Work in Distributed Interactive Applications at NUI Maynooth

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Abstract

Distributed Interactive Applications, such as networked games, are one of the most important and popular computer applications available today. However, their successful deployment is hampered by the limitations of the underlying network connecting participants, particularly the deleterious effects of lag and jitter. The Distributed Interactive Applications Group at NUI Maynooth has undertaken substantive research on overcoming these limitations for more faithful shared interactivity in such applications. In this poster, a brief overview of the contribution of the group is given with particular emphasis given over to results in psycho-perceptual analysis, compression parameters, behavioral modeling for entity state prediction and network modeling.

1. Introduction

Distributed Interactive Applications (DIA), now represent one of the most important factors of the multi-billion dollar games industry. One of the most popular examples is World of Warcraft, which currently has approximately 5 million subscribers.

However, the successful deployment of DIAs is hampered by the limitations of the underlying network connecting participants. Network latency and jitter, unreliable data transmission, and bandwidth restrictions all serve to directly affect the consistency that needs to be maintained for interaction between participants to be fruitful [1]. Because of this, much research time has been committed to dealing with the problems presented by network limitations. Here, we describe the work of the DIA Group at NUI Maynooth. Work there concentrates on overcoming these limitations for more faithful shared interactivity in such applications.

2. The work of the DIA Group

Situated in the National University of Ireland, Maynooth, the Distributed Interactive Applications Group (DIAG) was formed in 2003, and currently has 8 members. Since it's inception, the key contributions of the group have been in the area of network traffic reduction and network latency masking using predictive models within peer-to-peer DIAs. A predictive model attempts to reduce the amount of network traffic transmitted by using entity dynamics information, such as velocity and acceleration. The industry standard predictive approach is dead reckoning [2].

Initial work focused on improving on dead reckoning using a statistical predictive technique known as the Hybrid Strategy Model [3]. This approach uses strategy models in order to predict the behaviour of entities in the long term, in comparison to dead reckoning, which only employs short-term models. It was shown to successfully reduce the amount of network traffic transmitted within a Distributed Interactive Application when compared to dead reckoning.

Leading on from this work, our current research can be split into three separate strands. The first strand focuses on improving the performance of the dead reckoning approach. Neuro-reckoning employs neural networks in order to better choose the entity dynamics information used to predict entity behaviour [4]. This novel approach was shown to result in a reduction in network traffic transmitted in comparison to traditional dead reckoning. The limitations of the spatial threshold traditionally used with dead reckoning were then examined, leading to the proposal of the time-space threshold [5][6]. This method uses spatial inconsistency measures and the length of time the spatial inconsistency has lasted in determining when to transmit an update.

The second strand of work determines how psycho-perceptual bounds can be used in choosing valid error thresholds for use with predictive approaches [7]. This research aims to answer questions such as, for example, how far can the virtual world view vary from client to client without users noticing?

The final strand of work considers the effects of varying background traffic, transmission paths, numbers of participants and entity dynamics on the consistency of the application. This work has resulted in the successful development of a test-bed using the Torque Games Engine for our techniques, allowing us to better understand problems that came with the real world deployment of our methods [8].

3. References

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