

## 4 A Supervisory Data-Traffic Controller in Large-scale Distributed Virtual Reality Environments

Ali Akgunduz<sup>1</sup>, Prashant Banerjee<sup>2</sup>

<sup>1</sup> Department of Mechanical and Industrial Engineering, Concordia University, 1455 de Maisonneuve Blvd West, H549-28, Montreal, QC H3G 1M8, Canada

<sup>2</sup> Department of Mechanical and Industrial Engineering, University of Illinois at Chicago, 842 W. Taylor St, ERF: 2039, Chicago, IL 60607, USA

In this chapter, an efficient technique for distributing the data in collaborative virtual reality simulations is presented. The technique described incorporates the culling and level of detail concepts in virtual reality (VR) to obtain cell-based bounding volumes in each virtual environment. Defined bounding volumes are utilized in filtering the data that is transferred between different virtual environments in the simulation system. Depending on the nature of the data and the current relationships of the virtual cells and collaborator's bounding volume, the selection of one of the data-sharing options (real-time or delayed data transferring) by utilizing the supervisory control system is described.

**Keywords:** *Collaborative Virtual Reality; Data Traffic; Supervisory Controller*

### Symbols

$\rightarrow$	pointer in C++ programming language
$\alpha$	rotation about X-axis
$\beta$	rotation about Y-axis
$\gamma$	rotation about Z-axis
$C_i$	$i^{\text{th}}$ virtual cell
$R_j$	$j^{\text{th}}$ room
$t_T$	travelling time