FPGA multimedia player based on RISC-V

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AMD XILINX

On board test by Spartan-7 FPGA

INTRODUCTION

Multimedia technology can give people multiple sensory experiences and greatly satisfy their intrinsic needs. Therefore, our team made a multimedia audio that **integrated audio playback, video playback, audio visualization, music drum detection, sound amplitude visualization, and other functions**. Among them, **a RISC-V soft core was successfully ported and carried a unique user interface.** We used FFT algorithm for audio visualization calculation, displayed music amplitude change by using the cooperation of electromagnet and magnetic fluid. Our team also applied light changes to show the music drum beat. Overall, the work simultaneously explores the music spectrum information, amplitude information, and drum beat information, which presents them in a novel form of sound and light, and brings users a better multimedia experience.
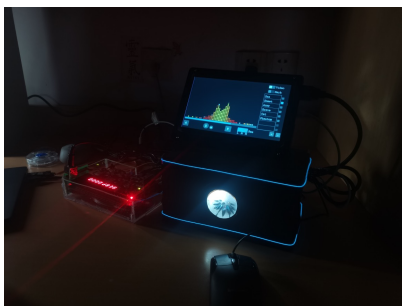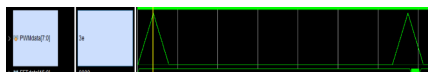
FPGA multimedia player based on RISC-V
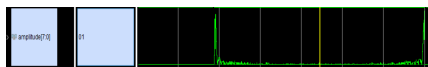
Transplant and usage of RISC-V soft core
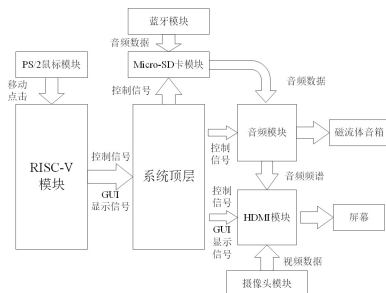
A RISC-V soft core that performs the function of system control, is design with **a user interface devised to fit its performance**

Adaptation and revision of fast Fourier transform

Amplitude of triangular wave signal

FFT result of triangular wave signal

Due to resource shortage, a special **revised FFT algorithm** is applied, which utilization the **real number property of music signal** to cut down the resource usage to half. The picture above shows the FFT result of triangular wave signal.

CREATIVE DESING

RESULT

The system is capable of playing music with MP3 format, displaying music signal spectrum on the screen, controlling magnetic fluid dancing, and drive lights twinkling with music trump.
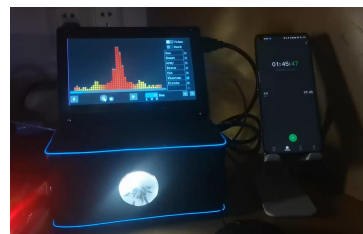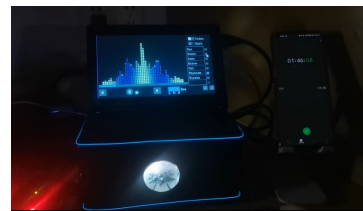
Playing with music "Phantom of the Opera"