BULGARIAN-UKRAINIAN SCIENCE RESEARCH PROJECT: "DEVELOPING OF DISTRIBUTED VIRTUAL LABORATORIES BASED ON ADVANCED ACCESS METHODS FOR SMART SENSOR SYSTEM DESIGN"

Duration: 2009-2010

The Project Aim

The aim of the project is developing of methods and tools for remote virtual design of smart biosensor devices and systems and creating on this base the distributed virtual laboratory (VLCAD) as tool for interdisciplinary researches.

This aim courses necessity to solve next tasks:

to develop theory elements and methods of virtual design, ontology of typical distributed laboratory with advanced access methods on the base of numbered information spaces;

to develop and optimize effective methods of virtual design of smart biosensor devices and systems;

to create on this base samples of biosensor systems for medical and environment protection purposes (biosensor systems for express-diagnostic of plant state and detecting of acute infectious diseases, such as bird flu, cow leucosis and etc.).

There will be formulated new principles of creating of VLCAD and smart computer devices and biosensor systems.

On basis of subject fields analysis there will be created high level and low levels of VLCAD ontology, which has to meet such properties as clearness, coordination and expansibility.

On basis of created ontology there will be developed distributed VLCAD for designing of smart computer devices. This VLCAD will be created on the base of formalized representation of knowledge with usage of numbered information spaces.

High reliability is important parameter for smart biosensor devices for wide use. This causes creating of program modules for calculation of reliability parameters in the VLCAD structure. According to this there will be developed original program models for calculation of reliability parameters of microelectronic components, devices and systems. Program models will be built on methods, which are based on different probability distribution laws: standard exponential (one-parametric function) and DN-distribution (two-parametric function). For every method there will be created algorithm, realized as VLCAD computer program (software).

During creation of program modules one of important purposes is to find errors on the early stage of development. In this project there will be developed algorithm for automatic translation the system, written in MSC language, to the Petri Net. On the base of this algorithm there will be created program module and it will be integrated into the VLCAD. This module will be also used during designing and creating of VLCAD itself for control of its reliability and security.

There will be developed algorithms for experiment data processing and software for automatic building and visualization integral dependences, which allow to get in real-time integral data from outputs of smart biosensor devices, created during this project.

By means of VLCAD there will be developed and created samples of smart biosensor devices for express-diagnostic of plant state and express-detecting of acute infectious diseases, such as bird flu, cow leucosis and etc.).

Expected Results

Results of the execution of the Project will be presented as science articles. The next main tasks will be provided:.

1. Having made analysis and determination of typical features of design process there will be formulated main principles of creating of VLCAD for designing of devices for biological object express-diagnostic.

2. There will be created ontology of virtual design subject field with taking into account features of product life, design stages and proper output documentation. According to ontology there will be developed main components of virtual laboratory, such as, formalized methods, program modules and electronic libraries.

3. There will be creating original program models to calculate reliability parameters of microelectronic components, devices and systems on their base, by using of different probability distribution laws: one-parametric exponential and two-parametric DN-distribution.

4. By means of VLCAD there will be developed and created samples of smart biosensor devices for express-diagnostic of plant state and express-detecting of acute infectious diseases, such as bird flu, cow leucosis and etc. Applications of devices will allow providing fast and effective medico-ecological monitoring in Ukraine and Bulgaria, estimate agricultural plant state, prevent and protect from pandemia of bird flue and other acute viral infections etc.