Carnival: a modular framework for automated facial animation

aira. Carnival: a modular framework for automated facial animation. Poster at SIGGRAPH 2010, 2010. Bronze award winner, ACM Student Research Competition

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SIGGRAPH2010

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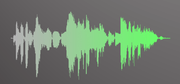
Social Signal Processing Network

Problem

Facial animation is difficult to do convincingly, particularly when synchronizing with speech. There are various ways to automate facial animation:

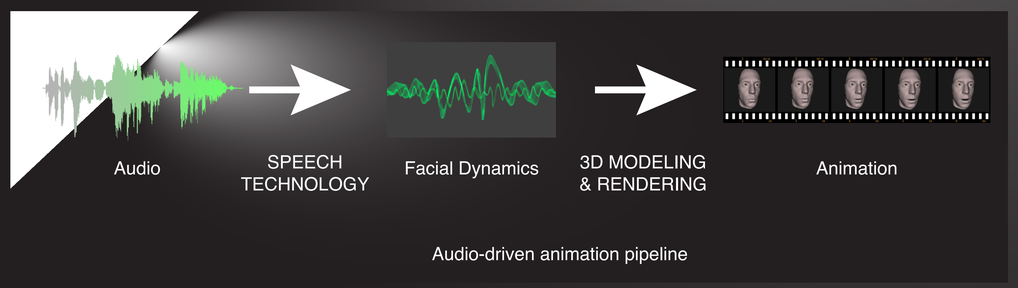
- Performance-driven animation

- Audio-driven animation



- Audio-visual text-to-speech synthesis (AVTTS)

The problem with these solutions is they bring together software and data formats from different fields—in particular speech technology and graphics technology—that are not well integrated.



Audio-driven animation pipeline

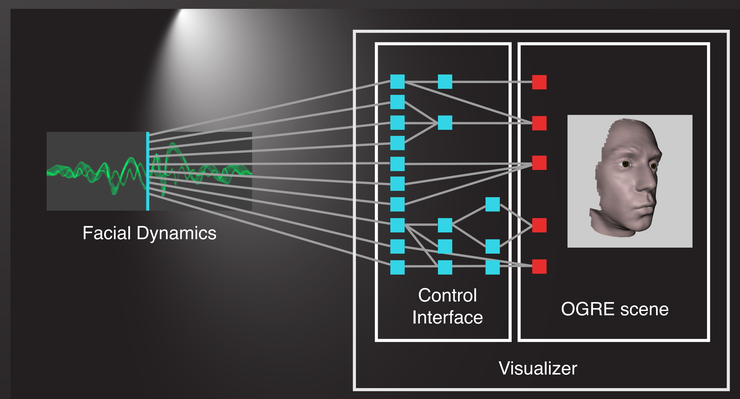
- Conversion of facial dynamics into animation is cumbersome, slow and offline.
- Lack of live connection between speech and rendering pipelines. Difficult to backtrace animation problems, or see outcome of edits in the speech processing level.
- No standard control interface for different facial models, so adaptation process must be repeated in each case.

Solution

Software framework called “Carnival” which places speech and graphics components within a single object-oriented system.

- Fast and automatic end-to-end processing
- Real-time animation and linked display of time-varying representations for instantaneous feedback/feed-forward information
- Standardized object interfaces for easy integration of new components

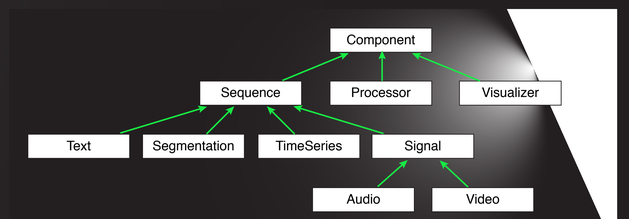
The core of our solution is a platform independent C++ API.



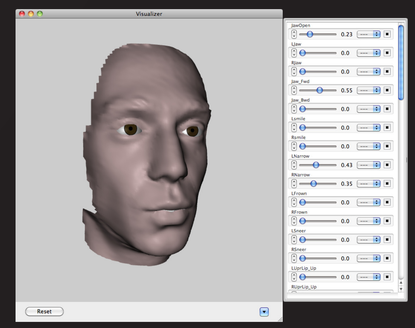
Schematic of the *Visualizer*, a real-time, modular animation component that is a key class in the Carnival API. The Visualizer consists of a standardized Control Interface and an OGRE scene. The Control Interface comprises a set of deformation parameters (DPs) (blue squares), which may be bound to the current time point in a time series (Facial Dynamics), or to other DPs by linking functions. Ultimately, DPs link to deformers (red squares) of the facial model in the OGRE scene. The Visualizer serves as an image decoder, converting deformation parameter vectors to images. It can accommodate any facial model created in standard animation packages.

Applications

- API may be used for fast prototyping of automated animation systems
- Suitable for performance-driven, audio-driven, or AVTTS applications
- Our implemented tool built on the API is suitable for in-house industrial or academic use



The *Component* class hierarchy of the Carnival API. Components are objects that can be loaded, edited and saved. They include both data objects and the processing modules out of which systems are buiit.



GUI window for a Visualizer, with real-time output and manual slider controls for the deformation parameters.