around y coordinate

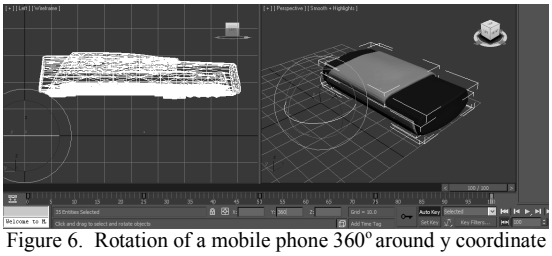

Figure 6. Rotation of a mobile phone 360° around y coordinate

Several objects may be added (for example two mobile phones) in the same 3D space by writing a code line in the code corresponding to the other phone [12], [13]:
Inline { url "nokiaN70.wrl" }

Thus, in our example, Nokia N70 phone will belong to the same virtual space as the SamsungU70 phone. The initial file SamsungU70.wrl may be saved under another name, wrl presentation, for example. The file that results will be imported in the 3D utilitary. After the presentation file is imported the objects will look like in Fig. 7. For a better visualisation the button Orbit is activated which can rotate the 3D space. Then, by clicking the Zoom button the 3 D space can be enlarged.

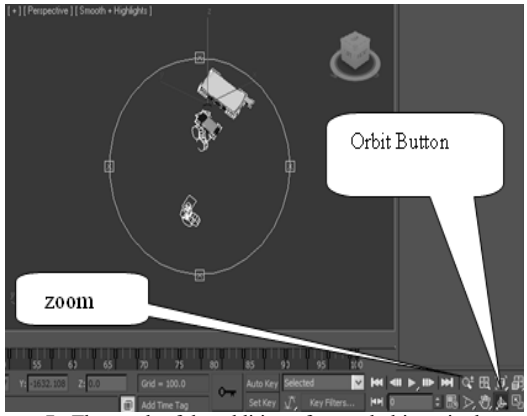

Figure 7. The result of the addition of several objects in the same 3D space

The utilitary may help to add images to surfaces, colours of materials may be easily changed, without key sequences. For this, the menu Rendering-Material Editor is used. For the telephones to have an image as real as possible the parameters **Ambient** – the ambient created by the reflexions of the object; **Diffuse** – the usual colour of the object; **Specular** – the luminosity of the objects; **Specular Level** – level of luminosity; **Glossiness** – brightness of the object; **Soften** – to make a soft passage between the colour of the object and its brightness – Fig. 8.

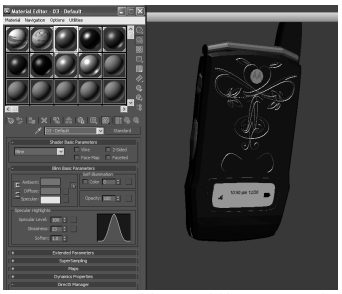

Figure 8. Parametres Ambient, Diffuse, Specular, Specular Level, Glossiness and Soften – to obtain an image as real as possible

To set the way we see objects when we open the VRML file with Internet browser a View Point must be created [9]. When we create a VRML world using a 3D utilitary, a view point is automatically created but it is very probable that this view point to be at a great distance from the objects and we will not be able to see the objects right when the 3 D file is opened. In order to create a view point (camera) the following steps will follow: Create – Cameras – Target Camera. In the utilitary window a left click is pressed anywhere in the 3 D world and when **drawing/ pulling,** an image appears in the form of a camera, as in Fig. 9. This camera is directed towards the mobile phones and is drawn closer or farther according to how close it has to be to achieve the best image.

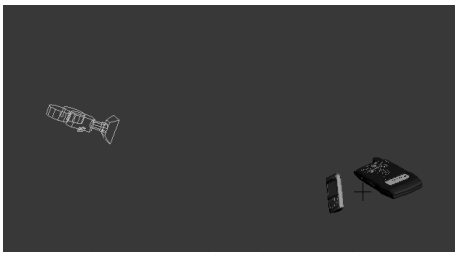

Figure 9. Creation of a View Point

Finally, the 3D world created by help of the utilitary may be exported to be used in the Web. All changes made using the utilitary will appear in the code of the 3D file with names resembling the modifiers in the utilitary. For example to map a real image of the mobile phone we used the menu Rendering – Material Editor, and we modified the parameters; Ambient, Diffuse, Specular, Specular Level, Soften. In the code there will appear sequences of code, nodes Material which contain the following changes

```
appearance Appearance {
        material Material {
            diffuseColor 0.03922 0.04314 0.07843
            ambientIntensity 1.0
            specularColor 0.567 0.567 0.567
 shininess 0.2685
            transparency 0 }}
```

An important factor in creating the interactive world is the number of frames per second (fps) which is rendered when the user interacts with the virtual world. An answer of 10 fps is considered the minimum accepted ratio for the interaction with the virtual space. The number of surfaces in the model has a great importance upon the

answer. Another problem may be the performance of the computer which is used, so it is better to keep the models as simple as possible.

IV. USING VRML CODES IN PROGRAMMING WEB DYNPRO ABAP

In order to use VRML files in Web Dynpro, these may be imported in the SAP system in the folder MIMEs that is created within the component in which one works at the same time with the import of the file – Fig. 10. In the Layout of a View the tridimensional images can be visualised from a link (element view LinkToURL) or in a Iframe, on condition that on the computer the Sap system is installed a VRML plug-in to exist, for instance cortvrml.

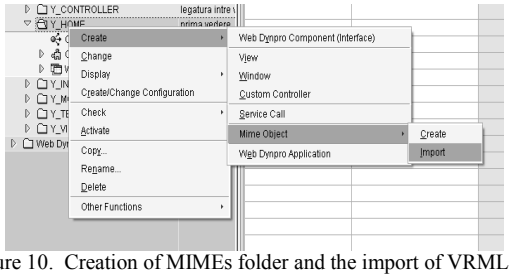

Figure 10. Creation of MIMEs folder and the import of VRML file

The layout of the view will contain, besides other UI elements, an iFrame element whose source will be connected to the wrl file in the MIMEs folder. Thus in the main page the user will be welcomed by the 3D space by help of the rendering VRML plug-in. Fig. 11 presents the integration of the wrl files in WD component.

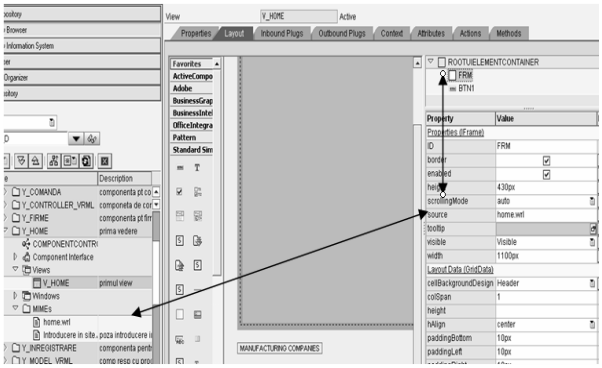

Figure 11. Integration of a 3D image through VRML file in Web Dynpro view

Figure 12 presents the result of integrating a 3D image in a Web Dynpro page.

Figure 12. 3D images in Web Dynpro page through an IFrame

V. CONCLUSION

Our paper presents a modality to integrate 3D images in the SAP technology for the present-day Web, Web Dynpro ABAP. The use of 3D graphics in Web SAP Web technologies is interesting for a most suggestive presentation of different products in the network of companies that use as ERP system the SAP system. The case study was performed through the technique of the faceless component by decoupling the data model from the visual part [1], [5].

Web Dynpro framework represents a very notable tool that has very many visual elements, the data may be transferred through data binding, the components that exist in the library in the system may be used, there is access to the interfaces and methods created by SAP... thus very complex projects may be created to solve the real needs in the production processes in the companies.

Due to the MVC (Model View Controller) concept and of the faceless component, a project can be divided between designer teams, thus a team works on the graphic part of the project and the other team on the logic part. Later there is the possibility of integrating a Web Dynpro application within a portal, possibly in a portal that can be accessed by several SAP and non SAP servers.

Among the advantages of our solution shows you mention: its simplicity, the possibility of using VRML sources for 3D image and that an integrated solution requires no expensive both in terms of installation and cost.

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