Development and Evaluation of a Ingame Latency Compensation Technique Artificial Neural Networks

Thema:
Development and Evaluation of a Ingame Latency Compensation Technique Artificial Neural Networks
Art:
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BetreuerIn:
David Halbhuber
BearbeiterIn:
Julian Hoepfinger
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Hintergrund

“Latency from a general point of view is a time delay between the cause and the effect of some physical change in the system being observed” [1]. Latency in video games impairs the performance of the player and game experience. The performance in games, which require precision and have tight deadlines like Counter-Strike: Global Offensive, is dependent on the latency [2, 3]. There are three main latency compensation techniques to improve game experience and performance [4].

• Delayed input techniques try to add delay to local actions to allow simultaneous execution by all clients [4, 5]. • Time-offsetting techniques enable a rollback to the previous state of the game [4, 5]. • Predictive techniques estimate the occurring events in the game from the locally available state [4, 5].

The goal of this work is to build a predictive system for Counter-Strike: Global Offensive using artificial neural networks (ANN). ANNs have been successfully used in computer vision tasks, such as pattern recognition in images [6]. One problem with ANNs is their long runtime due to internal complexity [7]. If used for latency compensation in video games, the ANNs inference needs to be fast and lightweight. If inference takes too long an ANN based latency compensation technique ultimately leads to an increase in overall latency.

This work aims to build and evaluate a predictive system for the video game Counter Strike: Global Offensive.

Zielsetzung der Arbeit

The first step of the work is creating a data set for Counter-Strike: Global Offensive. The data set

includes pictures of game scenes and the user input at this frame. There are two approaches to collect this data. The first one is parsing the replay files and collecting the necessary data. The second approach is used, if the replay files are not providing enough data. Here the user input is logged by a program during some volunteers playing the game. The next step involves developing an ANN to predict the upcoming user input based on the current frame.

After training the ANN, it is evaluated in various scenarios. The goal is to determine if the developed predictive system is practicable in Counter-Strike: Global Offensive.

Konkrete Aufgaben

Literature research Create a suitable dataframe for ANN training *Train the latency compensation model* Evaluate the developed model *Write the thesis

Erwartete Vorkenntnisse

• Tensorflow, Pytorch or Keras • Programming in C++/Python and Unity • Data analysis

Weiterführende Quellen

[1] Latency. (2021). Wikipedia. https://en.wikipedia.org/wiki/Latency_(engineering), Retrieved: 21.04.2021. [2] Claypool, M., & Claypool, K. (2006). Latency and player actions in online games. Communications of the ACM, 49(11), 40-45. [3] Claypool, M., & Claypool, K. (2010, February). Latency can kill: precision and deadline in online games. In Proceedings of the first annual ACM SIGMM conference on Multimedia systems (pp. 215-222). [4] Savery, C., & Graham, T. N. (2013). Timelines: simplifying the programming of lag compensation for the next generation of networked games. Multimedia Systems, 19(3), 271-287. [5] Sabet, S. S., Schmidt, S., Zadtootaghaj, S., Naderi, B., Griwodz, C., & Möller, S. (2020, May). A latency compensation technique based on game characteristics to mitigate the influence of delay on cloud gaming quality of experience. In Proceedings of the 11th ACM Multimedia Systems Conference (pp. 15-25). [6] Albawi, S., Mohammed, T. A., & Al-Zawi, S. (2017, August). Understanding of a convolutional neural network. In 2017 International Conference on Engineering and Technology (ICET) (pp. 1-6). Ieee. [7] Cai, E., Juan, D. C., Stamoulis, D., & Marculescu, D. (2019). Learning-based Power and Runtime Modeling for Convolutional Neural Networks.