living floccus:
Floating Volumetric Pixels Using Fog Rings with Stroboscopic Effect

Keina Konno*
Keio University

Yasuaki Kakehi*
Keio University

Figure 1: *living floccus.*

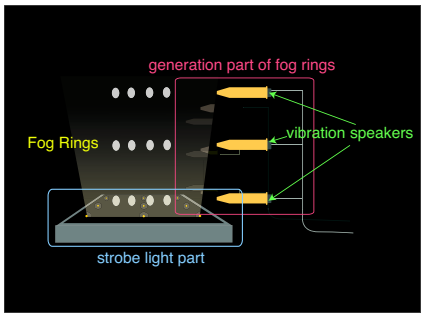

Figure 2: *System design.*

Figure 3: *Volumetric pixels in the air.*

1 Introduction

We can find various aesthetic elements in a series of actions of fog and smoke: appearing, expanding, floating and disappearing. This time, we focus on fog as a material, which forms a pixel, and propose a novel volumetric display system named "living floccus". As shown in Figure 1, this display system can show dot images with fog rings generated by air cannons in the air.

Fog and smoke are often used for atmospheric effects in the entertainment industry such as live theatre, concerts, theme parks. Especially in the field of media art, projection screens utilizing fog have been proposed as a display system that makes use of its features, the motion of air, and flow [Rakkolainen et al. 2005]. On the other hand, several systems (e.g. "for those who see" [Schulze 2010]) have been proposed that construct images utilizing an array of fog rings as pixels. In these previous systems, formed images flow and disappear instantly . In contrast to this, our system can control the positions and patterns of volumetric pixels in the air by combining the fog ring array and strobe light projection.

2 living floccus

Figure 2 shows the system design of the living floccus. The hardware of living floccus consists of two parts: a generation part of fog rings and a strobe light projection part.

We describe technical innovations provided by our system as follows: Firstly, as mentioned above, in this system we utilize a fog ring as a pixel of an image. For generating fog rings, we attached a vibration speaker on the bottom side of a cylindrical container. In addition, through a tube attached to the side surface of the container, there is a continuous input of humidified air generated by a commercially available humidifier. By controlling the motion of the speaker surface, the humidified air are pushed out and a fog ring flies out of a small hole in the top side of the container. While these fog rings flies away instantly, we applied the stroboscopic effect to make pixels remain in the same position. In this system, white LED lights are attached in several points for illuminating the fog rings. Thus, in a dark environment, by forming fog rings at regular intervals and controlling the on/off timing of the LEDs according to the fog interval, we can see the fog rings as if they keep still in the air.

Secondly, we have also developed software for controlling the position and pattern of the volumetric pixels. By controlling of the volume, frequency and phase of the output signal of the vibration speaker, we can change the position and interval of the appeared pixels. For example, when the strobe light blinks in 4Hz, by controlling the on/off action of the vibration speaker in 20Hz, we can change the pattern of every five pixels freely.

Finally, by designing the arrangement of the fog ring generation units, we can develop various types and scales of substantial displays. For example, when we set the units in a line, the system can show two dimensional images in the air by operating the units simultaneously. Furthermore, we can achieve a three dimensional volumetric display with units in a 2D array setting.

3 Applications and Future Works

We have already implemented prototype systems for displaying 2D and 3D pixel patterns. As shown in Figure 1 and Figure 3, this display works as an ambient information board. The display can show not only static images but also animations by changing pixels patterns sequentially. Of course, the image displayed on it is affected from environmental factors such as winds. Audiences can observe the digital information and analog phenomena simultaneously. In addition, since these pixels made of fog rings have high transparency, we can apply this system for Augmented Reality by overlapping the displayed pixel image onto physical objects.

In the future, we are going to implement this system in various scales and situations. In addition, we also plan to propose interactions using gestures and tangible objects.

References

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*e-mail: ykakehi@sfc.keio.ac.jp

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