Bloxels: Glowing Blocks as Volumetric Pixels

Jinha Lee* The University of Tokyo
Yasuaki Kakehi* Keio University
Takeshi Naemura* The University of Tokyo

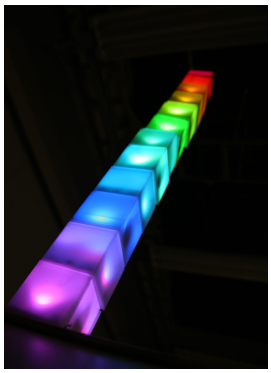

Figure 1: Bloxels

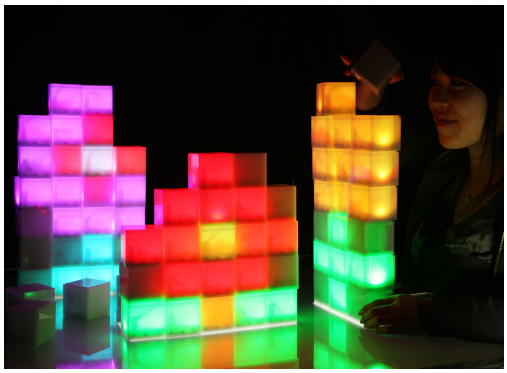

Figure 2: Application for Entertainment

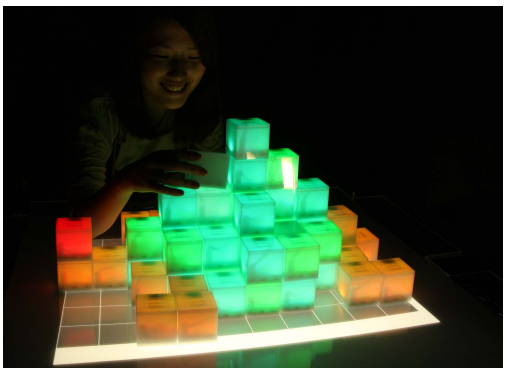

Figure 3: Application for Education

1 Introduction

In this paper, we propose a novel block-shaped tangible interface named Bloxel (see Figure 1). A Bloxel is a translucent cubical block that glows in full color and communicates with the neighboring Bloxels through high-speed flickers.

Our significant accomplishment is that users can build displays with a variety of shapes by stacking hundreds of Bloxels on a tabletop surface. Each Bloxel obtains its color data from the lower Bloxel through infra-red high-speed flickers, and transfers a series of color data to the upper Bloxel. In this way, Bloxels serve as volumetric pixels which can display meaningful content as a whole. With our module-based approach, we introduce a ground-breaking display technology. Moreover, as an augmented version of children's block play, Bloxels will have a significant novel impact on the field of physical computing and tangible interfaces.

2 Technical Innovations of Bloxels

So far, several types of block-shaped tangible device have been proposed[Sharlin et al. 2002][Dunn et al. 2003]. Compared with these works, technical innovations of our system are as follows:

First, our optical design for simple communication through light is crucial for the intuitive manipulation of physical blocks. A Bloxel consists of two full color LEDs for display, nine infra-red LEDs for data transmission, a photo detector, a battery and a micro controller. The infra-red LEDs are placed so as to realize the data transmission even when the neighboring Bloxels are not completely in contact with each other.

Second, our data processing method enables a simple system configuration. While each Bloxel communicates only with the neighboring ones, 3D sensors or cameras are not necessary to track the positions of the Bloxels.

Finally, to send signals to the base of the stacked Bloxels, we have invented a horizontal tabletop display system. Our specialized DLP projector [Kimura et al. 2008] can emit high-speed flickering signals pixel by pixel to the base. This allows users to realize several kinds of applications as demonstrated in our video.

3 Applications

We believe that Bloxels can be applied for media art works and entertainment purposes as well as for display technologies and human interfaces. By using Bloxels, we have already implemented some applications.

One is an application for entertainment (see Figure 2). In this application, users can see hidden animations (e.g. flowers) by stacking Bloxels on the tabletop. Another application is for education (see Figure 3). In this application, Bloxel can serve as an interactive tutorial for a shape creation process. When stacking up Bloxels followed by signals, users can be guided to create specific shaped objects.

In the future, we plan to develop much more applications by using the Bloxels in various situations.

References

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*e-mail: vlc@hc.ic.i.u-tokyo.ac.jp

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