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Blimps as Performance Media

Hideki Yoshimoto Koichi Hori

Department of Aeronautics and Astronautics, University of Tokyo

This paper describes our concept and practice of blimps as performance media, which amplify performance with their flight movements and additional effects. We cleared design factors of blimps as performance media, which we believe lead to more diversified applications of aerial performance, and implemented four applications based on them.

1. Introduction

Aerial vehicles have been used in entertainment field and realized aerial performances. In this paper, we focus on blimps. With their features of slow speed, softness, canvas-like envelopes, blimps have high potential to be used in aerial performances [Berk 2006, Kawamura 2004, Knowbotic Research, Paulos 1998]. However, design principles of blimps specialized for performances are not clear, and this lack limits diversity of the applications. In this paper, we define blimps used in performances as blimps as performance media and argue on the design factors for them toward novel application of unmanned aerial vehicles.

2. Concept of Blimps as Performance Media

Richard Schechner defines performance as "an activity done by an individual or group in the presence of and for another individual or group." The former individual or group is called "performer" and the latter is called "audience [Shcchner 1988]." We follow the definition of performance by Schechner and define blimps as performance media as "blimps that amplify an activity by performers to audience with their flight movement and additional effects." Additional effects are visual effects and auditory effects.

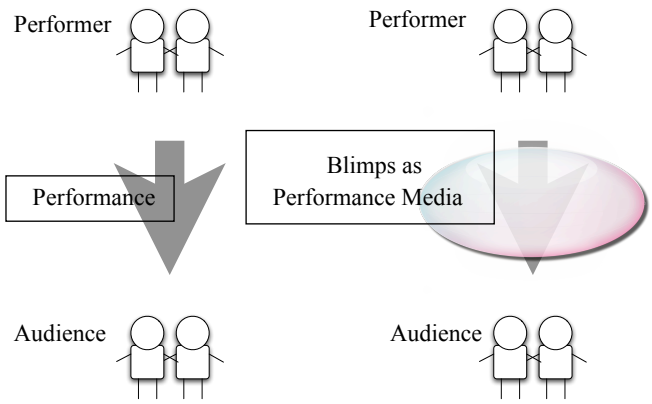

Figure 1. Performance and Blimps as Performance Media

A.I.Lab, Department of Aeronautics and Astronautics, University of Tokyo. 7-3-1, Hongo, Bunkyo-ku, Tokyo.

3. Design

This section describes design factors for blimps as performance media. Scope of performers and flight area are the key factors to determine the style of performance mediated by blimps. Based on the definition in chapter 2, flight movement and additional effects are key factors that determine the behavior of the blimps.

(1) Scope of Performers

Difference in scope of performers makes different styles of performances. We propose three models of scope of performers: Professional-Performer model, Audience-is-Performer model, and Blimp-is-Performer model. In the professional-performer model, performers who operate blimps and audience who observe blimps are clearly distinguished. In the audience-is-performer model, audience and performer are same. In the blimp-is-performer model, human performers who operate blimps are hidden and audience observe only blimps as performers.

(2) Flight Area

Flight area of a blimp means whether above, before, or among audience does a blimp fly. When a blimp flies above audience, the blimp could gather attention from broad area, so this mode would suit installation style performance and advertisements. When a blimp flies before audience as on the stage, the audience's attention would be focused and concentrated onto the limited area, so this mode would suit show style performance. When a blimp flies among audience, the audience could see the blimp close and sometimes they may touch it, so this mode would suit installation that audience actively participate in.

(3) Flight Movement

Design of a blimp's flight movement includes two factors: degree-of-freedom (DOF) and strength. DOF determines the fundamental dynamics of the blimp as a moving body. Strength of the movement would be strong, weak, or none. In an application where a blimp makes a complex movement like dance in front of the audience, strong movement would be required. In an application where a blimp fly close to the audience, weak movement would be required. No flight movement makes a blimp a balloon.

(4) Additional Effects

Additional effects include visual effects and auditory effects that a blimp's body equips. Effects whose source is not a blimp's body (e.g., music played by musicians) are not included. Visual effects would include decoration, light, picture, and video.

Auditory effects would include sound and music produced by speakers and other actuators on board.

4. Implementation and Observation

4.1 Beatfly

We implemented a small indoor blimp called Beatfly [Yoshimoto 2009-2]. Beatfly is equipped with full color light-emitting diodes (LEDs) for real time visual effects and controlled from various interfaces such as voice via mobile phones, physical controller, music, and other software applications. Beatfly is provided in open source to propose new aerial entertainment application. We designed two styles of application for Beatfly: Participative Performance and Show Performance.

(1) Participative Performance

In the participative performance, the public control and observe the blimp at the same time. They participate in the performance and produce their own representation using "everyday devices" (e.g., mobile phones) without any special preparation. The main purpose of the participative performance is simple and easy interaction between the blimp and the general public. Scope of performers should be audience-is-performer model and the flight area should be above audience so that the public can observe the blimp's response easily. Beatfly has three propellers and has 3 DOF. Flight movement and visual effects are required as feedback from the blimp but they are not necessarily strong or showy.

Design Factors		Value
Scope of Performers		Audience-is-Performer
Flight Area		Above Audience
Flight Movement	DOF	3 (x, z, yaw)
	Strength	Weak
Additional effects	Visual	Full Color Light
	Auditory	N/A

Table 1. Design of Participative Performance in Beatfly

(2) Show Performance

In the show performance, performers and audience are definitely distinguished. Skilled performers control the blimp and represent artistic performance to audience. The main purpose of the show performance is showing more skillful and complicated performance to audience. Scope of performers should be professional-performer model and the flight area should be before audience so that the audience's attention can be focused. Strong flight movement and visual effects are required.

Design Factors		Value
Scope of Performers		Professional-Performer
Flight Area		Before Audience
Flight Movement	DOF	3 (x, z, yaw)
	Strength	Strong
Additional effects	Visual	Full Color Light
	Auditory	N/A

Table 2. Design of Show Performance in Beatfly

(3) Implementation

For the participative performance, we implemented a system where people could control the blimp with their voice via mobile phones [Igarashi 2001]. Through laboratory experiments and several demo exhibitions, we observed that the vertical movement and LED effects well represented the participants' vocal messages but the participants had difficulties in controlling the blimp's horizontal movement with word commands because the audio signal included noise and latency. For the show performance, we implemented a system where a skilled performer could control the blimp with a physical controller. In a laboratory experiment we made a performance to music with the system and kinds of motions such as circular flight, slow swing, and hovering could represent the tunes. Full-color light effects worked as real-time illuminations. We implemented the system as plugins of a visual programming environment with which people who are not skilled in computer programming languages could build interactive applications with blimps.

Figure 4. Laboratory Experiment with Beatfly

4.2 fluff

fluff is an exhibition where multiple blimps with LEDs illuminate the space to music [Yoshimoto 2009-1]. In the exhibition we floated ten blimps. The blimps scattered among audience could expand the representation from the stage into the whole space surrounding the audience. The exhibition included two different performances: Installation and Live Performance.

(1) Installation

In the installation, ten blimps performed to electronica music played by a computer. Because our concept of this exhibition is that multiple illuminating blimps scattered among audience could surround the audience and blur the boundary between performers and audience, the blimps should be located above and among audience. Scope of performers should be blimp-is-performer model because the blimps are controlled by the programmed sequence and human performers are hidden. The blimp has two propellers and has 2 DOF. Weak flight movement is welcomed to stir the space. Visual effects are strongly required.

Design Factors		Value
Scope of Performers		Blimp-is-Performer
Flight Area		Above and Among Audience
Flight Movement	DOF	2 (x, z)
	Strength	Weak
Additional effects	Visual	Full Color Light
	Auditory	N/A

Table 3. Design of Installation in fluff

(2) Live Performance

In the live performance, a human band played in front of audience and ten blimps were scattered among the audience to expand the representation into the space. Scope of performers should be professional-performer model because human musicians act with the blimp although the blimps are actually controlled by the programmed sequence. Flight movement should be a little quiet not to interrupt the musicians. Visual effects are strongly required.

(3) Implementation

In the installation, audience walked around the blimps, touched them, and threw them up. They sometimes interacted with each blimp, and sometimes looked around the whole space illuminated by the blimps. In the live performance, audience enjoyed the music performance on the front stage and the light illuminations scattered among them at the same time. Through the installation and the live performance, the floating blimps could expand the representation into the whole space surrounding the audience. The audience said, “I felt as if I were surrounded by and absorbed into the lighting space,” and “The whole space was illuminating and beautiful.”

Design Factors		Value
Scope of Performers		Professional-Performer
Flight Area		Among Audience
Flight Movement	DOF	2 (x, z)
	Strength	None
Additional effects	Visual	Full Color Light
	Auditory	N/A

Table 4. Design of Live Performance in fluff

Figure 2. fluff

5. Open to the Public

Beatfly is opened to the public [Yoshimoto 2009-3]. The circuit is based on the Funnel IO, which is an easy toolkit with a wireless modem. The software is provided as plug-ins of a visual programming environment and people do not have to write any source code to make their own applications but only connect patches with lines. We also opened the source code of the plugins so that experts who are knowledgeable about computer programming can modify the software. We published the all resources to build the Beatfly including instruction, parts list, circuit diagram, and software on Instructables, a social community site focussing on do-it-yourself [Instructables]. We

also introduced six example applications of Beatfly, which allow people to start their projects quickly.

6. Conclusion

This paper proposed our concept of blimps as performance media and explored design and application of them. Blimps as performance media is defined as "blimps that amplify an activity by performers to audience with their flight movement and additional effects." We refined scope of performers and flight area, which determine the style of performance mediated by blimps; flight movement and additional effects, which determine the behavior of the blimps, as design factors for blimps as performance media.

We introduced four applications from our own practices -the participative performance and the show performance in Beatfly; the installation and the live performance in fluff. We opened Beatfly to the public on the background of the rise of do-it-yourself.

From ancient times, illumination in the air such as blinking balloons and searchlights has attracted people because they could be widely looked at and imply communication beyond a distance [Marvin 1988]. We believe that blimps as performance media could activate people's representation and contribute to communication among people.

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