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Vortex Academic Partner Projects



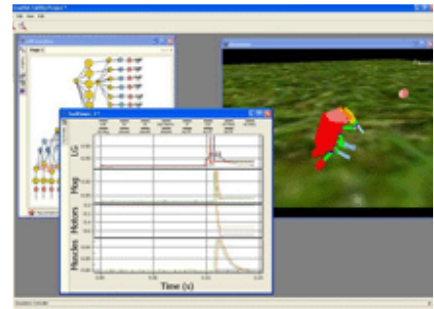
Carnegie Mellon University

The Robotics Department uses Vortex to simulate unmanned vehicles, and path planning for their DARPA Grand Challenge entry, Red Team Racing. *"The fidelity of the dynamics and collisions, combined with fast performance rates were significant factors for us"*, William L. "Red" Whittaker, leader of Red Team Racing.



Georgia State University

Vortex is used at AnimatLab, in a simulation software environment which models how the body and nervous system dynamically interact in a virtual physical world where all the relevant neural and physical parameters can be observed and manipulated. The body is situated in a virtual physical world governed by Vortex. The animat's movements in the virtual environment are under neural control as it responds to simulated physical and experimental stimuli. The autonomous behaviour of the animat is displayed graphically in 3-D alongside the time-series responses of any designated set of neural or physical parameters.



Cornell University

The Computational Synthesis Lab uses Vortex for their evolutionary robotics research. Dynamic simulation is a key component of this research and Vortex was chosen on the basis of ease of programming, performance, stability, and accuracy. Vortex is used to perform multiple parallel simulations on 100+ cores as part of their optimization development.



University of Rochester

The Computer Science Department used Vortex to simulate human being actions in virtual environment. Research is conducted into how virtual humans can manipulate objects and how to model human's body posture vividly. One of the difficulties about simulations in Virtual Reality is the lack of a suitable physics model. Vortex provided a solution for developing the physics models needed. The PhD thesis project explored the principle of how humans control their behaviour based on their interaction with the environment, how people obtain their ability to complement different tasks. Specific tasks included modeling virtual object manipulation and human body posture.



behaviour in motion



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Tokyo Institute Technology

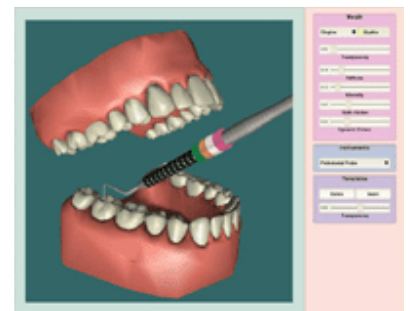
The Department of Computational Intelligence and Systems Science (CISS) researched techniques of learning control; specifically, finding desirable control rules through trial-and-error interaction with the environment. Several real robots (four legged robots, snake robot, etc.) were made to demonstrate or to investigate theories, but trial-and-error costs were too expensive on real robots. For this reason, a

powerful 3D physical simulation tool was needed and Vortex was chosen. With other options, the dynamics engine is too unstable to simulate long time steps for the learning. In the CISS department, several labs also adopted Vortex.



University of Illinois at Chicago

Vortex was used to conduct research and to develop a haptics-based dental procedure simulator as part of a Ph.D. thesis in Computer Science, in conjunction with Department of Mechanical and Industrial Engineering, and the Department of Periodontics at UIC. Object-object collision Collection among dental instruments and tooth surfaces were performed with Vortex, integrated with a haptics library, to allow users to get force feedback.



Heinz Nixdorf Institute, University of Paderborn

The Computer Integrated Manufacturing group uses Vortex for teaching undergraduate mechanical engineering students. In the Virtual Reality-Lab, students are taught to develop Virtual Prototypes of mechanical mechanisms including a dynamics simulation using CMLabs' Vortex. Students learn how to use Vortex beneficially within the context of industrial oriented applications.

One of the research topics of the VR-group is the integration of functional simulations into Virtual Prototypes (VP). Vortex is used for building physically correct behaving VPs. With the help of Vortex, VPs are interactive — they integrate an interactive simulation of the dynamical behaviour of complex parts and assemblies into the VP.



National Defense Academy

A research project in the Mechanical Systems Engineering concerning the realization of manipulation skill for robot arm/hand relies on Vortex. The work involves the control theory and motion planning for robot arm/hand which has dexterous manipulability such as human arm/hands. Vortex is enables for precise calculates of the complex movement of dexterous manipulation such as pen spinning and juggling by robot hand.

The academy benefits from CMLabs' "strong simulation tool which can calculate multi-body dynamics with complex contact constraints because there is no commercial software developed using the complementarily theory".



University of East Anglia

The School of Computing Sciences used Vortex to accurately model the complete dynamics, including collisions and friction of a four-legged walking robot.



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University of California at Berkeley, EECS

A project used Vortex to develop a real-time technique for generating realistic sound from rigid-body simulations. By numerically computing the modal response characteristics of the geometric objects in a scene the system realistically synthesized the sound created by contact between the objects. Generating the audio in a physically realistic fashion from the simulation physics allows the user to infer physical properties of the object and their interaction in the same way as with real-world phenomena.



Seinajoki Polytechnic, School of ICT

The School of ITC has installed Vortex in a virtual 3D environment CAVE which was the first 5-sided CAVE and first digital DLP CAVE in Finland. The hardware and software is used in ICT's Virtual Reality technology education.



The University of Victoria

A Mechanical Engineering lab has implemented Vortex in a project that integrates a 6DOF haptic device from Quanser into a virtual environment generated in Vortex. The graphics block runs the virtual environment simulation and provides visual feedback to the user using the Vortex simulation engine.



The University of Calgary

The AR2S research lab uses Vortex in simulating control mechanisms and robots. The AR2S lab is devoted to the study, development and the testing of diverse control methodologies such as Artificial Intelligent (e.g., autonomous agents) and formal techniques (e.g., adaptive control) applicable in mobile robotic and manufacturing systems.



Zhejiang University

Zhejiang University uses Vortex in virtual reality and virtual prototyping which includes physical modeling and simulation of product behavior in a virtual environment. Vortex was integrated with in-house virtual reality software to build simulations of mechanical products including the dynamics behavior of vehicles and real time collision detection and response in virtual assembly.



Beijing Institute of Technology

The Beijing Institute of Technology is using Vortex in container crane simulation research. Vortex accurately simulates the dynamics of cables among other elements to improve the accuracy of the virtual environment.



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