Fraunhofer Institut Nachrichtentechnik Heinrich-Hertz-Institut

Remote Game Play

Low Delay Streaming of 3D Graphics

Heinrich-Hertz-Institut
science in action

Features

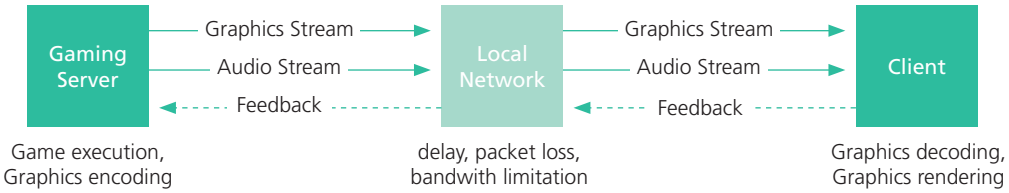
- Streaming of 3D graphics over local networks
- Interception of graphics commands without modification of existing games
- Supports OpenGL and SDL
- Low delay streaming for remote game play
- Compression, caching, and state simulation for increased efficiency
- Video streaming for end devices without rendering capabilities
- Applications: Interactive gaming in hotels, cafes, and home environments, terminal for remote visualization

Modern computer games pose high demands on CPU power and are usually only available on high end PCs and game consoles. In order to enable ubiquitous gaming in a home environment, hotel, or café, a 3D graphics streaming solution has been developed. From a server executing the games, the graphics commands are intercepted, encoded and streamed to low cost end devices, where they are rendered locally. The object-based approach offers high visual quality at low delay, crucial for gaming and interactive graphics applications.

Streaming of 3D Graphics

We have developed a low delay system for streaming graphics over a local area network with the special emphasis on computer games. We target at game applications in hotels, cafes, or home environments, where multiple and ubiquitous game play are desired.

One approach often used to display graphics output remotely, is to render the graphics locally, grab the framebuffer content, encode the frame using a standard video codec like H.264 and to transmit the output to the client as a video stream. This has the advantage of predictable bit-rates, no requirement of hardware accelerated rendering at the client, and independence of the graphics scene complexity and features. However, video encoding of high resolution output is computationally very demanding and has to run in parallel on the same PC with the computer game. With that technique, the execution of multiple games on one server is extremely difficult since this would require parallel encoding and the games would have to share a graphics card.



Besides the video streaming approach, that we use for end devices without hardware accelerated rendering capabilities, we also intercept the graphics commands being sent to a graphics library like OpenGL or Direct3D. The commands are encoded and streamed to the client device where they are decoded and rendered locally. Although this requires a graphics chip at the end device, we avoid the encoding complexity of video compression at the server as well as the usage of its graphics board. Therefore, multiple games can be executed on one PC necessary for providing game services at hotels or other public places. Also, streaming graphics content can be started as soon as the first commands arrive and waiting for the entire frame before starting the render process can be avoided. Further reductions in delay are achieved by intelligent caching and efficient coding, while a graphics state simulation avoids feedback information returned from the client's graphics board. The combination of these techniques finally enables interactive game play over local networks.

Competencies

The Computer Vision & Graphics group works on enhanced algorithms and software implementation in the field of 3D image and video processing:

· Facial expression analysis and animation
· Face scanning
· 3D reconstruction and object tracking
· Virtual and augmented reality

For more information visit us at: http://ip.hhi.de/comvision_G2/research.htm

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