An Interactive Zoetrope for the Animation of Solid Figurines and Holographic Projections

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(Our Siggraph '10 presentation will be based on a paper of the above title given at IDW '09 in Miazaki Japan)

ABSTRACT

We demonstrate interactive zoetropes that animate holographic images or solid figurines. Unlike previously existing zoetropes, they are capable of aperiodic, interactive behavior. For example, we use them to animate talking character's mouths in real time, in response to human speech.

Zoetropes trace their roots to the early 1800s. Initially developed as parlor entertainment, they inspired the successive-image presentation method used in modern cinema and television. They were typically spinning platters or cylinders around which 2D images were affixed. The device was spun rapidly, and included a method (e.g. slits or mirrors) to strobe the user's view of the images, freezing their translational movement, and overlaying them to create animation.

Fig. 1

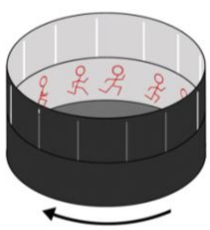


Fig. 2

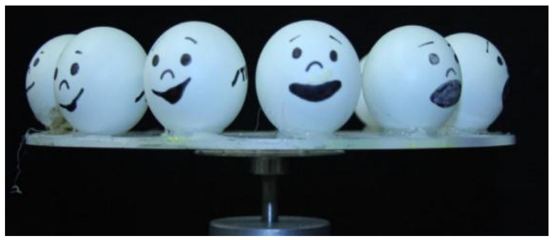
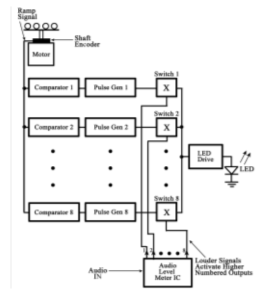


Fig. 3



More recently the zoetrope has enjoyed a resurgence with global LED strobe illumination replacing slits, and solid figurines replacing 2D images. These new zoetropes still show all of the figures in motion at once, and they are still only capable of depicting periodic motion; the show repeats after each revolution of the platter.

Our interactive zoetropes however allow us to instantaneously vary the order in which the images are displayed each revolution, allowing us to change the course of the animation in real time. This supports non-repetitive and non-trivial animation using a small, finite number of images or frames. Other researchers and commercial vendors have explored video animation based on audio input. In contrast, our approach allows instantaneous interactive animation of physical objects and holograms.

We have prototyped 3 different types of interactive zoetrope. A first example animates whimsical faces drawn on ping-pong balls (Fig. 2) affixed to a small rotating platform. A rotary shaft encoder and associated electronics (fig 3) determine which figurine gets lit, based on an audio input level.

Fig. 4

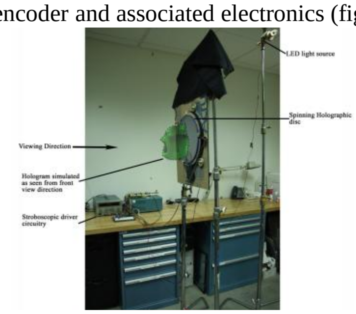


Fig. 5

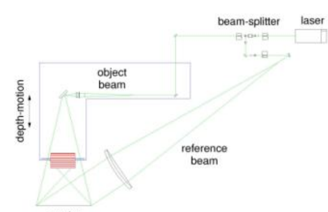
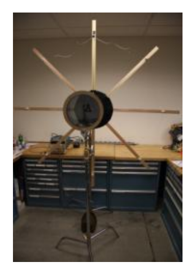


Fig. 6

Fig. 7



In the case of this "Ping Pong Ball Zoetrope," as a person speaks into a microphone (Fig. 4) the whimsical ping-pong ball character mimics their talking mouth movement.

A second version of our device spins a holographic plate (fig. 5) manufactured by Holorad Inc. The hologram (fig. 6) has 8 frames of animation of a "monster" character. Each frame has 42 depth planes, and is read out depending on the angle of an external light source to the back face of the transparent hologram. We rapidly rotate the hologram in its plane while strobing a high power LED controlled by an analog of the electronics used in the previous incarnation. The effect is that a luminous 3D image floats in front of the hologram, and appears to speak (moves face and mouth) in sync with a person speaking into a microphone.

A final version (fig. 7) retains the hologram but instead of spinning it, we essentially "spin" its lighting. Fixed LEDs at 45 degree angles around the hologram are lit synchronously to the instantaneous volume level of a person speaking into a microphone, and again animate the monster.

We would plan to demonstrate the Ping-Pong Ball Zoetrope, and the stationary hologram interactive zoetrope at Siggraph '10.

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