TECNATOM & INSTITUT DE ROBOTICA RAILWAY SIMULATORS

SURE, RELIABLE FORMATION

There are operation positions in the railway world that imply situations of risk for their characteristics. One of them is the train driving. The aptitudes and degrees of reaction of the train drivers need therefore to be developed and controlled with rigor.
Formation devices are needed to prepare better operators without necessity of using the real rolling stock, avoiding risk, problems of programming schedule and lack of productivity.
The training simulators are presented as the perfect solution to the problem of the training of the different collective that work jointly in the tasks of traffic control , conduction and maintenance.
The rail simulators are formation tools that allow a documented, reliable, complete, sure and evaluation objective of these different collective.
The wide experience of Tecnatom and Institut de Robotica in the design, development and exploitation of training simulators guarantee the final goal on the simulation projects applied to the formation.

EXPERIENCE IN THE SIMULATION AREA

TECNATOM is a spanish company established in 1957. In 1972, the company passed into the hands of the country's main electricity utilities, becoming an engineering services firm for the start-up and operation of electricity generating companies. Since then, its activities have been centred mainly on the training of the plant operations personnel and its technical support, with real time-full scope replica simulators of spanish nuclear power plants, or graphic interactive simulators (GIS) of spanish fossil fuel fired plants. TECNATOM owns six full scope replica simulators of NPP, and up to ten GIS of electrical power plants and other processing industries. We have extend our activities out, with such kind of services for several plants in Germany, Switzerland, Taiwan, Russia, Ucrania, Romania, Brazil,Mexico,etc.In the last years TECNATOM is involved in a diversification process, extending its training and developing activities to other areas of the civil simulation (railway, process industry, avionics,etc.)

INSTITUT DE ROBOTICA is a laboratory integrated in Valencia University, that develops activities in several research areas, and in particular the related with Interactive 3D graphics, Virtual Reality and Civil Simulation (ARTEC group). The work developed covers a wide range of technologies from the interactive visualization with virtual actors to integrated simulation systems including projection and sensorization of external devices. In its nine years of existence a large amount of projects have been completed in close collaboration with the industrial environment. It has also participated in many R&D European Projects, that have in common the base technology used: 3D real time graphics where ARTEC is one of the most experienced group in the Spanish country. In particular, the Simulation Team has developed civil simulators for automobiles, railways, helicopters and civil machinery.

In this way, the combination of the capacity of TECNATOM as supplier of training tools and services and its commercial and post-delivery support structure and the INSTITUT DE ROBÒTICA experience in developing civil machinery simulators, guarantees that the product will fulfill the most rigorous requirements.

RAILWAY SIMULATORS

Our simulators have been developed adopting a modular conception, employing only wide spread commercial hardware or software components, and allowing the product to be adapted to the specific training needs of the client.

The final configuration of the simulator will be fixed according to the specific training needs, allowing a wide range of solutions: from the simplest (one visual channel, front monitor , soft-panels for operator's interaction , generic dynamic and visual environment models) to the most complete (configurable replica cabins, several visual channels, separate movement, visual and sound systems, specific mathematical models for dynamic and control, specific dock visual environment with all the necessary elements –pedestrian, vehicles, buildings, etc). In this way, there is a wide typology of Simulators to be provided, accordingly to the user requirements :

⇒ Base motive or fixed.
⇒ 45º up to 180º of field of vision.
⇒ specific or generic conduction.
⇒ Hard of Soft panels in the driving cab
⇒ specific or generic visual database.
⇒ Generator of Images in a simple P.C. platform, or using a cluster.
⇒ Position of Instructor that allows each student's continuous and personalized evaluation
⇒ Virtual panels for the of Subsystems located in the auxiliary closets that facilitates the driver the representation and the control of all the operation elements distributed in the train.
⇒ Simulation of urban traffic (Cars, Crossings, Pedestrians, etc)
⇒ Simulation of the Communication devices and procedures (Consign, Boss of Station , Control of Traffic)
⇒ The simulation includes the different elements: rail circuits, switches , stops , barriers, etc...
⇒ Simulation of malfunctions.
⇒ Generation of telegrams.
⇒ Simulation of Traffic of trains.
⇒ Integrated system of Formation of Circulation and Conduction : This System facilitates the practice of a simulation exercise with the maximum realism. Different collectives can participate, in a simultaneous way, in their respective virtual operation positions.
⇒ Self-study Positions (on-line Attended Teaching) : They allow the users to get familiar with the systems of the unit working in real time or in off-line way.

WIDE RANGE OF PRODUCTS

The simulators are designed to cover the formation (initial and recurrent) in a collective, individual or combined way, for:

⇒ Drivers.
⇒ Bosses of Station.
⇒ Controllers of Rail Traffic.
⇒ Technicians of Maintenance.

The technical solutions based on the modular conception allows to adapt the products to each client's specific formative necessities, from integrated complete systems of training to tasks specific simulators, from standard railroad to urban subway systems or trams.

TRAMWAY SIMULATOR

A tram simulator has been developed for Metro de Valencia. The simulator includes five visual channels (front and two side visuals, covering up to 140º vision angle, and two rear mirrors).

It also includes an specific traffic module, that generates a "random" traffic of cars that inter-actuates with the tram model in the crossings. The behavior of the "virtual" cars drivers can be defined using some rules and typologies (aggressive, standard, distracted...).

In this way real "new" situations are presented to the tram driver in each simulation session, avoiding the trainee to face "well known and repeated" events, avoiding the typical trainee comment : "the same red car cross the same street at the same point during the session" .

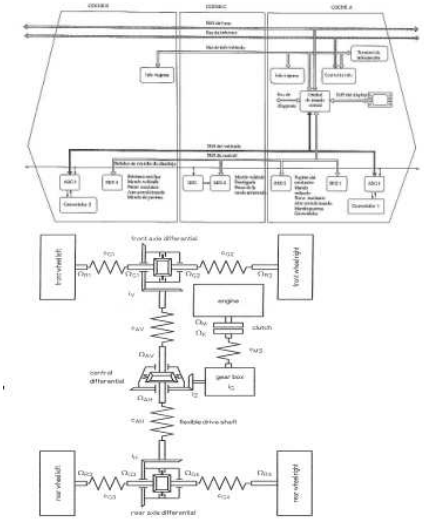
The following software elements have been considered :

Tram Systems

- Dynamic module
- Collision module
- Control and Logic module
- Power system module
- Brake system module
- Malfunctions

Visual

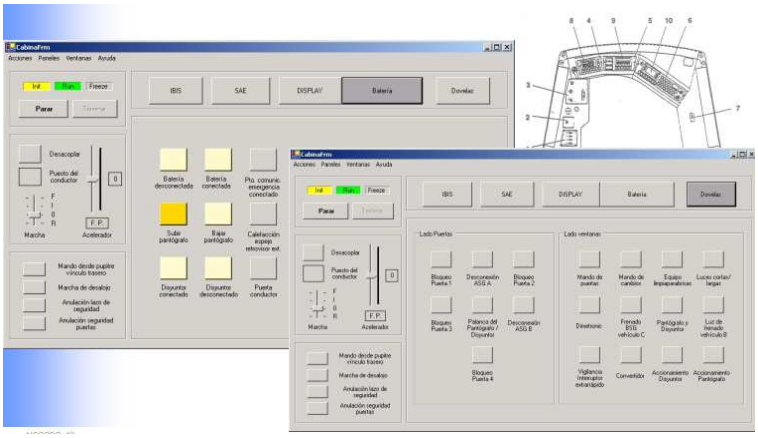
- Sound module
- 3D Visual Data Base
- Visual Motor
- Traffic Module
- Events and malfuntions module



The following functional elements are included :

=>*Input/output system*
=>*Driver interface*, using softpanels :

- A simplified desk equipped with the main vehicle controls,
- Lamps & indicators,
- Auxiliary equipment such as push buttons and displays are emulated on a set of flat touch sensitive screens. This results in a cost effective and extremely configurable solution.



=>*Interactive Navigation Module (INM)*, allowing the driver to operate controls and elements distributed in the train (door interlocks, local relays, etc), using a 21" touch-screen
=>*Projection system*
Three 21" screens for the track view (140° horizontal visual field)

INM

Driver Inteface

=>*Instructor Console*

The instructor adjusts the main parameters with an intuitive and fully graphical interface including:

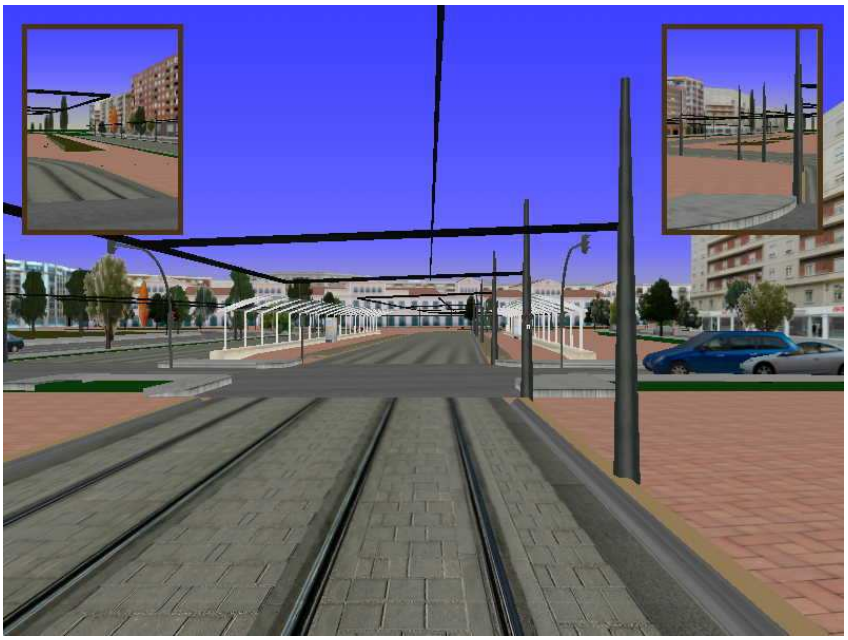
- Tram line signals and interlocks
- Type and density of moving objects·
- Weather conditions & time of day·
- Malfuntions chosen on a “high level list” of typical traffic situations
- Status information on events, track and vehicle data
- Trainee performance analysis and scoring system

The simulator will be used as a training tool for drivers, under normal, fault and emergency situations.

The training objectives are:

- To enhance the efficiency and quality of tram drivers
- To ensure and optimize a high level of safety and security at an affordable cost
- To drive in an urban environment with anticipation of other traffic participants behavior and errors
- To reduce the total number of fatal or severe accidents (only possible in simulator)
- To familiarize future drivers with basic driving principals such as powering, braking, door operation and passenger announcements, the route and environments of the city
- To establish the safety requirements targets and manage procedures
- To train in economic driving by optimization of powering, coasting and braking

Examples of the 3D visual



For further information, please contact: :

Miguel Torres Puya
mtorres@tecnatom.es
Ph.#(34) 916598600 Fax.#(34) 916598677
www.tecnatom.es