



VisCMSE

Visual

Control, Monitoring and Simulation Environment

AZ GLOBAL RESEARCH AND ENGINEERING
PROPRIETARY



Introduction

VisCMSE is a Java application that was developed and is marketed by Canadian company AZ Global Research & Engineering Ltd. It supports two principle functions:

1. Development of the control, simulation and monitoring systems and
2. Control, monitoring and modeling of complex industrial installations, facilities and another systems.

Possible areas of application of VisCMSE include:

- wide variety of geoinformation problems (crop monitoring, change detection, disaster responce),
- resource management (fishery, wild life, cattle, etc.),
- monitoring and automated control of industrial processes (chemical, metallurgical, food processing, space launch operations, etc.),
- monitoring of networks (electrical grid, pipelines),
- monitoring of controlled environments,
- monitoring of storage facilities (grain, fuel, hazardous, etc.),
- security,
- container and ship tracling, and
- other tasks.

Specific applications include environment monitoring, water resources management, disaster impact assessment and prediction of development of natural and technological disasters, and Earth Observation applications and Space-based monitoring. VisCMSE can be also used for training, for modeling of hypothetical scenarios and for strategy development. While VisCMSE is design environment that is used to generate open-architecture configurable control system code, these applications are only the few examples of possible areas of utilization of the product.

VisCMSE Heritage

VisCMSE originates from the latest developments in Space launch and satellite control systems, combined with extensive experience of a development team in computer modeling and computer simulation. Some aspects of the VisCMSE technology were used in 1990s in the projects like launch control system for Connestoga launch vehicle (Wollaps Island, USA, 1995), mission control cenetr of Space Port Canada (Churchill, Manitoba, Canada, 1997), and in the projects of Altair Aerospace Inc. (1994-2002). The earlier version of VisCMS (dubbed M²C Builder) was also used by AZ Global Research and Engineering Ltd. for development of the software for the Cape Canaveral fire monitoring project (ongoing) and for the data fusion and control applications for the satellite ground station in Sardinia, Italy.



VisCMSE Advantage

The VisCMSE commercial advantage originates from its innovative approach to control system architecture and to design process (see the following section).

- VisCMSE provides functionality that allows an average engineer who possesses only basic knowledge of any high-level program language (Java, C, C++, Fortran) to develop monitoring and control system application for systems of unlimited complexity. According to AZ Global Research & Engineering estimates, software development time and associated cost may be reduced by factor of 10 or more, and development process does not require involvement of a team of professional programmers.
- Use of VisCMSE eliminates the communication gap between the engineer (who understands the system that he/she creates, but is not proficient in software design), and the monitoring and control system developer (who is proficient in software design, but not always understand all engineering aspects). This feature dramatically streamlines the system development.
- VisCMSE allows for flexible top-down approach to gradually account for the system's complexity. At the early stages of design engineers may use simplified models to do fast analysis of alternative engineering solutions, and may introduce more sophisticated models "on the go" without redesigning the whole system.
- VisCMSE allows the user to simulate the system's functionality, including abnormal scenarios, and to detect potential problems at the level of software design, before the actual system is built.
- Monitoring and control system that is being developed within VisCMSE design environment includes an intuitive and easy-to-use graphic interface that allows operator to rapidly narrow down to the source of the problem in the monitored system, and to dramatically reduce reaction time.

VisCMSE also provides convenient, simple and flexible operator GUI and does not require extensive training to operate.



VisCMSE Technology Fundamentals

VisCMSE is designed to model, monitor and control distributed systems with asynchronous data input. It relies totally on Object-Oriented Design, broadly uses computer-generated code and dynamic class loading according to automatically supported naming conventions.

Within VisCMSE the system is represented as a neural network of Java objects¹ that are linked by pair interaction through specially designed “connector” objects². Both functional and connector objects are designed according to unified rules, that allow the user to develop models and controlling and monitoring for systems of different level of complexity using the same pre-designed “building blocks” from the objects library. VisCMSE uses Final State Model representation of the conditions of the monitored system, thus eliminating a need to analyze rapidly changing sensor readings “on the fly”.

If VisCMSE is used, the designer only has to take care of the following:

1. Place the components objects on the plan of the monitored object or facility using interactive GUI. GUI supports “drag and drop”, resizing and rotation of the objects.
2. Connect the objects according to their physical and functional connections using visual design workplace;
3. Provide the hardware drivers for interfacing with monitoring and commanding execution devices, and develop simple Java “shell” using the template library.
4. Provide the modelling software, when applicable, and develop the Java “shells” to handle modelling tasks.

The system generates its component objects, links objects into neural network-like³ structure according to the designer’s drawing, archives this structure as the new object in the library for the future use as a building block for more complex systems, generates control and monitoring application code and system-specific application, creates monitoring and modeling workplace and deploys separate end-to-end application ready for distribution, all fully automated. The newly created application is completely independent from the VisCMSE design workplace⁴ and may be used and distributed separately, with pre-defined editing functionality according to the end-user agreement.

¹ Some example objects: electronic components (for electric circuit); sensors; separate production lines; settlements and areas of flooding (for disaster impact monitoring), etc.;

² Some example connector objects: electric wiring; wireless links; roads; pipelines.

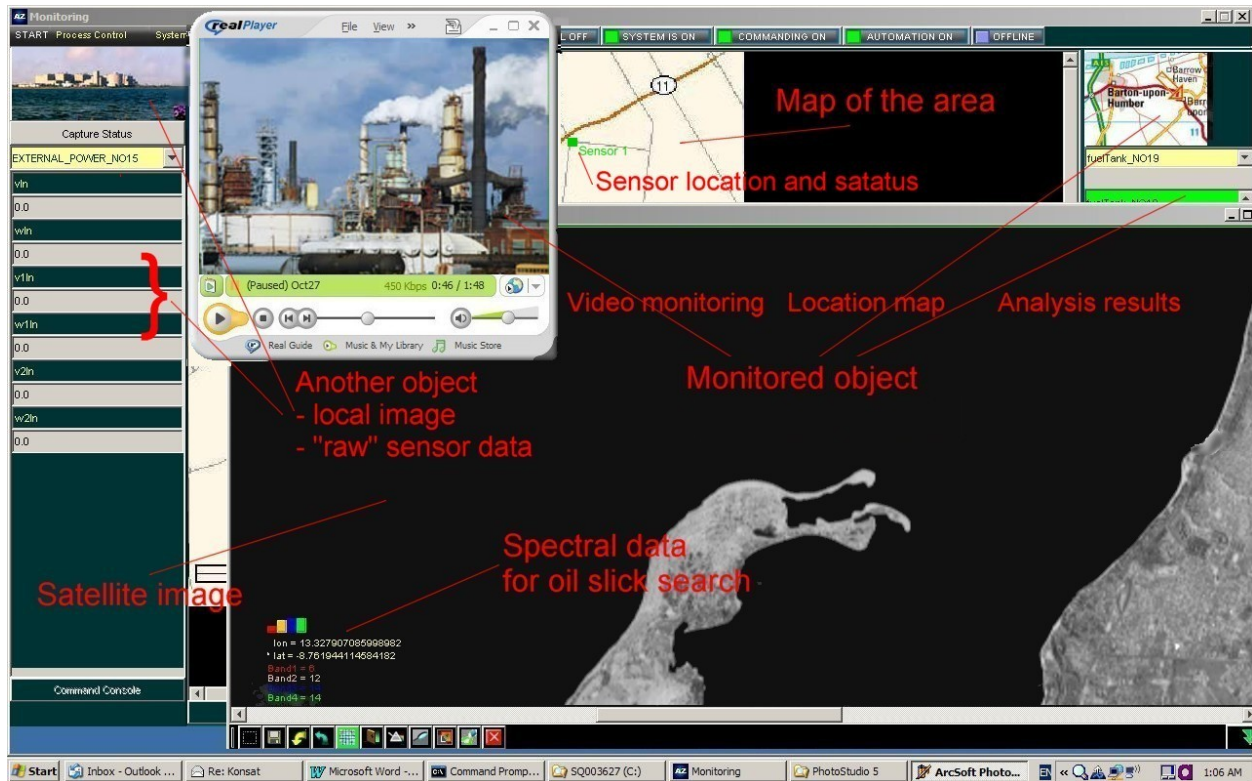
³ Graph

⁴ The workplace allows to test system before deployment



Functionality

When VisCMSE product is used for modeling or monitoring, the application periodically checks the events log and updates the system status by propagating the events (changes of incoming data values) through the system according to established network connection “tree” and timing priority. The propagation “tree” is generated by monitoring and modeling application “on the fly”. As events are being propagated through the system the operator is able to see the changes of the status⁵ of all the high level objects that are included into monitoring loop, and if a problem occurs, is able to zoom into troubled object of the system by clicking on the specific part of the system plan. The process may be repeated until the operator narrows down to the low-level physical component that is the source of abnormal state of the troubled high-level part of the system.



Typical VisCNSE operator workplace(implementation of the environment monitoring system with use of the Earth Observation data).

⁵ Color coding



Delivery Options

- *Demo-VisCMSE* is small system with limited number of components and with restricted configuration capability. Demo-VisCMS is provided free of charge with no technical support. Written end-user agreement is required. Technical support may be provided on the subscription basis.
- *Standard VisCMSE* is provided on commercial basis and supports full configuration capability, including creation, addition, removal and configuration of the system components “on the fly”, and one year of technical support. Please contact AZ Global Research and Engineering Ltd. for quotation.
- *Enterprise VisCMSE* is provided on commercial basis and supports full configuration capability, including creation, addition, removal and configuration of the system components “on the fly”, and creation of the hierarchical systems, and one year of technical support. Please contact AZ Global Research and Engineering Ltd. for quotation.

Operational Systems

- Florida wild fire monitoring (Cape Canaveral)
- Satellite ground station automated control (contracted)
- Satellite-assisted resource management, environment monitoring and disaster response (contracted)

Archived Systems

- Power substation control and automation
- Windfarm monitoring, automation and WiFi control
- Small water distribution pipeline network
- Fishery monitoring
- Environment monitoring (vicinity of the Bruce NPP in Canada)
- Assistance to local authority (Orange county, Florida)
- Flood monitoring and modeling
- Facility monitoring and automated control
- Container tracing and port security



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