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Title:

Design and Implementation of Sound Harmonic Driven Water Fountain

Abstract:

Recently, fountains have been developed to offer more aesthetic with light, musical sound and other effects by creating a dramatic appearance of the water patterns. In world cities, musical fountains are found in many urban areas, and their basic operation depends on the harmony between the music and water movements which can be accomplished by several ways based on the musical sound characteristics.

This thesis offers the hardware and software parts of musical fountain control system that adjusts the water heads and lamps light intensity based on the sound frequencies and loudness.

In the current work scenario, the sound signal frequency spectrum is separated into four frequency bands using digital filters (where each band occupies a certain range of frequencies and is produced by one digital filter). The output signal of each band drives one submersible pump and one lamp via a variable speed drive (VSD). The head of the water and the light intensity of colored lamp are controlled by the VSD unit which controls the magnitude and frequency of the voltage supplied to the pump and lamp. This voltage is controlled according to the digital filter output, which is connected to the analog voltage control terminal of the VSD.

The hardware implementation has been done by four groups of components, where each one consists of one Arduino board

(to function as an infinite impulse response (IIR) filter), one VSD to control the pump speed and light intensity, one submersible pump to produce variable head water burst (the head follows the filter output) and one colored lamp to display the filter output behavior in beautiful visual modes.

This system has been tested by applying different music and speech signals. It works well and offers a variable water heights and light intensity in synchronization with the sound's input frequencies and intensity.