

Chapter 7

Virtual Reality Support for Trading

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ABSTRACT

Virtual reality offers the promise that finally, most of the capabilities of the human mind and senses can be harnessed to improve global financial performance. Over millennia, humans have adapted to their environment by using 3D vision, 3D sound, touch, smell, taste, et cetera. The human brain is highly attuned to these sensory inputs. Survival has often been dependent on split-second perception and quick decisions while under stress. Trading is a similar setting, with 42% of all trading occurring within milliseconds (Business Week, 2009). Losing traders have gone bankrupt and become extinct without exploiting their full sensory capabilities to perceive and understand the trading environment. Most traders have relied on simplistic 2D graphs, text, tables of numbers, and vanishing sounds of the trading floor. More recently, vendors have tried to help traders use more of their senses. Modern computer technology allows traders to better assess the markets, make faster and better decisions, and to get an edge in trading.

MIND AND TRADING

Some aspects of virtual reality technology are increasingly used even if not explicitly labeled as such. Virtual reality is closely related to animation, movies, computer games, and scientific visualization / auralization. Virtual reality uses computers to simulate real or imaginary worlds.

Virtual reality allows people to enter a world that they can interact with in real time, just as if they were really there. It is most like a computer game but virtual reality applications are usually not games. Virtual reality trading applications attempt to experience a useful reality. The data are real. Trades have real monetary consequences. Virtual reality technology informs the trader and allows the trader to better interact with the data and market. This paper illustrates how this might be done using

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sight, sound, touch, and other senses. Increasingly powerful hardware is becoming available to help activate the senses. The associated software is increasingly mature. The main limitation is the imagination of entrepreneurs and vendors as to how to develop products that traders can use to improve the efficiency of the financial system.

HARDWARE FOR THE SENSES

Sight

Virtual reality emphasizes visual experiences because vision gives the most information about the environment. The visual cortex is the most massive system in the human brain (Wikidoc, 2011). The eyes contain around 70 percent of all the body's sensory receptors, making sight the most information heavy of all the senses (Lefton & Brannon, 2002). Virtual reality generates visual signals that can be communicated as light rays to the user's eyes. Virtual reality images can be displayed on a computer screen or seen through special stereoscopic goggles. In 1968, Ivan Sutherland created the first virtual reality head mounted display system that gave the user the illusion of being in the same virtual environment as wireframe models (Pausch, 1997). Computer screens are less "real" than head mounted displays but much more popular due to higher resolution, lower cost, and ergonomics. The human brain is quick to perceive the 3D information implied by 2D images displayed on standard computer monitors. The video game industry has done much to ratify the idea that artificial worlds can be generated by software and adequately displayed on 2D screens. The movie industry also has used computer graphics to make movies since the 1970s. Toy Story in 1995 was the first movie made entirely with computer animation. Avatar in 2010 showed that computer animation could create a believable artificial world and that the visual illusion of 3D

can be enhanced by special glasses. All of these methods can be used to visualize financial trading.

Graphics Cards

Graphics cards use dedicated GPUs to speedily render graphics on a local computer without bogging down the host CPU. Numerous exciting new graphics cards are introduced each year.

NVIDIA GeForce 400 Series® became available in 2010. Its Fermi® chip GPU has 512 stream processors in sixteen groups of 32 and 3.0 billion transistors. It supports OpenGL 4®, Direct3D 11®, VisualStudio® and C++. The card has 256MB attached to each of the enabled 6 GDDR5 memory controllers for a total of 1.5GB. The chip can perform one double-precision floating-point operation per cycle per core.

In 2006, NVIDIA® introduced CUDA®, a general purpose parallel computing architecture with a new parallel programming model and instruction set architecture. CUDA uses the parallel compute engine in NVIDIA® GPUs to solve many complex computational problems much faster than on a CPU. CUDA allows developers to use C or other languages such as Fortran, Python, Lua, etc. CUDA allowed the Fermi® card to be used for ray tracing by numerous applications shown at SIGGRAPH® 2010 in Los Angeles. Ray tracing is more realistic than shading so thus enhances the experience of virtual reality. The fact that the ray tracing can be done on the graphics card simplifies the software so that it will be easier to implement than on parallel computers. PEER1.com® uses the Fermi card to provide cloud supercomputer services. For example an auto design can be rendered in the cloud and the image displayed on an Apple iPhone®. Cloud supercomputing could be useful for traders who want to outsource supercomputing; when traveling; or in meetings when traders need a quick answer without breaking up to go turn on the supercomputer. Supercomputing often is used by virtual reality because of the difficult problems addressed.

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