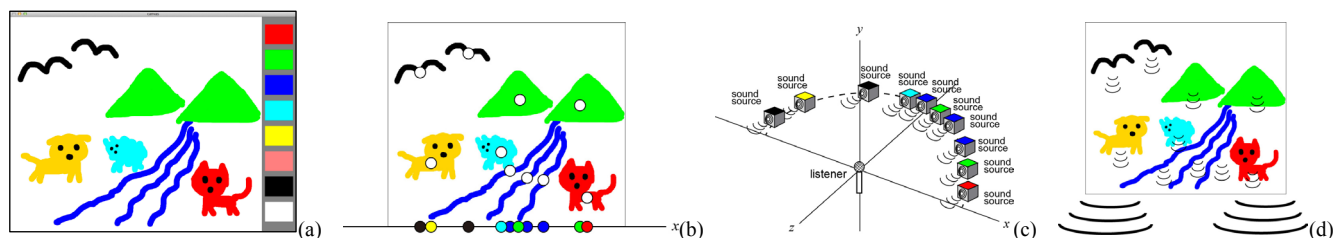


# RAKUGACKY: making sounds with drawing

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**Figure 1:** The interface of "RAKUGACKY" consists of a color palette and a virtual canvas, which is similar to ordinary simple drawing software (a). The picture on the virtual canvas is divided into several regions based on color (b). Sound sources for each region are decided, and they are placed in the space based on the position of each region (c). Sound sources start making sounds at each position, and the system makes a mixed stereo sound for the picture (d).

## 1. Introduction

Images and sounds are closely related, and sounds could emphasis or change impressions of images. Thus several methods to synthesize sounds from images are developed [Hermann et al. 1999]. In this paper, we propose a novel interactive media system "RAKUGACKY" that can make sound with drawing. In this system, a user draws a picture on a screen, and the system synthesizes sounds for the picture automatically. The system analyzes the picture during drawing, and synthesizes or changes sounds interactively according to the analyzing result.

## 2. The process of making sounds from drawing

Figure 1 shows the process of the proposed system. The interface of the system consists of a color palette and a virtual canvas, which is similar to ordinary simple drawing software (Figure 1(a)). The user selects a color of a pen and draws a picture on the canvas with a mouse or a tablet.

The picture on the virtual canvas is divided into several regions based on color during drawing (Figure 1(b)). Then the shape of each region is analyzed by calculating several feature values: the area:  $s$ , the length:  $l$ , the circularity:  $c$ , the inclination:  $i$ , the curvature:  $v$ , and so on.

We have selected about 30 sound sources based on objects included in pictures drawn by children. They are prepared in the system as monaural WAV files beforehand. They are the mewling, the barking, the bleating, the cawing of a crow, the chirping of insects, the croaking, the murmuring of a stream, the whistling, the sound of dropping, and so on.

The system selects one of sound sources for each region based on its color and feature values. For example, blue regions that relate to water are classified into 4 types of objects as follows.

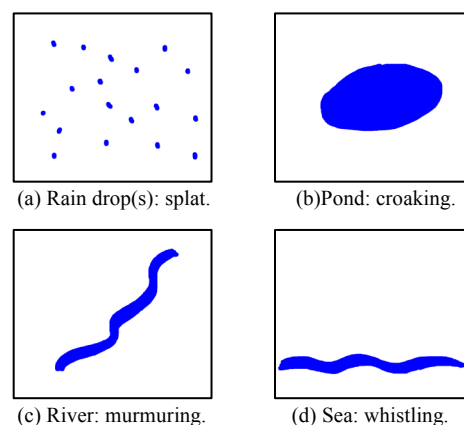
- Rain drop (Figure 2(a)):  $s < s_0$  ( $s_0$ : a threshold)
- Pond (Figure 2(b)):  $s > s_1$  and  $c > c_0$  ( $s_1, c_0$ : thresholds)
- River (Figure 2(c)):  $l > l_0$  and  $|i| > i_0$  ( $l_0, i_0$ : thresholds)

- Sea (Figure 2(d)):  $l > l_1$  and  $|i| < i_1$  ( $l_1, i_1$ : thresholds)

After sound sources for each region are decided, they are placed in the space based on the position of each region (Figure 1(c)). Pitches of some sound sources are changes based on the feature values of each region. They start making sounds at each position, and the system makes a mixed stereo sound for the picture (Figure 1(d)).

The process of making sound is executed during drawing in succession. Sound sources are added and the mixed sound is changed each time the user draws additional objects. The user can enjoy drawing with sound interactively.

The user can draw a picture not only on the virtual canvas of the system, but also on a physical sketchbook to make sound in the system. The system monitors the sketchbook with a video camera, and analyzes the picture in the same way as drawing on the virtual canvas. It is possible to change sounds by moving or touching the sketchbook.



**Figure 2:** The classification of blue regions based on features of the shapes.

## Reference

HERMANN T., RITTER H., 1999, Listen to your Data: Model-Based Sonification for Data Analysis, *International Institute for Advanced Studies in System research and cybernetics*, pp. 189-194.