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UDC 681.3.01

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ADAPTATION OF GAMING PROCESS TO IMPROVE HAND REHABILITATION

Abstract. Hands, as the most dexterous part of our body, are of vital importance to our everyday life. However, since hands are extensively used in nearly all tasks, they are exposed in more dangerous environment than any other parts. Overwork, injury and geratic complications, such as stroke can all cause hand function, totally or partially, which directly diminish the quality of life.

Unpleasant effects caused by trauma and overwork to hands results with immediate hand rehabilitation. Trainings for patients' rehabilitations are normally goes in rehabilitation center in hospitals, with getting some physiotherapy for hands, making some exercises and etc. However all this may bore patients and not to motivate to sooner recovery.

The Leap Motion controller is a small device that senses consumer gestures and is aimed to enlarge a user's interactive experience with their computer. Using infrared sensors, it is able to collect data about the position and motions of a user's hands. This allows to use leap motion in different purposes like development of children's intellect, having fun with playing virtual reality games and etc. One more example for effective usage of such device is in the purpose of medicine.

Key words: Leap Motion, Machine Learning, Unity3D, Modeling, Autodesk 3Ds Max, Cinema 4D, Computer Vision

If you're just now hearing about real life escape games, you're the norm. Escape games have actually been around for nearly a decade, but they're just now gaining mainstream popularity. Starting in Japan, the real life escape game industry has spread worldwide and has appealed to people wanting to experience their entertainment, not just watch it. The industry really only began to explode in 2014, and there's no end in sight to the growing popularity of this fun and engaging activity.

The best part of real escape games is that the player is the main character instead of just watching a character. And due to the rise in all of these businesses, each one brings its own unique experience, forcing "game makers" to be diverse with their themes and puzzles. One notable characteristic of the game is the puzzle vs. story difference. Some games can be all about solving hard puzzles and math problems, while others can be theatrical and focus on how the player must escape from a "situation" (and is mainly more observationally based). The better games are the ones that are able to intertwine the two aspects to create a truly distinct experience [1,2].

A virtual environment was developed in order to adapt the scenario as much as possible to the patient's reality. The participant was asked to sit on a chair and to have his forearm resting on a small table nearby. When wearing the HMD the participant saw a virtual body substituting his own, with the left virtual hand closed and resting on a virtual table colocated with the real one and therefore in the corresponding position and orientation. The participant could see his virtual body by looking directly at it, as if looking at his own real body, but also in a virtual mirror that showed a mirror reflection of the body. The movements of the participant's real left arm were tracked and mapped to the virtual left hand, which would move in the same way, contributing to the generation of ownership. This could be seen directly from a first-person perspective and through the virtual mirror. To avoid problems of rejection of the virtual body due to physical appearance, care was taken not to show the face of the virtual body in the mirror, simply by placing the virtual mirror in a position and orientation that showed only the body from the neck down. To further induce ownership over the virtual limb, we applied synchronous visual tactile stimulation using the method described by Slater et al. This was achieved using a soft ball attached to a 6-degrees-of-freedom Wand device whose tracking information determined the position of a virtual ball. As a result of this configuration, when the soft ball touched the participant's real hand, a corresponding virtual ball touched the virtual hand. The reflection of the body movements on the mirror was used to increase the sensorimotor correlations to induce body ownership [3-6].

The participant was informed about the principles of immersive virtual reality and how the session would be organized. Then, he was given a consent form to sign. Next, the EMG and EEG electrodes were attached to the forearm, over the wrist flexors, and to the skull (FP1), respectively. Impedances were checked and the hand tracker was attached to the back of the participant's left hand. Then, he trained for a BCI task that was to be used in Part 2 of the experiment (see below). By means of the BCI, and over a 3 min period, the participant tried to reduce the size of a virtual ball as presented on a PC desktop monitor. Then, we proceeded to the main experiment, which was divided into three parts.

At the beginning of each part of the experiment, the position of the participant's left hand was realigned with the virtual one, and there was a check to ensure that the virtual hand correctly replicated the rotation of the real hand. Then the position of the virtual table and the visual tactile coupling were recalibrated to minimize incongruence between the tactile and visual inputs. The aim was to provide the participant with both sensorimotor and visual motor correlations to maximize the chance of inducing body ownership.

The HMD was donned by the participant and calibrated to make sure that the subsequent scenario would be seen correctly. Once immersed in the virtual environment, virtual body ownership was triggered through 1 min of synchronous visual tactile stimulation, with the physical tracked ball repeatedly touching the participant's left hand and the corresponding virtual ball touching the virtual left hand. Then, depending on the section of the experiment, the virtual hand would open under specific conditions, and a task had to be completed. At the end of each part of the experiment, the HMD was taken off, and the participant was given some time to rest.

The growth of the Internet as the primary vehicle for secure communication and electronic commerce has made efficient cryptographic processing a key factor of good system performance. In this paper, we demonstrated that a hardware-software co-design provides excellent performance while maintaining the flexibility to support new algorithms in the field.

To motivate our design, we analyzed the characteristics of eight secret-key cipher kernels. We showed that they lack branch or memory bottlenecks, have few unknown dependencies, and offer little headroom for performance improvement on traditional architectures. Given these analyses, we proposed new instructions that speed the common operations of symmetric ciphers, and efficient hardware that improve kernel performance. Instruction set support is added for substitutions, permutations, rotates, and modular multiplication. CryptoManiac is an application-specific co-processor that is a 4-wide VLIW machine. We then examine their performance on microarchitecture and hardware models of varying cost and performance. Performance analysis of the optimized benchmarks revealed a 59% speedup over machines with rotate instructions, and a 74% speedup over machines without rotates for the architectural extensions. CryptoManiac was able to run Rijndael 2.5 times faster than the Alpha 21264 workstation with 1/100th area and 1/100th power of the Alpha processor.

We evaluated different design configurations by building detailed hardware models of varied widths and capabilities. We then calculate encryption rate by synthesizing the models to obtain timing estimates. Our systematic approach allowed us to study the tradeoffs between chip area and performance. We showed that the highest-performing and most cost-efficient design is the 4-wide combining configuration. Rijndael, the new AES standard, runs 2.25 times faster on a 360MHz CryptoManiac. Our analysis of the original and optimized algorithms suggests that there is more opportunity to speed up cryptographic processing. We are considering improved functional unit designs as well as more aggressive circuit implementations.

To compare the performance between the different participants, we introduced a performance index. This performance index was based on the performance ratio, calculated as the best-reached threshold divided by the time to reach it. Thus, the performance ranged between 0 and 50 %, and the time ratio between 0 and 90 s. In addition, since there were some participants who performed better than others, we compared their performance ratio in each condition against the mean performance ratio across conditions.

When the Leap Motion software recognizes a gesture, it assigns an ID and adds a Gesture object to the frame gesture list. For continuous gestures, which occur over many frames, the Leap Motion software updates the gesture by adding a Gesture object having the same ID and updated properties in each subsequent frame. The metaphorical projection is an indispensable tool for conceiving the preliminary design of the two primary facets of the virtual world.

Accurately extracting the interesting object is a precondition in image based rendering of a virtual environment. However, because of the effect of noise, it be-comes difficult to get useful information from images. According to the steps of obtaining images, we know that in images the useful data always mix with noise. The existence of noise obscures the boundary between the object and the background, which makes it difficult to distinguish them. This is a much confused problem in the computer visual field. Therefore, noise reduction, image enhancement, and restoration are becoming the very important steps in image based rendering of a virtual environment.

According to different aspects of simulated objects, the modeling methods can be divided into scene appearance modeling, physics-based modeling, behavior modeling, virtual-real combining modeling, etc. Scene appearance modeling focuses on the appearance of the scenery, mainly including those modeling methods based on geometry, image and material and illumination information; physics-based modeling represents object's physical properties, making the dynamic and static sceneries in virtual environment more vivid, mainly referring to the simulation of physical process, such as simulation of dynamics, collision, and deformation; at present, behavior modeling in VR mainly indicates the modeling of autonomous entity, refer- ring to artificial intelligence.

Active-attenuation model treats each voxel in volume data field as a particle light source, and distributes source intensity and an attenuation coefficient. After attenuation along a distance in data field, the light generated is projected to the visual plane to form resulting image. This type of model derives light intensity computing formulae applicable to 3D volume data with different properties according to relevant physical laws and equations. With reliable physical and mathematical basis, this method is the most frequently used illumination mode for volume rendering.

Varying density emission model treats any object as a continuously distributed particle light source system. Object space is filled with particle clouds. Each particle can emit lights. Illumination is computed through accumulating the contribution from particle past through by the light towards light intensity. Although there are different microscopic explanations, this type of model has the same result as that of active-attenuation model.

There were evaluated different design configurations by building detailed hardware models of varied widths and capabilities. We then calculate encryption rate by synthesizing the models to obtain timing estimates. Our systematic approach allowed us to study the tradeoffs between chip area and performance. We showed that the highest-performing and most cost-efficient design is the 4-wide combining configuration. Rijndael, the new AES standard, runs 2.25 times faster on a 360MHz CryptoManiac. Our analysis of the original and optimized algorithms suggests that there is more opportunity to speed up cryptographic processing. We are considering improved functional unit designs as well as more aggressive circuit implementations.

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УДК 537.86/.87:530.182

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QUALITATIVE AND NUMERICAL ANALYSIS OF LASERMODEL WITH OPTICAL INJECTION

Abstract: The nonlinear processes plays important role in the development of new communication systems and computing elements. Understanding of laser instabilities is necessary for developing control techniques. From a dynamical systems point of view, semiconductor laser systems are very attractive due to the fact that they show an intriguing variety of complicated dynamics. Lasers including semiconductor, solid-state with the additional external perturbation produce temporal and spatial instability. An optical injection is an example of such perturbation. External perturbations may destabilize or induce the sustain intensity oscillation.