Autonomous gaze animation for socially interactive virtual humans during multi-party interactions

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Game Research Focus Area, Seed Funding Presentation, January 21, 2016
Our goal: Simulating group (multi-party) social interactions
Vision and Motivation

• Improving soft skills with Immersive Role-Playing Games
  • Negotiation skills
  • Communication skills
  • Problem solving
  • Conflict resolution
  • Emotion management
  • Teamwork and collaboration

• Application area:
  • Job training
Goldman Sachs: VR will overtake the TV market by 2026

In an analyst note today, Goldman Sachs explained the thinking behind its belief that virtual reality — which notoriously flopped hard in the early nineties — is going to be such a huge success this time around that it’ll overtake the TV market by 2026.

“So, what has changed that differentiates the current state from the 1990s flop? The answer is the technology, in our view,” Goldman Sachs writes.
Immersive Role-playing Games

- Artificially-driven characters that can take roles in real-life simulations
  - should be engaging
  - encourage/challenge the user
  - have emotional/social intelligence
  - have real-time interactivity
  - high-fidelity (realistic appearance and behavior)
  - social and physical presence
Research on multi-party interactions

• Interaction with virtual characters **mainly focus on one-to-one interactions.**

• **Multi-party interactions** is an **open research area.**

MACH: My Automated Conversation Coach, MIT Media Lab, 2013

Eva Virtual Tutor, MIRALab, Switzerland, 2009
Existing work on multi-party interactions

Microsoft Research Redmond, 2009

IMI, NTU, Singapore, 2014
Challenges in multi-party interactions

- Speaker identification
- Addressee detection
- Engagement modelling
- Interruptions and overlaps during speech
- Modelling turn-taking behavior
- Emotion, personality, roles

Tasks in the project

Task 1: Scene understanding for multi-party interactions
Duration: (October 2015 - August 2016)

Task 2: Virtual Human Controller for Behavior Generation
Duration: (October 2015 - August 2016)

Task 3: Integration
Duration: (December 2015 - August 2016)
Task 1: Scene understanding

- Speech recognition
  - speech content confidence

- Sound localization
  - sound type angle

- Head pose tracking
  - userID
  - userlocation
  - headpose

Multi-user tracking and fusion

- World and User Model
  - participant entered/left
  - event ID
  - person name location

- Fusion:
  - speaker identification
  - addressee detection
  - user re-identification

- Multi-user entrance/leave mechanism
  - participant speech
  - event ID
  - speaking person content
  - listening person

Feedback from v/h/robot control

World query (e.g. get location)
Engagement Intention Detection
## List of features

<table>
<thead>
<tr>
<th>Feature</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change of distance and orientation</td>
<td>If the user is not only passing by but staying stable for a while</td>
</tr>
<tr>
<td>Greeting/calling by name</td>
<td>If the user calls by name or greets explicitly</td>
</tr>
<tr>
<td>Waving hand</td>
<td>If the user waves hand</td>
</tr>
<tr>
<td>Distance</td>
<td>If the user is closer to the vh/robot</td>
</tr>
<tr>
<td>Orientation</td>
<td>If the user configures his/her body towards the vh/robot</td>
</tr>
<tr>
<td>Closeness to the center of FoV</td>
<td>If the user is closer to the center of the field of the view of the vh/robot</td>
</tr>
<tr>
<td>Speaking</td>
<td>If the user is speaking</td>
</tr>
<tr>
<td>Smiling</td>
<td>If the user is smiling</td>
</tr>
</tbody>
</table>
Task 2: Virtual Human Controller

• Lip-synchronized speech
• Facial expressions
• Gestures
• Gaze
• Based on Unity-3D and CereVoice Text-to-Speech System
• Driven by Behavior Mark-up Language (BML):
  http://www.mindmakers.org/projects/bml-1-0/wiki
Research page and video

http://www.uu.nl/en/research/virtual-worlds/virtual-interaction
Thank you

Questions?

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