

# EUREKA PROJECT E!3178 - IVIMA

## 1. General description

<b>Project</b>	E! 3178 - IVIMA	<b>Status</b>	Finished - 05-May-2008
<b>Title</b>	<b>Interactive Virtual Mock-Up Assembly</b>		
<b>Class</b>	Sub-Umbrella	<b>Technological area</b>	Robotics-Production automation
<b>Start date</b>	01-Jan-2004	<b>End date</b>	01-Jul-2007
<b>Duration</b>	42 months	<b>Total cost</b>	3.79 Meuro
<b>Partner sought</b>	No		
<b>Summary</b>	Development And Industrial Integration Of A Virtual Assembly Tool For Automotive Product Assembly Design, Training And Ergonomics Through Innovation In Cad-Cam, Real-Time Visualisation And Force Feedback Integration Fields.		

## Budget and duration

Phase	Budget(Meuro)	Duration (Months)
Definition phase	1.26	8
Implementation phase	2.53	34
<b>Total</b>	<b>3.79</b>	<b>42</b>

## Member contribution

Member	Contribution	Position	Since
<b>France</b>	<b>50.00%</b>	<b>Notified Finished</b>	<b>05-May-2008</b>
Turkey	22.00%	Notified Finished	05-May-2008
Belgium	28.00%	Notified Finished	29-Mar-2007

## Participants

Company	Country	Type	Role
<b>Gie Regienov</b>	<b>France</b>	<b>Large company</b>	<b>Main</b>
Barco N.V.	Belgium	Large company	Partner
Infotron A.S.	Turkey	SME	Partner
Oktal	France	Large company	Partner

## 2. Project outline

### Project description

The IVIMA (Interactive Virtual Moc-up Assembly) project aims to define and develop an innovative virtual assembly tool for automotive product assembly design, training and ergonomics.

There are only a limited number of assembly tools on the market to study the feasibility and ergonomics of factory assembly tasks for vehicle parts using CAD-CAM (Computer Aided Design - Computer Aided Manufacturing) descriptions.

In addition, there is no complete real-time system on the market using force feedback devices, which is necessary for a visuo-kinesthetic evaluation.

This kind of tool could be integrated in existing product process CAD-CAM design tools on the market.

The IVIMA project aims to develop a prototype assembly-disassembly system, as well as the user evaluation of the final system.

The software sales partners of the project will ensure the feasibility of integrating the resulting innovative software into existing CAD-CAM software packages.

The IVIMA project is proposing a strong innovation in CAD-CAM, real-time visualization and force feedback integration fields for virtual automotive production / design, thanks to:

- Use of recent force feedback technologies
- Development and integration of efficient collision detection and mechanical law algorithms
- Development and integration of collaborative display devices
- The availability of a comprehensive and complementary set of skills within the project (software design, automotive product-process design, mechanics, real-time visualization, CAD-CAM data and user evaluation)
- The availability of scientific knowledge for the evaluation and assessment of visuo-haptic systems.

Keywords: virtual, mock-up, assembly.

### Technological development envisaged

As the amount of CAD-CAM data to manage is very important (heavy and complex), efficient algorithms for collision detection need to be developed.

The main challenge is to provide real-time effects effect/collision taking into account the laws of physics.

CAD-CAM data are complex and need to be optimized for real-time collision; this optimization of the geometrical definition (including transformation) will be developed in the project.

The development of an innovative, collaborative head mounted display device will allow efficient training.

### Markets application and exploitation

Potential customers are:

- Car manufacturers
- Car part suppliers
- CAD-CAM software suppliers
- Research laboratories.

### Project codes

#### **BSI**

BL/BY	testing
BLB.L	test models
ALI	computer-aided design
X	consumer goods and services
MU/MX	computer software
BMM	simulation

#### **NACE**

2852	General mechanical engineering
3410	Manufacture of motor vehicles

**NACE**

5020  
7220

Maintenance and repair of motor vehicles  
Software consultancy and supply

### 3. Main participant

<b>Company</b>	<b>Gie Regienov</b> ??Technocentre Renault, Fr Tcr Ava 0 13 Avenue Du Golf, 1 782 88 Guyancourt France  Tel +33 1 76 85 19 85 Fax +33 1 76 89 07 74  www.renault.com
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<b>Organisation type</b>	Large company
<b>Participant role</b>	Main

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### Contribution to project

WP1: State-of-the-art studies. WP2: Targeted applications specification. WP3: System specifications and development of collision detection algorithms and CAD-CAM data optimization. WP4: System specifications and development of man - machine interface and collaborative display devices. WP6: Integration. WP7: Technical validation and evaluation of benefits. WP9: Assembly area environment. WP10: Project coordination and management.

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### Expertise

The Technical Centre for Simulation (CTS) is located at Guyancourt in RENAULT's Technocenter and is specialised in the development of Driving Simulation and Virtual Mock-up tools. Its missions are: - To disseminate digital tools in operational engineering departments, validated in terms of efficiency and human factors. - To formalize the use of innovative tools in the vehicle development process. - To manage the development and exploitation of the driving simulators, both at the central site (dynamic simulator) and at customer sites. - To manage the development and exploitation of virtual 3-D mock-up systems at user sites. - To lead study and validation actions to define the relevant perimeter of use of the systems of virtual mock-up and virtual driving tests. Concerning RENAULT's activities for virtual assembly applications, CTS could contribute knowledge, experience and support on the following actions: - Digital mock-up reviews using P2V software, developed internally at RENAULT but also used outside of RENAULT; - Experience and tools for CAD-CAM data conversion and optimisation; - Software library for collision; - Scientific cooperation with LPPA for perception studies and validation. CTS has managed, participated in or is currently involved in a number of European (EUREKA: TRACS, CARDS, ULTIMATE; 5th R&D Framework: CLARESCO, etc.) and national (VALSID, HYBRISIM, etc.) projects in the fields of driving simulation and virtual (mock-up) prototyping.

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### 4. Partner

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**Organisation type**  
**Participant role**

Large company  
Partner

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## Contribution to project

WP1: State-of-the-art research WP3: System specifications and development of collision detection algorithms and CAD-CAM data optimisation WP4: System specifications and development of man - machine interface and collaborative display devices.

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## Expertise

An international company founded in 1934, headquartered in Kortrijk, BELGIUM, is active in three key areas of imaging technology. BARCO designs and develops solutions for large screen visualisation (control walls, simulation/virtual reality, LED (Light-Emitting Diode) walls, etc.), display solutions for life-critical applications (medical, air traffic control, cockpit displays, etc.), and systems for visual inspection. BARCO has a network of subsidiaries, distributors and agents in almost 100 countries, and has competence centres in Europe, the U.S. and JAPAN. The turnover in 2002 was 670 million Euro, 53% was generated by BarcoProjection (large screen visualisation) and 29% by BarcoView (displays for life-critical decisions). BARCO Expertise and contribution: The key expertise that Barco brings to this project is imaging and display technology, stereoscopic and/or large-screen visualisation solutions for Simulators, for Virtual & Augmented Reality. As well as, interactive interfaces, tracking technologies and optical pointing devices, for large screen visualisation systems, BARCO also has a dedicated software team that has worked on the integration and calibration of tools for various tracking devices. WP-specific contribution outline: Through its description of state of the art collaborative display devices, BARCO brings its experience of integrating diverse stereo technologies and outlines the way that they interact with screens and mechanics. Thanks to their experience with, for example, wireless IR (Infra Red) based tracking devices like the Magik Wand, and camera-based auto-alignment systems, BARCO can also contribute to the sensor technology study. The creation of collaborative displays is a complex process that depends on a large number of parameters that will need to be defined during the course of the project. The viewing area and angles, the number of viewers, the ambient lighting conditions, etc. are all factors that will help determine the choice of the stereo projection system. The main challenge in this part is to create a multi-person immersive workspace: as most existing stereo viewing systems are designed for providing one stereo viewing point, multiple technologies like active stereo (shutter glasses) and passive stereo (linear or circular polarization or a colour-based stereo separation system like Infitec(TM)) may have to be combined in order to achieve a correct stereo rendering for different viewers in their respective positions. BARCO has the expertise to also select the appropriate screen type, based on the stereo technology that will be used, both in front- or rear-projected configurations. In addition, semi-transparent screen types (style HoloPro) can be used in applications that require superposition of VR (Virtual Reality) imagery on real-world objects. In addition, BARCO can design and provide the mechanical structures to be used in various configurations, taking integration with tracking and haptic devices into account.

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## 4. Partner

<b>Company</b>	<b>Infotron A.S.</b> ??Prof. Dr. Fahrettin Kerim Gokay Cad. 27/3 Altunizade, 346 62 Istanbul Turkey  Tel +90 216 651 0955 Fax +90 216 651 0954  www.infotron.com.tr
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<b>Organisation type</b>	SME
<b>Participant role</b>	Partner

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## Contribution to project

WP1: State-of-the-art studies WP3: System specifications and development of collision detection algorithms and CAD-CAM data optimization WP4: System specifications and development of man - machine interface and collaborative display devices WP6: Integration.

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## Expertise

A privately owned Turkish company, established in 1994 with its headquarters in Istanbul, TURKEY, INFOTRON also has a branch in Ankara, a manufacturing workshop in Istanbul and a subsidiary in Munich, GERMANY. The mission of INFOTRON is to provide the best service or product, in the shortest time frame, using or creating the best available technologies to fully satisfy the customers in the target industries, while increasing the individual knowledge, skills, and cooperation. INFOTRON has four main divisions: Product Design and Development, Simulation, Digital Media and Information Technologies. INFOTRON Product Design and Development serves a wide spectrum, from initial concept designs of products to the final stages of manufacturing, using high-end technology with powerful hardware and software, and most importantly by experienced, talented and hardworking designers and engineers. INFOTRON Product Design and Development process includes Industrial Design, Mechanical Design, Virtual and Rapid Prototyping, Analysis, Manufacturing, Production and Reverse Engineering. INFOTRON Product Design and Development owns its own Rapid Prototyping System and 3 axis Vertical CNC (Computer Numerical Control) for these purposes. INFOTRON Product Design and Development's mission is to be an excellent supplier of design and engineering services and products to the world renowned consumer goods, automotive, aerospace and defence corporations. INFOTRON Simulation is also unique in its field with its software development and systems integration capabilities in virtual reality applications, industrial and military simulation systems, mission rehearsal and war-gaming systems, again, using the most sophisticated hardware, software and toolkits. INFOTRON Simulation offers solutions in a wide variety of simulation applications, ranging from engineering, flight simulators and part task trainers, to weapon systems trainers. The mission of INFOTRON Simulation is to provide and create the leading edge technology simulation products to the urban, automotive and defence corporations, helping them to reach excellent real world performances through virtual world practices. Regarding the IVIMA Project, INFOTRON's experiences can be summarized as follows: Besides having developed various simulators including tank gunnery simulator, F5 flight simulator, tower and radar simulators, INFOTRON has developed applications, especially for

ergonomics studies and human-machine interactivity, in different defence and industrial projects using software like Deneb Robotics/Delmia. INFOTRON also implemented a couple of projects with some Turkish automotive manufacturers to develop and refine their assembly lines. In addition, INFOTRON developed a proof-of-concept project for Turkish Aerospace Industries and Turkish Air Force for assembly/disassembly simulation of F-16 cockpits using MULTIGEN-PARADIGM INC's SmartScene technology, CRYSTALEYES stereo-glasses and FAKESPACE gloves.

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## 4. Partner

<b>Company</b>	<b>Oktal</b> ??Immeuble Aurelien li Impasse Boudeville, 2 311 00 Toulouse France  Tel +33 5 62 11 50 10 Fax +33 5 62 11 50 29  www.oktal.fr
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<b>Organisation type</b>	Large company
<b>Participant role</b>	Partner

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## Contribution to project

WP1: State-of-the-art studies WP3: System specifications and development of collision detection algorithms and CAD-CAM data optimization WP4: System specifications and development of man - machine interface and collaborative display devices WP6: Integration WP8: Business plan deployment WP9: Assembly area environment.

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## Expertise

The organisation was founded in 1989. Its main activities are based on simulation and synthetic image generation. OKTAL has acquired important knowledge of methods and techniques used in the following fields: - Town and country planning: Virtual mock-ups for decision aids, communication and studies. Expert in computer graphics for real-time 3-D visualization. - Automotive: OKTAL is a major actor in car driving simulation in FRANCE by producing simulation systems, simulation software packages and 3-D databases. OKTAL's solutions are used by industrials (PSA PEUGEOT-CITROEN, RENAULT) and research centres (INRETS, CNRS, LCPC, LAMIH). OKTAL is the reseller of SCANer(C) II, property of RENAULT research department. OKTAL is the reseller of P2V, property of RENAULT research department. OKTAL also has complete mastery of computed image generation field. - Railway: A complete set of simulation systems for train drivers dedicated to training or studies. - Air Traffic Control: A complete set of training simulators dedicated to air traffic controllers. - Defence: From basic trainers to advanced tactical simulators. - Virtual Reality and Simulation: Dedicated software applications or simulation systems. Computer and Web Based Training. OKTAL is the reseller of P2V, property from RENAULT research department. - Synthetic Environment: OKTAL's subsidiary, OKTAL SE, activity is dedicated to multi-sensor (radar, infrared, etc.) synthetic environment modelling and visualization tools. OKTAL won the first price of Silicon Graphics Visual Computing Awards 1996 in Visual Simulation category with an urban railway real-time visual simulation.

OKTAL is the coordinator of two PREDIT projects (French Transport Research Program): \* VOIR, 'Improvements of Atmospheric effects rendering in daily and nightly conditions for Driving Simulation' in association with INRETS, CNRS and LCPC. \* MICADO, 'Study of multi-sensor systems (Infrared, laser, video, radar) for detection of collision in driving applications' in association with RENAULT, ONERA, INRETS, LCPC and CITILOG. OKTAL have an important knowledge of the creation and manipulation of 3-D databases. Twenty 2-D/3-D graphic designers are employed by OKTAL and have strong experience in computer graphics (3-D, textures, lighting, etc.). Involved in the development of P2V RENAULT research software and reseller of the product, OKTAL have experience in CAD-CAM data conversion and optimization for real-time rendering.