**Project Description**

It is a very costly, dangerous and often impossible to conduct experiments using real systems. Experimenting with models is a valuable substitute to real experiments. The quality of the model can be increased by connecting real and virtual worlds. In these worlds, the experimental results are more truthful and comprehensive. The models used are evaluated in various fields such as: research, industry, commerce, military, etc.

Simulation is the execution of a model, represented by a program that provides information about the system being investigated. Simulation is the rapid display of a series of images of 2D or 3D attributes of objects to create an illusion of movement.

This Interactive Demonstration is a cocktail of:

- Connecting Quantum and DNA computing using the Bloch sphere,
- Learning to program with interactive 3D graphics in the virtual worlds of Snow People, Lake States, etc. using the programming language Alice,
- Using head developed games (Ticket-Tape, Home Power, etc.) to teach parallelism with robots in Robotics Developer Studio using Visual Programming Language.

**Connecting Quantum Computation and DNA Computation using the Bloch Sphere**

Quantum and DNA computing are distributed and parallel computing techniques. They are useful for solving problems which require massive computations such as encryption, writing, searching, and etc. Quantum and DNA algorithms cannot be efficiently simulated on classical computers because classical computers cannot efficiently deal with the parallelism. The quantum circuit model is sufficient to describe quantum algorithms whereas DNA circuit model is sufficient to describe DNA algorithms.

This work establishes the relationship between a quantum qubit and a DNA string using the Bloch sphere. The Bloch sphere is a vector graphical representation of a qubit in a 3D vector space. The model used in this work presents one way to solve these disparities to use computer games to motivate students to study elements of parallel and distributed computing.

**Alice - Programming with Interactive 3D Graphics**

The programming language Alice was designed to describe, create, and process 3D virtual worlds.

This presentation shows how to write programs in Alice that use basic programming concepts such as variables, decisions, loops, and events.

Working with an Alice program looks as playing an interactive video game. Programming in Alice is easy and fun and does not require programming knowledge.

Alice is a perfect programming language for 2-12 grade students.

**Program**

A program is a set of instructions that tell a computer what to do. An instruction is an action to be performed.

Writing a program aims to animate objects in a 3D virtual world is all about:

- objects and
- actions objects can perform.

**Scenario**

A scenario is a problem statement that describes the overall animation in terms of:

- what problem is to be solved,
- what lessons to be taught.

**Making Animation**

Creating/Designing/Connecting/Developing/Building an animation is a four-step process:

- Writing a scenario (a description of a problem or a task, a problem statement)
- Creating/developing the plan of action
- Writing the animation program
- Testing (see it work) the animation program

**Scenario Example**

The scenario described a sequence of actions:

- Three snow people are outsiders, on a snow-covered landscape.
- A snow song is playing.
- A snowman is followed by a snowman who is talking with another snowman. He said, “Hello!” and “How do you do?” and “Hello me.”
- The snowman turns to see who is calling her. She was surprised.
- She did not like the snowman’s approach.
- She blushed. Her face changes color from white to red.
- She is not interested in meeting the snowman. She saw the snowman.
- She is not interested in meeting the snowman. She is not interested in meeting the snowman. She blinks with her eyes at the snowwoman.
- She is not interested in meeting the snowman.

**Using Computer Games as Motivators for Studying Elements of Parallel and Distributed Computing**

The Faculty sees:

- Undergraduate computer science enrollment is decreasing
- Quality of qualified students is lower and lower
- Parallel and distributed computers and/or computing is more and more complex.

One way to solve these disparities is to use computer games to motivate students to study elements of parallel and distributed computing.

Intel Corporation has developed a few computer games such as Ticket Tape, Smoke, Destiny the Cloud, Pr, Ms., and etc. as software tools for teaching parallelism on original way.

**Experiments with Robots in Robotics Developer Studio using Visual Programming Language**

Microsoft Robotics Developer Studio 2008 (RDS) is a software (Window-based) platform - environment for developing robotics applications for a wide variety of real or virtual computer hardware devices - robots.

Microsoft Visual Programming Language (VPL) enables programmers (even students and beginners) to design and build their own robots by programming very easily using a visual programming environment. Algorithms are coded just by dragging, dropping, and connecting blocks that represent various services. Flowsheets could be simplified by collecting connected blocks and running them later as a single block elsewhere in the program.

**Microsoft Visual Simulation Environment (VSE) enabling real-world physics simulation for robot models or in other words simulates robotics applications in 3D physics-based virtual environments.**

Experiments with robots in Robotics Developer Studio using Visual Programming Language consists of many experiments such as Drive and Reuse robots present at the given picture.

Experiments with robots have important applications from Military and Homeland Security to Biomedical Engineering.

**Bibliography**

1. qubit.org [Accessed: 2019-06-11] 2. Squankum 3. Vojislav Stojkovic and Hongwei Huo 4. Ticker Tape is a teaching computer game that shows a complex 3D particle system. Ticket Tape has 100's of moving objects. All movement, drag, and etc. simulation are based on deterministic calculations. Good frame rates have been achieved using multi threading and SIMD programming. Playing Ticket Tape is simple and natural.

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