

En collaboration avec le centre de formation de Pratt &Whitney Canada et un étudiant au doctorat en technologie éducative de l'Université de Montréal, ÉCHO a développé une application de réalité virtuelle immersive qui vise la formation de mécanicien en aéronautique. Ce prototype développé à partir du logiciel Cyberdeck utilise un système de commande basé sur la reconnaissance vocale, un système de visualisation immersif (HMD -head mounted display) et un système de navigation basé sur le positionnement de la main et de la tête. Le mécanicien en formation accomplit des tâches spécifiques reliées à des opérations d'entretien sur un moteur d'avion. Le système est conçu en fonction de stratégies pédagogiques précises.

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Project Description

Choice of an authoring system.

The schematic animations can be made either with mTropolis or Director depending on P&WC preferences. Our staff has expertise with both authoring systems. Director has the advantage of being the more established product. mTropolis has greater ease of use, it has recently been bought by the makers of Quark Express, Version 2.0 has been announced but is not shipping at this time.

Choice of method and tools

The oil schematic animations will consist of high definition 3D images based on P&WC drawings and modelled in SOFTIMAGE, a high end 3D animation software package. These tri-dimensionnal models would then be imported to either mTropolis or Director as 2D image components to be then animated and rendered interactive. This approach will yield the maximum in terms of quality of imagery, comprehensive understanding, ease of use for the instructor and motivational impact for the student. The 2D components exported from SOFTIMAGE will be organised into a library of visual parts that will allow PW&C staff to make future revisions. If need be new parts could be created by modifying and mixing existing parts with Photoshop.

The problem of integrating Director or mTropolis with Acrobat.

To our knowledge and after consulting with Adobe/Acrobat technical support, we have come to the conclusion that Adobe Acrobat is not capable of plugging directly into Director or mTropolis run time software as it does with QuickTime. The following options are thus available.

Option 1) Forget about going directly from Acrobat to Director or mTropolis run time software and integrate into the animation modules the hyperlinked Acrobat content pages. This would create integrated modules in Director or mTropolis.

Option 2) Adobe offers a plug-in for Acrobat that allows one to directly open a web document. The animation modules could reside on the computers hard disk as web documents. Director animations can be formatted for the web in Shockwave, version 2.0 mTropolis documents can be formatted as mPire. The Acrobat document would then be able to open directly the animation modules.

Option 3) This option uses a web browser to view all hard disk resident documents in the appropriate web format (Acrobat, Director or mTropolis, HTML, etc...) . There are many strategic advantages to this approach:

Immediate hardware advantages:

- All training material will be able to play on all types of computers (Window, Mac, Unix, Network computers etc..)
- Machines to be used could include 486 intel machines.

Immediate software advantages:

- The major investment in software development is network ready.
- Content authoring (HTML) and integration is facilitated by many new authoring software packages (ex: Pagemill)

Future advantages:

- With the advent of an intranet server and internal networking, many new possibilities become available in terms of offering close to real time feedback to the instructor, making all software available on all machines at all times, flexibility of management, custom training, often reduced costs of operation etc...
- With the advent of an internet external connection your training database can be made directly available to your customers for continuing educational programs and certification renewal etc....
- These new services can also bring in additional revenues.

Software choices and their impact on user interface.

a) Getting to the animation modules and then hyperlinking to other documents:

Option 1

User interface path using an integrated Director or mTropolis run time. hyperlinked

information is directly accessible as an integrable part of the run time. In this option Acrobat is not used:

Instructor opens a single document (run time Director or mTropolis) and has the choice of going to either one of the four animations, information is hyperlinked within the animations

Option 2)

User interface path using Acrobat with the web browser plug-in, to access Shockwave or mPire formatted animation documents:

Instructor opens an Acrobat document, from that document he is hyperlinked to the animation module of his choice via a web browser that is opened with the appropriate resident file containing the animation module (Shockwave or mPire).

Hyperlinked files from the animation modules can be accessed in the following ways:

- a) Leaving the web browser and going back to Acrobat. The links would be accessible from the Acrobat document entrance page.
- b) Information is viewed within the web browser by going to an hyperlinked Acrobat (or HTML) document.
- c) Information is integrated within the Schockwave or mPire document

Option 3)

User interface path using a web browser to access both Acrobat documents and animation modules:

Instructor opens a web browser (Netscape or Microsoft) and from that browser has access to all documents (Acrobat, Schockwave or mPire, etc...) links from the animations can be made to HTML or Acrobat pages containing the written or graphic material. The addition of a uniform navigational environment (web browser) between different types of documents facilitates selective access to the different documents Since the material is resident on the hard disk, or can be placed in cache, access times are reasonable.

b) Navigation within the animation modules:

- (1) The instructor selects a particular animation (animation 1,2,3,4).
- (2) An animation default still-image view containing menu bar with pop-up submenus appears.
- (3) The user chooses the desired animation (system full animation, sub-systems) with a Pop-up menu.
- (4) The specified animation appears and the user can activate it with a control panel (play/stop, forward/reverse, beginning/end, pause, speed control)
- (5) The user is able to zoom in on a particular Item within the chosen animation by clicking on an image map.
- (6)An enlarged animated section becomes available control panel functions apply. (play/stop, forward/reverse, beginning/end, pause, speed control if necessary)

We have listed a set of options in the hope of letting the P&WC decide of the right fit

In summary , this proposals offers P&WC a certain number of options. As far as we are concerned all of the choices are workable. The right fit is often based on considerations of human ressources and established practices, these are elements we cannot evaluate. On the other hand if we were to decide without taking into consideration these factors, we would choose Director over mTropolis because it has a wider user base and we would tend to access all documents through a web browser because we think that most computers within the next three years will be networked and that the investment in training software should be planned to take this into account.

For further information or questions about this proposal, please do not hesitate to communicate with the following:

Dr. Georges F. Singer
tel: 514-871-1979

BESOINS

- * interaction entre divers composantes
- * networking eventuel
- * mode d'edition
- * changer / ajouter / effacer contenu
- * systeme ouvert reprogrammable
- * acces privilegie de n'importe ou
- * mode de consultation sophistique
- * plein ecran
- * plusieurs fenetre
- * grand controle sur le contenu (zoom, pan, interruption, interaction, vitesse,...)
- * prises de contenu / impression (ecran, highlites, copy/paste, clipboard)
- * dossier usager
- * recherches
- * navigation aisee (souris, deplacement...)
- * mise en evidence de contenu / dessin par dessus (par reseau?)
- * presence de macros
- * record / playback / automation
- * undo
- * transitions modeles/images <-> animations invisibles
- * possibilite de limiter l'affichage d'information
- * acces a certaines donnees systeme (date, version CBT,...)
- * acces par mot de passe du screen saver
- * differents acces selon l'usager
- * bons temps de reponse / indicateur de progres sinon
- * installation facile
- * package bien integre
- * eventuelle expansion reseau

DONNEES A TRAITER

- * Adobe Acrobat (PDF)

- * Adobe Illustrator
- * Adobe Photoshop 3
- * Quicktime VR
- * images
- * texte
- * audio
- * video (AVI, MPEG, MOV)
- * animations (2-D, interactives et lineaires en meme temps)

ENVIRONNEMENT

- * Pentium 75
- * Win3.11
- * 50 MB HD de libre
- * CD-ROM 4x

DUREE DU PROJET

60 jours

OPTION WEB BROWSER

Avantages par rapports au besoins ci-haut mentionnes

- * network ready
- * interaction avec les diverses composantes sous NS3+ via JavaScript si le plugin le permet.
- * possibilite d'utiliser les style sheets pour encoder le texte des documents d'apres leur sens et de creer un style sheet qui satisfera aux conventions de P&W.
- * ...

Desavantages

- * la prise de contenu serait limitee a du copy & paste du texte (sans sa structure) d'un document et de l'enregistrement d'images sur disque ou clipboard pour recuperation ulterieure.
- * l'impression ne peut se faire que par document HTML ou par image. On sait que l'impression de pages web n'est pas toujours ideale... (une version future les style-sheets permettra de definir le style d'impression des pages HTML.)
- * Il est difficile d'imaginer un site avec acces securise, multiusager, avec mot de passe, dossier d'usager, possibilite de mise a jour global et acces a base de donnees sans installer un serveur web centralise. Cela implique une installation plus complexe mais unique du contenu sur un serveur central en plus d'une installation des clients avec plugin sur chaque station. Il se pourrait qu'on aie aussi a installer un reseau TCP/IP s'il n'y en a pas.
- * La bande passante necessaire pour les fichiers multimedia n'est pas adaptee a n'importe quel reseau et risquait de causer un engorgement sur un reseau local ou tous les usagers travaillent en meme temps. Un simple acces au serveur pourrait donc depasser la limite de deux secondes par operation fixee par P&W.
- * Bien qu'on puisse distribuer les version originales de nos documents afin qu'elles puissent etre editees, la maintenance d'un site doit se faire a la main. La creation d'une interface pour mettre le site a jour pourrait etre tres couteuse.
- * Un browser seul ne pourrait pas avoir acces a toutes les donnees systemes comme un logiciel le pourrait. Bien qu'on puisse connaitre la date, il faudrait implanter un autre systeme (plugin???) pour connaitre d'autres variables (comme

la version de CBT, le mot de passe du screen saver)

* Bien qu'on puisse integrer plusieurs document a l'interieur d'une meme page, les faire interagir et se acceder, l'interface entre ceux-cis peut etre parfois limitee et leur possibilite de disposition aussi. Il m'est donc presentement difficile de predire la qualite d'une telle integration. Il se pourrait qu'elle ne se fasse pas d'une maniere aussi transparente que desiree.

* il n'est pas evident aux premiers abords de permettre a l'utilisateur de 'dessiner par dessus l'ecran pour mettre en evidence une section.

* Une page HTML est un document au contenu statique. Avec Les nouveaux browser, on peut acceder a du HTML dynamique. Explorer 4.0 semble etre le gagnant sur ce point. Cependant, le HTML dynamique touche plus a la presentation que le contenu. Or si l'on desire acceder a differentes vues de l'information a partir d'un contenu complexe, une page HTML seule ne peut offrir qu'un filtre d'information limite.

* Il n'existe pas de mode plein ecran isole du bureau comme dans director. Cependant, les versions 4.0 des browsers Netscape et Explorer utilisent le plein ecran dans leur mode push en laissant accessible un panneau de controle accessible pour changer de site. Je n'ai presentement aucune idee comment utiliser ce systeme pour nos fins.

* Les browser n'offrent aucun support a priori pour les macros, undo, record/playback et les capacites d'automation. Peut-etre qu'en etant restreintes aux modules director, ces fonctionnalites pourraient etre envisageables (?)

* Certains browsers (...) sont plutot instables et limites sous Win3.11. Plusieurs plugin demandent Win95/NT.

Pour resumer, une implantation via une page web pourrait etre faisable, mais pas sans compromis. Bien que les browsers soient un moyen approprie pour publier un ensemble de documents a partir d'un serveur, ils n'offrent pas les ressources d'un environnement pleinement integre. Leur capacite de scriptage permettent peut-etre la mise en place d'un certain ensemble de fonctionnalites mais cet ensemble est tres limite et mal adapte au developpement d'applications plus complexes.

Suggestions d'utilisation du VR pour Pratt et Whitney:\

- 1) Inclure la nacelle, les objets impossible a montrer en classe
- 2) Pre-training of instructors
- 3) Walk around
- 4) Go thru the engine
- 5) Eye piece (Boroscope) see the inside
- 6) Virtual exams

Proposition Pratt et Whitney

Request for quotation (RFQ)

PW 100 Oil System
PW 100 Control System

Who we are?

ECHO R+D is the commercial arm of the Center for experimentation and development of multimedia technologies - ECHO, a not for profit corporation associated with the University of Québec in Montreal but independantly financed. Since 1990 the Center has been experimenting with new multimedia technologies (interactive applications, internet, 3D and 2D computer animation, virtual reality), developing expertise in these areas and training students. In 1997, ECHO R+D was created to offer multimedia production and research services to industry and to better service the Center's existing clients. It's personnel is made up of an experienced multidisciplinary team including expertise in graphic design, educational technology, computer science and engineering.

Full description of services your company is offering

ECHO R+D researches, designs and produces innovative multimedia solutions for industry. It's areas of expertise are the following:

- Multimedia authoring (Mtropolis, Director, etc...)
- 3D modelling and animation (SOFTIMAGE)
- Internet design and production
- Internet programming (Perl, Javascript, Java etc..)
- 3D Scanning
- 2D Animation (TOONZ)
- Virtual Reality applications development
- Graphics software programming (C++, Java, Open GL, etc...)

List of clients and projects

Desjardins

- Web site design and production
- Visual design for ATM machines
- www.desjardins.com

Industry Canada

- Project for an Advanced Network Simulator - PANAS

(interactive simulation of the electronic highway TRAM)
www.echo.uqam.ca/echo/graphic/tramgfr.htm

Web site design and production:
Role of communications and information technology in education.
www.echo.uqam.ca/education/debut.html

Multimedia Communication 93 conference: 3D animation
www.echo.uqam.ca/echo/graphic/mul93gfr.htm

Miranda Research Inc.
Web site design

Université du Québec à Montréal
Web site design and production: Annual Report
www.echo.uqam.ca/uqam/

MeDnet Communications
Web site design and production: formation continue medical
Corporate image Design : Medecine 2001
www.echo.uqam.ca/mednet/

Ministère de l'éducation, Gouvernement du Québec
Web site design and production: École informatisée clé en main
www.echo.uqam.ca/ecoleinf/

Québecor Multimédias
Research on interactive storytelling

St. Remy Multimédia Inc.
Web site design and production: Surf and Shop

CANAL
3D animated television channel logo

Prima Télématic
Research on intranets

List of research projects (partial):

Intelligent Design and Emulation Application System (IDEAS) for Virtual Reality - A Feasibility Study Conducted For The Canadian Space Agency STEAR Program and PRECARN Associates Inc.

In collaboration with CompEngServ Ltd., CAE Electronics Ltd., Defence and Civil Institute of Environmental Medicine (DCIEM)

Social Sciences and Humanities Research Council of Canada
The continuous environmental experience. A study in virtual reality.

FODAR - Fonds de développement académique du réseau de l'Université du Québec à Montréal (UQAM/ETS)

Modeling of the human body for animation

In collaboration avec Dr. Jacques De Guise and Dr. Sylvie Doré

Communications Canada and Industry Canada
New Media Research

Commercial considerations

Time spent on the project is billed every two weeks. The terms are 30 days.

Any other pertinent information

3D Modelling portfolio

Internet portfolio

For additional information please consult our web site:

www.echo.uqam.ca

To see an example of an interactive animation using Director (Shockwave plug-in) please consult:

<http://www.echo.uqam.ca/echo/shock/mktanvic/mktanvic.htm>

Please state your hourly/daily rates for these types of projects (If you have different levels of expertise, please segregate)

Coordination, Programming and Design: 50.00\$ an hour

Concept development (Dr. G.F. Singer): 80.00\$ an hour

For each project, please describe the tasks at each of the milestones and indicate quantity of hours/days required for same including costs for each.

voir diagram

Other costs: please describe clearly any cost other than the above.

Materials (Jaz disks, disquettes etc...), communication (courrier, long distance calls, etc...) and transportation costs (outside the Montreal/St-Hubert area) as needed and approved by the client will be billed at costs plus 15%.

Please supply three references of names of companies which you have worked for and a brief description of the type of project that was worked on.

Luc Fournier
Manager
Telecommunication Industry Directorate
Industry Canada
tel. 613-990-1910

Réjean Bernard
Director
Service de l'informatique
Université du Québec à Montréal
tel: 987-3000 ext. 3134

Roselyn Lecours
Chef de spécialité
La Confédération des caisses populaires
et d'économie Desjardins du Québec
tel: 281-7000 ext. 6755

Please provide a copy of your company's Financial Statement for 1996.

ECHO R+D started operating as a separate entity in 1997, its financial year ends August 30th. The financial statement for 1996-97 will be available in

mid September.

Mr. Dale Evan

Dear Sir,

The following information can be considered as an addenda to our proposals. Included you will find two recent comparative surveys one dealing with authoring tools (Interactivity, September 1997) and the other with the business computers (Comsumer Reports, September 1997). These surveys while general in nature do give us some indications on the available choices in purchasing the right technology to meet your needs.

Our interpretation of Pratt and Whitney's needs have been coloured by trying to get the medium to long term cost/benefit advantage in terms of technology choices.

Should the need be to provide a qualitatively « unique visual learning experience » - a Disneyworld type of presentation/attraction- we would suggest a very different set of choices mainly based on a multimedia variation of our virtual reality software. A is presently in the works and could apply to all your training needs including the immersive the « hands on » type of application. The costs and technical choices for such a approach could be outlined if P&WC is interested.

Yours Sincerely,

Dr. Georges F. Singer
ECHO R+D

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Pratt & Whitney
Airplane Maintenance Training Prototype

Training of mechanical engineers using immersive virtual reality and voice recognition, Pratt & Whitney Canada. This project was the subject of a Ph.D. Dissertation in Educational

Technology at the University of Montreal by Jess Brouillard. Study of user's behavior in a virtual reality training environment,
Finalist in the university category, OCTAS 1999
ECHO, 1997-9, design and production

317 Pratt & Whitney : demo 1997-99 5 min 39 s

(French only)

In collaboration with Jess Brouillard Ph.D. (UdeM)

WEB TXT EN

In collaboration with the Pratt & Whitney Canada Training Center and a Ph.D. student in educational technology from the University of Montreal, ECHO has developed an immersive virtual reality application for the training of aviation mechanics. This prototype developed with the Cyberdeck software make use of a command system based on voice recognition, an immersive visual environment using a HMD (-head mounted display) and a tracking and navigation system based on the positioning of the head and the hand. The mechanic using this system accomplishes specific tasks related to aviation engine maintenance operations. The system was designed with clear pedagogical objectives in mind.
(ajouter traduction anglaise-texte)

INFO

1 Pratt & Withney : intro – english 1997-99 6 min 37 s

2 Pratt & Whitney : demo 1997-99 5 min 39 s

VR: description/recherche/éducation

With the development of its own virtual reality software, named "Cyberdeck", ECHO Research and Development Incorporated can truly be considered a pioneer in new media technological development.

During the last year, ECHO Research and Development Incorporated, in collaboration with researchers in the field of Instructional Design, has developed and designed a fully interactive and immersive virtual learning environment. In respect of existing learning theories and other researches in the field of virtual reality, the design of such an environment enables

participants to engage, manipulate and interact with the elements presented in a 3D-world. The virtual training environment, which replicates an aerospace work setting, is currently being tested involving a significant number of participants from the industry.

Various researches have, also, permitted ECHO to enhance the technological possibilities of its software and to explore the potential of its object oriented programming system.

Presently, instructional researchers are looking at learner's attitude towards certain attributes of the 3D immersive virtual reality environment, as well as, the impact of those attributes on the learner's actions. Among issues that are presently being looked at, we find:

(1) the overall impact of the voice recognition system on the learner's actions with regard to the task to be accomplished. This includes:

- using the voice system to move in the environment;
- using the voice system to take, place, throughout, etc. an object;

(2) the impact of the use of cues color for feedback replacing sound;

(3) the impact of the use of audio-linguistic feedback on the user's actions;

(4) the learner's attitude toward the physical limitation of the virtual environment;

(5) the intuitiveness of the different voice command.

The different researches has permitted ECHO to develop a solid expertise in designing virtual reality environment for training according to various learning objectives and learning

contexts.

If you would like to know more about ECHO developmental researches, please, contact Georges F. Singer, Ph.D. at ECHO.

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316 Pratt & Whitney : intro - english 1997-99
6 min 37 s

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(même page et texte que 317)
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A set of technological choices: « The Big Picture »

Negotiation through many constraints to achieve a goal is a good description of the process of choosing the « right approach to a problem ». The way we value certain aspects more than others, determines the technological choices we make. Very often it works the other way around, technologies impose their values on our way of seeing a particular problem, and thus impose themselves upon us. Our experience is that large organisations like to impose their choices on technology, they generally have the financial means to do so. Smaller organisations follow the path laid down by the technological market place and seek advantages in terms of cost/benefit and mainstream evolution.

This project offers similar difficult choices. This project's specifications would seem to encourage a custom approach, one of developing a very specific tool for P&W special needs. On the other hand the problem being addressed, that of creating an information system is a wide spread need and is being dealt with very aggressively by the marketplace.

To be more specific here are a few general directions and some of their advantages and disadvantages:

1) Custom code ex: a C or C++ engine designed with all the specs of this in project in mind:

Some advantages:

- The client has exactly what he wants
- If well done, looks great and is fast

Some disadvantages:

- Expensive
- Not easily maintained over time
- Integration of legacy code not obvious
- Closed system
- Changes must be made by the authors unless well documented source code is made available to the client and the client has the necessary human resources.
- Usually stand alone

2) Director or mTropolis run time: The whole document is a single Director or mTropolis document (or a set of modules with a principal interface)

- Some advantages:
- Custom code can be written so the client has close to exactly what he wants
- If well done, looks great and is sufficiently fast

Some disadvantages:

- Not as expensive as custom code, depending on how much additional programming has to be done.
- Not easily maintained over time (especially if there is a lot of custom code)
- Integration of legacy code not obvious, direct access to Acrobat and other information formats has to be custom coded.
- Changes must be made by the authors unless well documented source code is made available to the client and the client has the necessary human resources.
- New versions of Director and mTropolis will appear every 18 to 24 months to adapt to the changing operating systems and competition for new functionalities. Usually the new versions are backward compatible with the previous version.
- Limited networking (mTropolis TCP/IP) custom coding is necessary.

2) Internet solution:

- Some advantages:
- Custom code can be written so the client has close to exactly what he wants
- If well done, looks good and response time is adequate.
- Relatively inexpensive, tools are either free (Microsoft Explorer) or low cost. Mainstream technology will stay low cost and very competitive because of the huge developing market. Easy to use tools are already available.
- Easily maintained over time because of mass market pressure.
- Integration of legacy code is easy. Browsers can view Acrobat documents, QuickTime, QuickTime VR, Director - Shockwave, mTropolis - mPire, GIF, JPEG etc... Instead of spending money rewriting existing documents in a new format they can be used with little transformation and the money is spent developing new material.
- Very flexible, changes and additions to the structure and content of HTML documents can be easily made using tools such as (Pagemill, Frontpage

etc...) Not sophisticated programming.

- Training material can be played on all types of operating systems (Window, Mac, Unix, Network Computers etc...) and is very flexible in terms of hardware configuration.
- Information is very compact, takes up little storage space.
- Network ready, the material can be put on each station and/or on an (intranet or internet) server. Once integrated with a server there are many advantages such as:
 - easy monitoring of student activities and support (e-mail, voice etc...)
 - centralised easy maintenance and security
 - complex databases and search tools can be made available on line
ex: catalog of engine parts
 - Access to a wider audience (possibility of additional revenue)

Some disadvantages:

- All types of information look good (see our internet portfolio) but some formats might not be graphically as « hot » as some custom engines or Director/mTropolis.
- The browser can be modified to be as invisible as possible but it is always present, in some cases this is a navigational advantage.
- If the information is loaded on the computers hard disk response can be very good but not extremely fast. If large documents are downloaded from a server, response time will vary from very good to bad depending on the available bandwidth, the type of server, computer and network. A hybrid solution of placing large interactive documents that don't change often on the hard disk and smaller documents that change often (ex: instructor determined navigational patterns) on a server is a good compromise.

Assuming that money and time are available in sufficient quantity almost everything is possible. For instance should someone decide to write a software engine specifically for this project it could do everything quite well. The cost in time and money would probably be exorbitant but the client could be very happy with the result. In time though this could turn into a nightmare because only one thing in the computer arena is sure and that is change. How well will this system survive changes in content, changes in operating system, changes in use etc... ?

In summary. Internet technology, because of its wide spread use and the large amounts of money being invested in the development of content

using this technology, seems to us to be safest in terms of obsolescence and the most economical choice in terms of developing a large CBT database. The detailed specifications in the P&WC document should be met but these specifications in our approach are dependent on the « big picture » technological choices.

Unfortunately one of the key issues in multimedia design and production is whether what we do today will still be around tomorrow

Should P&WC need to be convinced of using the proposed Internet approach, we could put together a short demo test module using existing material to address navigational and performance issues.

We have read the P&WC specification document, and we think that it is possible to satisfy the expressed needs by using our approach. On the other hand the advantages that our approach brings forth will demand a more flexible attitude in terms of navigational and interface specifications. Our proposed solution while sometimes neglecting certain details, will offer a generally richer training environment and a better long term investment..

Intelligent use of Internet technology will satisfy the needs of students and instructors alike as many universities, colleges and institutes around the world have already shown.

Malgré le travail considérable qu'il reste à faire au niveau du développement et de l'intégration des composantes technologiques, et à la suite des auteurs présentés tout au long de cette recherche, nous croyons que les environnements immersifs de réalité virtuelle présentent énormément de possibilités pour l'apprentissage humain. Même si le prototype PW530 ne permettait pas une immersion complète de l'individu et qu'il a été impossible de mettre en application des notions comme celles de visualisation scientifique, d'objets intelligents, etc..., nous pouvons entrevoir la large gamme des possibilités que les environnements de RV permettent du point de vue de la conception et la mise en place d'environnements d'apprentissage stimulants et motivants. Ainsi, tout au long du développement du prototype PW530, il a été possible de créer des fonctions d'interaction (ex: commandes vocales messages de rétroaction, extrait vidéo) selon les besoins spécifiques de l'activité d'apprentissage. L'interaction dans l'environnement est d'autant plus stimulante que les apprenants pouvaient accomplir de façon naturelle plusieurs actions de la tâche à réaliser tout en recevant au moment approprié la rétroaction nécessaire à la poursuite de l'activité.

Le dessein ultime de la RV est sans aucun doute de reproduire parfaitement la réalité

voir meme la dépasser. Toutefois, en attendant que la technologie atteigne un degre d'avancement qui permette de creer facilement des experiences immersives de tres haut niveau, beaucoup de chemin reste a faire. A la lumiere de l'experience et des connaissances acquises par la realisation de ce projet, nous presentons ci-dessous quelques pistes de recherche qui tiennent compte des besoins du domaine mais aussi de la capacite du milieu a supporter les activites de recherche proposees.

De fcon generale, du point de vue du developpement de la technologi

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Earphone
use of voice guide

Learning activities description

Below, we describe the proposed learning activities that can be found in the PW100 Electronic System learning module. Those activities have been chosen according to the temporary learning objectives that have been formulated with respect to our understanding of PW100 Electronic System. Therefore, those learning activities may be modified or replaced according to learning needs. Such modifications would have to be decided and agreed on by P&CW, following the pre-analysis in which priority needs and definitive learning objectives would be determined with P&WC domain of knowledge expert.

Page text

This activity consists of a page containing text, hyperlinks, Qtime VR pictures, etc.about concepts and also some interactive links in which questions (with feedback) can be asked to the trainee.

This activity would be mainly used to introduce the trainee to

- a new concept;
- a concept that present little degree of complexity (e.i. this is the Autofeather

Unit);

- different aspects of a same concept (e.i. Autofeather functions)

Interactive association game

This activity consists of a page in which the trainee will be asked to match different items with others according to categories (e.i. EEC Inputs and EEC Outputs).

Matching will be possible by clicking and dragging a selected object (picture or word) on the right category.

Different form of Feedback will be given to the trainee according to the correctness of his action. (See below: About the feedback)

Video clip with questions

This activity consists of a Quick time film followed by 2 or more multiple choice questions with feedback.

This activity would be mainly used to introduce the trainee to

- a concept that required recognition abilities (e.i. recognize the Autofeather Unit)
- a concept that present some complexity (e.i. functioning of Engine Control Interface)

* Film scenarization will required the help of P&WC domain of knowledge expert as well as formal storyboard approval.

Animation with questions

This activity consists of a Quick time film made from animated 3D models followed

by 2 or more multiple choice questions with feedback.

This activity would be mainly used to introduce the trainee to:

- a concept that required the use of graphs, ???? (e.i. electrical flow paths)
- a concept that present multiple scenario (e.i. electrical flow paths representation according to aircraft running conditions)

* Film scenarization will required the help of P&WC domain of knowledge expert as well as formal storyboard approval.

Interactive simulation

The interactive simulation consists of a <game> that presents a model of the Engine Electrical System (EES) which goal is to help the trainee to refine and test its overall understanding of the system functioning.

The model will present EES main feature in their interrelations according to different running conditions of the aircraft.

Trainee could be asked:

- to select the appropriate Control Commands as the pilot would do in different running conditions;
- to observe a situation (e.i. electrical flow paths) and to answer multiple choice questions (with feedback);
- to selecte the possible running conditions according to (1) selected control command, (2) electrical flow paths, (3) <activated Logic functions>
- others (upon P&WC request)

The interactive simulation will consist of high definition 3D images based on P&WC drawings and imported to either mTropolis or Director as 2D image components to

be animated and rendered interactive.

* Upon P&WC request, the simulation could also be used to evaluate the trainee abilities.

** Interactive simulation scenarization (screenplay) will required the help of P&WC domain of knowledge expert as well as formal storyboard approval.

Others issues

about the Feedback

To avoid possible confusion for the trainee, feedback will always be given to the trainee according to the present scenario:

first	correct	sound A
first	incorrect	sound B
second	incorrect	text message: clue
third	incorrect	text message: proposition
following any incorrect answer	incorrect	text message: explanation

Courseware CBT Project
JULY, 1997

1.0 PW100 Electronic system learning module

1.1 CBT general scenario

In the following pages we present the sketch of the CBT general scenario.

In respect to the existing manual presentation format, PW100 Electronic system learning module has been divided into 3 sections. This division will help the trainee to acquire through different learning exercises new knowledge and to refine or correct his understanding of PW100 Electronic system.

Each section has then been divided into specific learning module. For each learning module, we have defined learning objectives in order to propose the most appropriate interactive learning activities.

Section 1 is composed of one learning module (module 1). The goal of this section is to allow the trainee to develop a «big picture» of the engine control functioning. So, through module 1, the trainee should acquire a better understanding of the engine control system interface as well as the role, function and relation of the control system components.

Section 2 is composed of four learning modules (module 1-2-3-4) that are interchangeable in sequence. The goal of this section is to allow the trainee to reinforce his knowledge about each engine control system component. Three of the four modules correspond to the main features of the engine control system interface (control commands in cockpit, electronical units, computational functions) and the fourth module acquaints for the difference between the automatic and manual mode.

Finally, section 3 is composed of one module. The goal of this section is to permit the trainee to test and improve his analysis abilities by confronting him with a setting that replicates troubleshooting situations. This module is an interactive simulation that will entitle trainee to verify his new acquired knowledge and correct, if necessary, his misconceptions. In this simulation, the trainee will be able to explore the engine control system functioning according to the aircraft different running conditions.

1.2 Learning objectives and learning activities

(see next pages)

Project time table

BOLD CHARACTERS indicate meeting with the client

Phase:

1- Project initialization

- revision of available materials of P&WC (pictures, Quicktime VR, etc.);
- project planning of time table and needed meetings;
- confirmation of specifications.

2- Conception and production of phase 1

3- Meeting for project approval of time table, etc.

4- Pre-Analysis

4.1 Domain of knowledge analysis (with one domain of knowledge expert);

- **Determination of learning objectives;**
- **Determination of priority concepts;**
- **Determination of needed hyperlinks;**
- **Determination of the need for trainee evaluation;**
- **Interview with some trainees (6 persons)**

4.2 Revision of proposed CDROM structure

- **Revision of CDROM proposed scenario;**
- **Revision of the proposed interactive simulation scenario;**
- **Revision of P&WC available material.**

5- Production of paper devis (conceptboard)

NB: In order to accelerate the processus, the paper devis will be made only PW100 model (ATP model)

- Interface design (including trainees mode and trainers mode)
- Hyperlinks;
- Quick time VR scenario and text;
- Feedback message (when, which, etc.);
- pedagogical text;

- other
- interactive simulation interface

6- Meeting for paper devis correction and approval (ATP model)
(might required 2 meetings)

7- CDROM Production of ATP model

- graphical design;
- video clip Quick time VR;
- animation Quick time VR;

8- Meeting for phase 7 production approval

9- Programmation

10- Meeting for ATP final product approval

11- Test of ATP module with trainees

12- Meeting for others PW100 models fonctionning specification

13- CDROM Production of others models

- graphical design;
- video clip Quick time VR;
- animation Quick time VR;
- Programmation

14- Meeting for others models final product approval and corrections.

15- Integration of all PW100 model in one CDROM

16- Approval by the client and corrections

17- Corrections

18- Final delivery

- **final CDROM;**
- **intallation instruction;**
- **user manual.**

19- Training of P&WC staff

NB: Are not included in this proposal services related to Hardware and Operating System

PW100 Electronic System Learning Module

1.General Scenario

For the purpose of the project and in the intention of keeping P&WC's setting, the learning module has been divided into three sections corresponding to the divisions of the existing manual. This division sets a defined structure for step-by-step apprenticeship. This learning environment aims to help the trainee aquire knowledge of the PW100 Electronic system through a series of different activities and learning exercices.

Each of the three sections has subsequently been divided into specific learning modules that each carry specific learning objectives. The interactive activities proposed are the best suited pedagogical tools to attain objectives.

Section 1 has a single learning module. Its goal is to provide trainee with a general idea of the engine control components and fonctionning. This section also focuses on the first steps thoward understanding the engine control system interface and the role, functions and relations between the system components.

Section 2 is divided into three learning modules. These modules need not be in any specific order. The objective in this second section is to permit trainee to aquire in depth knowledge of each engine system control component. Each of the three modules corresponds to a perticular feature of the engine control system interface (control commands in cockpit, electronical units, computational functions).

Section 3 is a one module section. The learning activities in this module will enable the trainee to aquire, test and improve his analytical capabilities by confronting him to artificial trouble-shooting situation. By the means of an interactive simulation, this module will also serve as an evaluation tool for the trainee in verifying his knowledge and, if necessary, correct his misconceptions. This simulation makes possible for the trainee to test the response of the engine control system in different running conditions.

