AUDI KONFUZIUS-INSTITUT INGOLSTADT

AKII Microlab

Technische Hochschule Ingolstadt

Bachelor/Master Thesis

Neural Network Avatar Reconstruction in Remote VR Systems

Problem description

In collaborative VR scenarios with remote sites, data must be transferred through network. The amount of data is therefore limited by the given bandwidth. Also, the data transfer is prone to network latency which is induced by a variety of factors like signal speed and time processing / buffering in network nodes. The larger the amount of data to transfer, the larger is the liability to network congestion which induces additional latency. Therefore, it is preferable to limit the amount of transferred data as far as possible. An approach capable to overcome such problems is compressive sensing, which can use deep learning through the capability to represent many signals using a few coefficients in a suitable representation. The project proposes the development of a system capable of learning the inverse transformation (i.e. generating an image out of tracking data) from measurement vectors to signals using a neural network. Such an approach will allow learning both a representation for the signals / data being transmitted and an inverse mapping approximating a recovery. Deep Networks are a good candidate for such a task, and especially Generative Adversarial Networks (GAN) have been shown to be quite adept at synthesizing novel data based on training samples, especially from noisy and small amounts of data. Such a network is forced to efficiently represent the training data, making it more effective at generating data similar to the training data. The system will be employed both locally and remotely in the avatar reconstruction to allow the rendering to be more accurate.

Tasks

- Study the basics of data bandwidth impact on remote VR avatar reconstruction.
- Investigate deep neural networks for data compression and recovery.
- Design and implement a neural network learning system using GAN.
- Test and evaluate the data reconstruction against ground truth (i.e. camera tracking system).

Required skills

Strong programming experience, machine learning and algorithms, signal processing.

Preferred field of study

BA/MA Computer Science, BA/MA Mechatronics(Robotics)

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