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Acceleration of image processing on FPGA-GPU systems and the effect of the velocity on the sensory conflict

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Nowadays, acceleration of image processing algorithm is widely used in different imaging and display systems. FPGA and GPU are playing extremely important role in the accelerator architecture. However, over/under speed might create a sensory conflict. Sensory conflict in the oculo-vestibular dynamic has been a very fundamental research question and affected several domains including engineering, aviation, emerging technologies, car industries and so on and considered as a serious industrial challenge in display technology and advance read-time image processing systems. Finding a practical solution for the sensory conflict in the real/virtual environment is essential. Because, based on this solution a set of efficient interaction (navigation/ manipulation) interfaces maybe be proposed. Reliable research results will influence directly technologies such as aviation (flight simulators, drone land base control, unmanned vehicle control and navigation), car industry (car simulator, manufacturing, assembling and disassembling of comportment), display systems, robotics and training. In addition, it can improves the quality of the cyber product such as games, HCI and automation industries. Different teams and research groups have inquired this problem all across the world. Researchers have studied the problem from various point of view including psychology, psychophysiology, neuroscience, computer vision, Man Machine Interface (MMI), Human Computer Interaction (HCI), user study, biology, robotics and telecommunication and so on. This presentation focuses on the sensory conflict problem from modeling, signal processing and computational neuroscience perspective, however the main focused will be on signal processing. Simply, it will be shown how the speed of visual flow, texture and the distance from visual flow can affect sensory conflict in a synthetic environment. Then the result will be verified using modeling and experimental data analysis. Nearly entire display system and test-bench was developed on windows platform and NVidia Quadroplex GPUs. The detection filters were developed and accelerated on FPGA. To simplify the development procedure for the newcomer developer and future researcher, all the GPU Kernels, C++ code, MATLAB engine and wireless network telecommunication and interfacing toolboxes were wrapped under JavaScript in the software platform which makes development very fast and easy. Enormous efforts, debugging, software tests were made for building such a user friendly and handy platform.

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