DirectCam: A Gestural System for Animatic Creation

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1 A 3D Gesture System for Animatics

In film production, hand–drawn storyboards are used to generate a roughly–animated *animatic* to explore visual ideas easily, without refining motion to a detailed performance. Our DirectCam system allows nontechnical users such as directors to quickly create and refine an animatic by gesturally controlling the placement and animation of sets, characters, and the camera. We use gloves augmented with reflective markers and a Vicon[1] optical motion capture system to track the user's hand position and posture. Users begin by importing a storyboard reel to overlay atop the camera view and then incrementally work by bringing in the set, animating the camera, and bringing in characters and props while applying rough animation to each as needed. A small set of hand postures are used to select a task such as camera navigation, object manipulation, or keyframe specification, which are controlled directly by subsequent hand motion. For fast access to scene elements, we reference sets, cameras, characters, and props on shelves that automatically appear as users reach to the edge of the display. The lightweight gestural interface, in conjunction with a large display, allows for fast learning and effective communication with collaborators in a group setting.

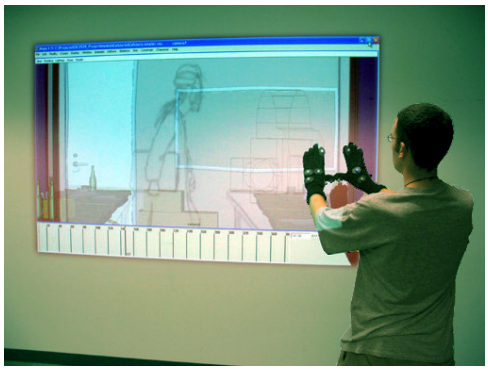

Figure 1: *A user aims the camera in a through–the–lens perspective with a director's "framing" posture. A storyboard frame is overlaid on the view of the 3D set.*

2 Camera Navigation and Animation

Since an important goal of an animatic is to communicate the director's cinematographic intent in addition to object placement and movement, we have developed a small but effective set of techniques for camera interaction. We model our interaction on the workflow of live action directors, who plan shots by arranging motion through the set to capture desired spaces while often looking through the lens to maintain appropriate composition. Inspired by this, we allow users to navigate locally with a through–the–lens perspective, as well as globally, using an external point of view. During through–the–lens control, camera pan and tilt is controlled directly with hand movement in the director's "framing" posture (Figure 1), allowing for a quick means of exploring the scene and aiming the camera. Camera movement is accomplished by a grasping gesture over the camera's on–screen "handle" to translate the camera along its local axes; movement is directly controlled by hand movement relative to the plane of the display. By performing a quick "pull–back" gesture, the user can transition the system to a third–person external view, where the scene camera is visible along with the entire scene to allow for an understanding of the camera relative to the entire scene. The external view may be controlled as before, but the user may also select and directly manipulate the scene camera to accomplish large–scale changes. Camera animations may be created with a quick grasp and drop gesture of the camera towards the animation timeline to set a keyframe. The timeline can be directly grasped and manipulated to seek to any particular frame; this can be repeated to set arbitrary keyframes.

3 Object Manipulation and Animation

Once a 3D set has been loaded, the user can select and insert into the scene any number of pre–made props or characters, which are available through the shelf. Standard 3D primitive shapes can also be inserted into the scene via selection from a separate shelf or by using specialized command gestures. Once created, any scene object may be selected by the user with a grasping gesture to begin manipulation. Hand translation and rotation relative to the plane of the display are mapped to the scene's world space and directly alter the object's transform to allow manipulation from any angle without having to conform to absolute axes. Objects can be scaled uniformly or along any local axis by grasping with the second hand and using a stretching gesture. Hierarchies can also be created with the separate selection of one object by each hand. Pose–to–pose animation is created in a manner similar to camera animation, as desired poses are dropped onto the animation timeline to set keyframes. Large–scale control over an object's entire animation is accomplished by directly grasping its keyframes and stretching or translating them to adjust an animation's length or starting time. The relative timing of an object's keyframes may also be adjusted with a two-handed rhythmic tapping technique. These techniques have been evaluated with a number of nontechnical users and an experienced animation director in a *Maya*–based implementation of our system with positive results. Using a small set of gestures, our system allows users to easily create animatics without any technical training.

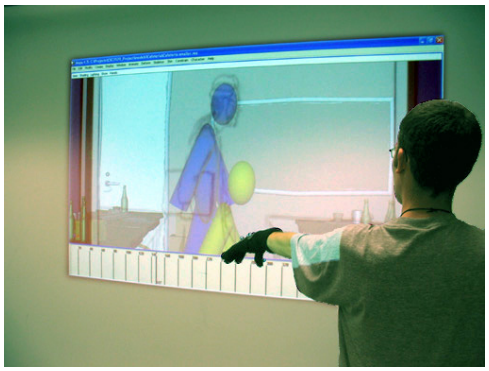

Figure 2: *Once a stand–in character has been posed to match the overlaid storyboard frame, a user creates a keyframe by "dropping" a ghosted copy of the object onto the animation timeline.*

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[1]Vicon: http://www.vicon.com