STROKES GROUPING AND TOPOLOGY-PRESERVING DEFORMATION FOR ROUGH STRAIGHT-HEAD ANIMATION

Proposal for a 2nd year Master internship
(subsequent PhD funding granted)

Location: Inria Bordeaux Sud-Ouest, MANAO research team (http://manao.inria.fr)
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Context

In 2D cartoon animation, two main workflows are used: pose-to-pose and straight-ahead [1]. The former consists in first defining key drawings at specific times, and then in drawing the inbetween frames (12 to 24 per second) to produce the illusion of a continuous motion. With straight-ahead animation, the animator sequentially draws each frame, deforms it, and redraws over the deformed drawing at a later frame, “never” looking back in time.

Computer-animation tools have been proposed [2,3] to mimic the pose-to-pose process, trying to partially automatize the inbetweening step through strokes interpolation (Figure 1). They usually represent the drawings as a graph of strokes, and either try to match those graphs at subsequent keyframes [2] – which can be very difficult when their topology changes – or build those correspondences by construction during user interactions [3].

Figure 1: Images (a) and (e) are the keyframes. The inbetweens (b-d) are automatically generated using [2]. The rightmost figure superposes the 5 frames and visualizes the interpolation trajectories.

Unfortunately, those approaches only support clean smooth input networks of curves, provide limited drawing and animation controls, and are not suitable for straight-ahead animation.

Goals

The overall goal of this internship will be to develop novel techniques to manipulate sketchy drawings (a.k.a., roughs) and interpolate between them to produce straight-ahead animations.

In rough drawings, multiple strokes may represent the same underlying curve. We thus need to identify these groups of strokes before any further processing. It would be unnatural for artists to specify such groups while they are drawing, as this could break their “creative flow”. Besides, rough drawings are often not drawn sequentially; each implicit curve is rather refined in turn by progressively adding new strokes. The first goal will thus be to develop a tool assisting the artist to segment a rough drawing into consistent groups of strokes once it is fully drawn. We want to
investigate the possibility to combine existing techniques based on user-annotations, such as scribbles (e.g., [4]), with automatic MLS-based approaches (e.g., [5]).

The second goal will then be to estimate correspondences between such implicitly defined curves at successive frames. With a straight-ahead animation workflow this task should be easier since a global registration between two successive drawings is induced by the deformation used by the animator. Nevertheless, we still need to provide artists with deformation tools that guarantee a bijective mapping between drawings by construction, such that both sets of strokes can be transformed to the intermediate frames. Most computer-assisted 2D animation software offer such functionalities, but few of them allow local deformations and, if they do, their interface is limited to control points of regular grids. We want to investigate interaction metaphors that better fit into the drawing pipeline (e.g., brushes).

Finally, we want to allow artists to control the dynamics of the animation between two keyframes, which mostly corresponds to the spacing of drawings. In traditional 2D animation, this is specified by spacing charts (Fig. 1, bottom) either on the side or along the main trajectory of the drawing. Time permitting, the third goal of this internship will be to develop interaction metaphors inspired by these charts to edit spacing properties for a single group of strokes but also across groups, to delay or speed up parts of the drawing for example.

Requirements

The successful candidate should have taken Master courses in Computer Graphics and have a strong experience in C++ programming. Additional skills in some of the following topics would be appreciated: expressive rendering, user interface, numerical optimization. Personal interest for drawing and 2D animation would be a plus.

References


