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FROM LIGHT TO SOUND: SIGNAL MODALITY TRANSLATION

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1 INTRODUCTION

This paper describes a signal modality translation project the purpose of which is to represent acoustic signals from images or patterns of light. Signal modality translation is a rapidly emerging technology; it has been widely used to synthesize images from wave signals or acoustic signals. Conversely in this project, signals in the form of images and video are modulated into continuous acoustic sounds, by the method of real-time digital signal processing (DSP).

The hardware equipment of this project is a conventional CCD camera, signal processing core, and an audio output system. The software equipment is MATLAB software with the Image Acquisition Toolbox.

The whole structure of the project comprises four process stages: the Image Acquisition System, the Feature Extraction System, the Sound Modulation System and the Sound Playback System. The output of this entire system is acoustic audio composed of various instrument library tones and is modulated according to the image features of the video input. Each audio output is not only unique as the video content changes, but also features continuous tones with distinct combinations of pitches and timbres.

Figure 1: Four main stages in this project.

This system could bring benefits to individuals with visual impairment, by aiding them in navigation and location. Moreover, it could be developed to applications in recognition systems, because visual information in some circumstance is difficult to extract.

2 SYSTEM CONTENT

2.1 Image acquisition process

As this system is based on images for acoustic modulation, the first procedure is to acquire images from the external environment, which is called the Image Acquisition Process. Both hardware and software tools are required. For the hardware a Logitech HD Webcam C310 was used as the imaging front-end, while for the software, a MATLAB (R2014b) program with an Image Acquisition Toolbox (R2014b) was employed.