Chapter 9
Holophonor: Designing the Visual Music Instruments of the Future

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ABSTRACT

This chapter considers the technological feasibility of the Holophonor, a fictional audio-visual instrument from the science fiction cartoon Futurama. Through an extended discussion of the progression of visual music towards interactive models, it was proposed that the Holophonor is an example of an ideal visual music instrument and could be constructed in the near future. This chapter recapitulates the key features of the fictional instrument. An evaluation of the technological feasibility of building a real-world version of the Holophonor is then given, with reference to existing technologies. In particular, it is proposed that the Holophonor’s ability to respond to the emotional state of the performer may be facilitated by drawing on approaches from HCI and affective computing. Following this, a possible architecture for the Holophonor is proposed.

INTRODUCTION

This chapter considers the technological feasibility of the Holophonor, a fictional musical instrument of the 31st Century that was featured in the science-fiction TV series Futurama (Groening et al., 2001; Groening et al., 2003). The Holophonor resembles an Oboe, and when played produces holographic images that respond to the mood of the performer. The visual images produced can be compared with Disney’s et al.’s Fantasia (1940), and associated with the artistic field of visual music, in which synesthetically animated visuals follow a musical structure. As discussed in our previous chapter Holophonor: On the Future Technology of Visual Music, the Holophonor can in many ways be considered as an example of the ideal visual music instrument. At once classically musical and capable of creating performances of a high artistic quality, the Holophonor can be

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picked up and played by anyone. While instantly accessible, a great deal of practice is required in order to become proficient and deliver virtuoso performances. Many features of the Holophonor are already demonstrated by existing visual music, and the wider sphere of associated audio-visual artworks and technologies. Nonetheless, there are currently no examples that combine these into a single, convenient, Holophonor-like instrument. We shall therefore proceed by discussing the technical feasibility of each of the main features of the Holophonor, allowing us to consider how these features could be implemented, and which areas require further research. Utilising existing approaches, a possible architecture is then proposed based around available technologies. Through the course of this discussion we will significantly draw upon approaches from the fields of HCI and affective computing, which we propose may provide solutions to some of the more futuristic aspects of the Holophonor design, such as ability for visual animations to respond to the mood of the performer.

**TECHNOLOGICAL FEASIBILITY**

In this section, the feasibility of the Holophonor is considered, based on an analysis of existing technologies and those in development or in early stages of research. This enables us to consider how a Holophonor-like device could be developed, and identify areas where further research may be required. Table 1 recapitulates the key features of the Holophonor.

The feasibility of these features will be considered in turn and where possible, they will be connected with existing technologies. In addition to technologies for creating sounds and visual projections, the nature of the Holophonor is such that it touches upon the integration of technologies with human emotion. This section therefore considers how proposed features of the Holophonor may be achieved using the approaches of affective computing. We also consider the HCI knowledge that exists, and the knowledge that needs to exist, to make the Holophonor successful.

### Table 1. Key features of the Holophonor

<table>
<thead>
<tr>
<th>Holophonor Feature</th>
<th>Description</th>
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<tbody>
<tr>
<td>Sounds</td>
<td>The Holophonor appears to be a reed instrument similar to an Oboe. The performer blows into the instrument and presses keys to produce a sound. The sounds produced encompass a range of traditional orchestral sounds and synthetic electroacoustic sounds.</td>
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<tr>
<td>Visuals</td>
<td>When melodies are performed on the Holophonor, visual images are produced. These are representational in quality, but can include surrealistic or dream-like elements, similar to <em>Fantasia</em> (Disney et al., 1940). Morph transitions can occur between visual scenes.</td>
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<tr>
<td>Projection</td>
<td>Visual images are holographically projected in the space of performance. The projection is able to rescale to fit the size of the venue. In some instances, images can escape beyond the venue.</td>
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<tr>
<td>Emotionality</td>
<td>The sounds and visual images respond to the emotion of the performer. It is necessary for the performer to feel certain emotions in order to perform successfully with the instrument.</td>
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<td>Portability</td>
<td>The device is portable and can be transported in an instrument case and played anywhere, similar to existing horns and reed instruments.</td>
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<tr>
<td>Accessibility</td>
<td>Anyone can attempt to play the Holophonor, but full mastery requires a lot of practice. Virtuoso performance is possible.</td>
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