Project Description

COMP3601 Design Project A

Semester 3, 2019

Project Description

Each group will create a conductible music player. The device will receive music file(s) from a PC using which it will then store and playback on request. The tempo of the played music will be controlled via a controller (without using trivial hardware components such as push buttons and potentiometers) that will be chosen by the groups and used as the timing of single beats of playing music. Thus, a user is able to speed up or slow down the music to whatever speed they like at will. In addition, a software program must be created which allows creation of the music files to be downloaded to the device via USB cable or wirelessly (Bluetooth or Wi-Fi).

Provisions

Each group will be provided with the following items to help build the project:

- Two Digilent Nexys FPGA Boards (https://store.digilentinc.com/nexys-retired/)
- Breadboard add-on board that connects to the Nexys board
- Speaker PMOD add-on board
- A group budget of $50 for the purchase of additional hardware parts

Features

The final product must demonstrate the following features:

- PC Software for creation of music, transferring music from PC to music player (FPGA Board) and possible monitoring of the device
- Tempo control via a sensing methodology to increate and decrease the number of beats played per minute

Purchasing

Each group will be responsible for ordering their own parts through suitable hardware parts distributors. Each group will be reimbursed for up to $50 spent on parts, although the total cost of parts used in the final design should be much lower than this amount.

Specifications

Music playing

- The music format will be a text file with a sequence of pairs of characters representing the frequency (i.e. pitch) and duration of notes to be played. Groups will be allowed to augment

this format to add their own information, but they must be able to download text files of the specified format

- The specification of this format is available on the course website
- The device should have a mode that plays the music at a specified default tempo given in a header at the start of the file
- A second mode allows control of the tempo dynamically through sensing method

Tempo Control

- Decision and design of the sensing method is not specified
- Sensing method should detect increase the tempo, decrease the tempo as the user interact with the sensor.
- Tempo will be controlled by from 60 beats per minute to 120 beats per minute. The method by which the user interaction with the sensor can be specified by the group, but it should be intuitive to the user.
- Feedback readout of the current tempo (either of the previous beat and/or an average of several beats) should be displayed to the user.

PC Software

- The PC software must be able to easily allow a user to create a text file for use on the device
- Usability of the software will be taken into account.
- Download of the files can optionally be performed by this same software This can be achieved by using a USB cable or a wireless data transfer method. If wireless methods (i.e., Bluetooth and WiFi) are used, the budget allocated for each group should be sufficient for additional hardware modules. In either method, it is acceptable to send additional information to the hardware board or receive information for display during feedback.

Assessment

Assessment of the completed design will be performed via demonstration by the group at the end of the session. The project will be marked on a combination of the following criteria (in order of importance):

- Adherence to the provided specification
- Ease and intuitiveness of use
- Additional functionality
- The budget of components used in the final design