V-Man Generation for 3-D Real Time Animation

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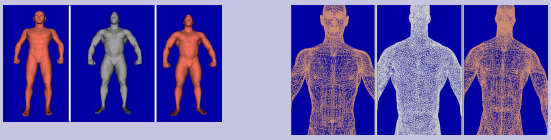
The V-Man project has developed an intuitive authoring and intelligent system to create, animate, control and interact in **real-time** with a new generation of 3D virtual characters: **the V-Men**. It combines several innovative algorithms coming from Virtual Reality, Physical Simulation, Computer Vision, Robotics and Artificial Intelligence.

1. Creation of the V-Man character

The key to the system is the automated creation of realistic V-Men, not requiring the expertise of an animator. It is based on the acquisition of real human data captured by 3D body scanners. The first a generic model is conformed to the scanned data to generate an animatable body model (Fig 1), secondly body meshes are skinned (Fig 2) and finally 3D garments are dressed on the body (Fig 3).



(a) (b) (c) (d) (e) (f)

Fig. 1. Generic model (a), 3D imaged body data (b) final conformed result (c), generic mesh (d), 3D imaged body mesh (e) and final conformed mesh (f).

Fig. 2. Skin weight distribution

Fig. 3. 3DGarment generation from scanned data

2. Build skills in the character

Skills are manufactured during the character creation. Each skill is a short sequence of motion capture animation defining a single action. Physical weights are assigned to body parts and constraints of the joints are defined for real-time physical simulation of the body (Fig 4).

3. Real-time animation in the V-Man environment

V-Men synthesise motion at runtime according to their environment, their task and their physical parameters. Given a high-level task like "walk to that spot" or "get that object", a V-Man generates the complete animation required to accomplish the task (Fig 5). In doing so, the character draws upon its unique set of skills. Transitions between movements require combination of motion blending algorithms, animation sampling methods and real-time physical simulation of the body. More over a path planner based on genetic algorithms allows a virtual character to autonomously compute collision free paths in real time according to its movement constraints as well as its areas of interest (Fig 6). Interaction is intuitive between the user and the V-Men: a V-Man understands high-level multimodal commands such as “go there” or “put that there”, where the command is expressed through out a voice control system while the deictics “that” and “there” are defined by mouse clicks. Moreover V-Men are capable to communicate through naturally spoken sentences with users using a natural language dialogue system.

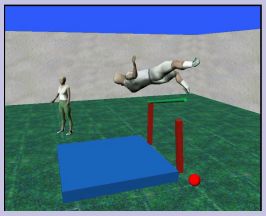


Fig. 4. Physical simulation of jump

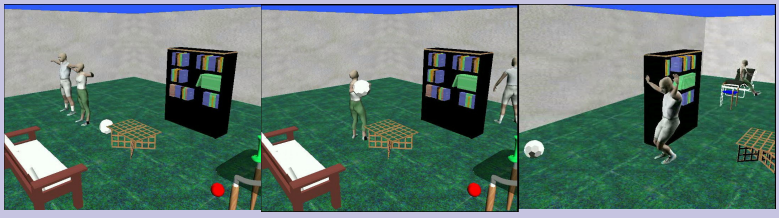


Fig. 5. Interaction with virtual environment

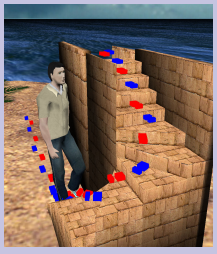


Fig. 6. Path of Foot steps

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