Research on Intelligent Control System Based on Feature Recognition

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Abstract. Fountain is an important facility in modern landscape art. Ordinary fountains are regulated by water valves, which makes the water column of the fountain very high, so the height of the fountain cannot be changed flexibly, the fountain is the product of the combination of the most popular garden architecture and appreciation in recent years. In this paper, intelligent control system based on feature recognition is designed. According to the system, fountain forms and features can be recognized automatically. At the same time, the system can also be integrated with computer animation, which makes the melody, emotion, rhythm and waterscape art to realize harmonious and unified.

Keywords: Fountain; Intelligent control; Feature recognition; Fuzzy expert system.

1. Introduction

In recent years, water application technology have been extensively developed rapidly[1]. Many of the techniques of water engineering branch of art landscape has gradually formed a relatively independent. In general Water landscape art can be divided into two categories: One is the use of relief or civil engineering structure, it is modelled on the natural landscape. For example, waterfalls, lakes, aquarium, stop, drop and so on are applied in the traditional garden. The other is completely dependent on landscape fountain equipment. Spray all kinds of springs, such as music fountain, program control fountain, fountain, fountain atomization dry land. Although it is widely used in the field of construction in recent years, its development speed is very quickly[2-3].

As the auditory art with visual art, music fountain has received widespread attention[4]. At present, in the spray music fountain, the most advanced openness based on the distributed computer control system is widely used in some companies. Some music fountain of computer aided design system and music fountain controller has also been breed with it. A lot of music fountain have been built in the domestic and international[5]. Types of problems in the music fountain control injection system are mainly exist in the following aspects:

- Music and fountain and not harmonious. Although real-time voice control method can respond to any audio signal, the control method do not coordinate with music, which performing water type and expressed by the music emotion and artistic conception are sometimes inconsistent.

- Communication technology has the certain difficulty. Projected control mode while it is possible to make the performance of the fountain in conformity with the music emotion and artistic conception, but the control way of the music is independent. It is on the basis of fully understanding of music emotion and artistic conception[6]. it needs artificial preparation for all kinds of water type, movement, lighting, water pump, such as opening and closing performance program.
• Music, lights, spray can not be connected. Although some music fountain controller can be from CD, VCD, DVD and other audio signal, its output signal with the input is a linear relationship with the size of the audio frequency signal[7]. It cannot make the music, splash and lights connected. And the music melody, emotion, rhythm and waterscape art can not be connected perfectly.

Considered the problems above, a new music fountain intelligent control system based on music feature recognition is designed[8]. The real-time voice control principle diagram as shown as Figure 1, it uses the audio signal of music to control the frequency converter, so as to control the waveform of the pump, so as to control the waveform of the music control source. The schematic diagram of preprogrammed control is shown in Figure 2, by working out various types of water and compiling into the control program, the synchronous output of the analog signal to the converter control, and then to the pump spray control.

**Figure 1.** Real-time voice control principle diagram.

**Figure 2.** Projected control principle diagram.

2. Design of Music Fountain Intelligent Control System
The control system not only can put the music signal converted into analog signals, but makes the output switch into audio signal. The control system can not only control frequency converter, but also controls solid state[9].

2.1. Composition of the System
The music fountain intelligent control system is made up of eight parts. According to its functions, the system is divided into three parts: performing program form, real time control and simulation parts[10]. It is shown in Figure 3.

2.2. Function of the System
The system can realize the music from CD, VCD, DVD. The melody characteristics, emotional characteristics and other basic features can be extracted. The function of the system includes music four parts, character recognition, the basic performance libraries, fuzzy expert system and fountain performance library.

• Music feature recognition. At present, the digital audio file have a WAVE, MP 3, WMA, RA, MI DI and so on. MI DI file format is the most mature music format. It have become an industry standard, its scientific nature, complexity of compatibility, and so on. Various aspects of far more than other standards, its General MI DI is the most common standard. As music industrial data communication standards, MI DI can command the operation of each music equipment and a unified standard format can imitate the original instrument performance skills.
In this control system, the MIDI file is as input audio source. MIDI equipment is sent via MIDI interface digital coding.

- Basic performance library. Basic performance program repository is designed to store a lot of basic performance, namely performance action sequences. The structure of the basic performance as shown in Figure 4.

![Figure 3. The composition of music fountain control system.](image)

**Figure 3.** The composition of music fountain control system.

![Figure 4. Basic structure diagram of performance program.](image)

**Figure 4.** Basic structure diagram of performance program.

2.3. *Real-time Control*

Real-time control can make the perform program into the control program. With the synchronous broadcasting frequency conversion governor, the synchronization of music and fountains can be realized. It includes two parts: compilation of control program, synchronous playing. The basic structure diagram of performance program is shown in Figure 5.

- The compilation of control program. With a microcomputer, according to the actual fountain device to show the program compiled successfully to control the music fountain spray and realize the synchronization of music and fountains.
- Synchronous broadcasting program. In order to prevent injection compared with the control delay, software development synchronous broadcasting program is used.
3. Conclusion
Fountain project is the inevitable development of the combination of high and new technology. With the rapid development of science and technology, high and new technology plays an irreplaceable role in the field of fountain control. In this paper, the basic principle of music, music recognition and the control system of the music fountain are analyzed and expounded in detail, and the music fountain is studied more scientifically and deeply. Because of the large number of high and new technology in the fountain project, the fountain effect is more gorgeous, beautiful, pleasing to the eye and exquisite.

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