Adaptive Delta-Causality Control with Prediction in Networked Real-Time Game Using Haptic Media
Yuji Kusunose, Yutaka Ishibashi, Norishige Fukushima, Shinji Sugawara
Nagoya Institute of Technology, Japan

Introduction
We expect that using haptic media gives players a higher sense of immersion.

• Related Work and Problem
We used the adaptive Δ (delta)-causality control scheme with adaptive dead-reckoning, which adjusts the output timing between terminals, for consistency and causality in a networked air hockey game using haptic media.

Since the scheme outputs not only information received from the other terminals but also information of the local terminal after buffering, the interactivity deteriorates.

• This Work
➢ Proposal of the adaptive Δ -causality control scheme with prediction in order to keep the interactivity high.
➢ Investigation of the effect of the proposed scheme by QoE (Quality of Experience) assessment in the networked air hockey game using haptic media.

Networked Air Hockey Game Using Haptic Media

➢ Each user operates his/her mallet with a haptic interface device (PHANToM Omni), and he/she hits the puck toward his/her opponent’s goal.
➢ The mallets and puck move only on the air hockey table.
➢ Each user’s mallet is operated on this side of the shared space at his/her terminal.
➢ When a mallet touches the puck, a player of the mallet feels force feedback.
➢ The owner of the puck, who has hit the puck last, calculates the position and velocity of the puck, and sends the information to the other terminal.

Assessment Results

We proposed the adaptive Δ-causality control scheme with prediction and investigated the effect of the proposed scheme by QoE assessment.
➢ We can keep MOS high by using prediction even if the network delay is large.
➢ There exists the optimal value of the prediction time.

Conclusions