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# Coding of virtual human motion

by

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### Abstract

The growing use of realistic virtual embodiments of human participants in virtual environments brings the difficulty of efficiently communicating and storing the actions of these virtual humans. It is only recently that researchers have started to bring together motion capture and other natural input technologies with realistic, real-time graphic representations of humans. A highly articulated and realistic virtual human can easily generate orders of magnitude more information than traditional synthetic objects such as vehicles and aircraft.

In this thesis, we approach the problem of dealing with virtual human motion data from a solid mathematical and engineering background. A basic introduction to virtual environments, networked environments and virtual humans is given. Analogous to the route taken by speech and video coding, we analyze the source data and investigate various implementations of coding techniques for this “new” class of data. A number of waveform coding and model based coding methods are implemented, and the results compared. We address the current disparity between facial expression coding methods and full body motion coding methods. This work contributes towards the MPEG-4 standardization process, and more specifically towards the work done by the SNHC (Synthetic/Natural Hybrid Coding) group.

## Coding of virtual human motion

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### Samevatting

Die toenemende gebruik van realistiese virtuele voorstellings van menslike deelnemers in virtuele omgewings bring effektiewe kommunikasie- en bergingsprobleme mee. Navorsers het eers onlangs die gebruikmaak van intydse bewegingsmonsters en ander natuurlike beheertegnologieë versoen met intydse grafiese voorstellings van mense. 'n Hoogs geartikuleerde en realistiese mensmodel kan ordes meer informasie genereer in vergelyking met tradisionele sintetiese voorwerpe soos voertuie en vliegtuie.

In hierdie tesis benader ons die probleem van virtuele mensdata vanuit 'n gevestigde wiskundige en ingenieursagtergrond. 'n Oorsig ten opsigte van virtuele omgewings, netwerkomgewings en virtuele mense word gegee. Soortgelyk aan die roete wat geneem is in die veld van spraak- en videokodering, word die brondata geanaliseer en 'n aantal koderingsimplementasies ondersoek vir hierdie "nuwe" klas van data. Ons spreek die huidige gebrek van vollyfkoderingsmetodes in vergelyking met die tans weldeurdagte gesigskoderingsmetodes aan. Hierdie werk dra by tot die MPEG-4 standaardiseringsproses, en meer spesifiek, tot die werk wat gedoen word deur die SNHC (Synthetic/Natural Hybrid Coding) groep.



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