g04\_FSM\_Controller

# Description of System’s Features

The purpose of the system designed in this lab was to provide user control of the music box system through the use of a finite state machine. The state machine was comprised of three states: stopped, played and paused. Playback was inactive in the stopped and paused state, while in the played state the song information was read from the LUT ROM, fed to the flash reader and finally played through the audio interface. See for the state diagram of the FSM.

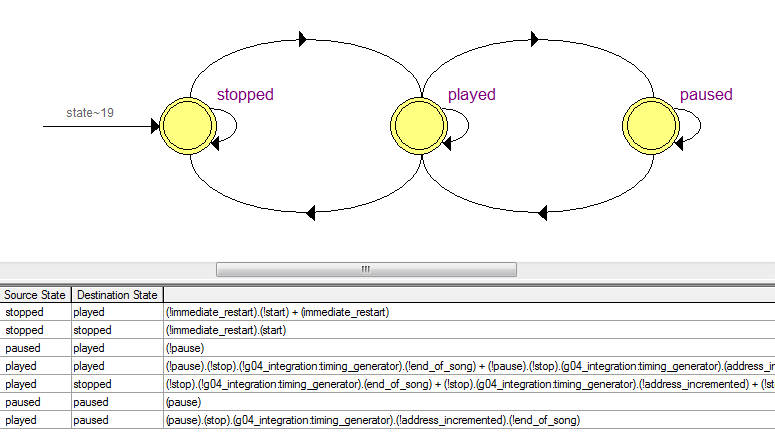


Figure Mealy-Type State Diagram for Controller

# Block Diagram of Entire System

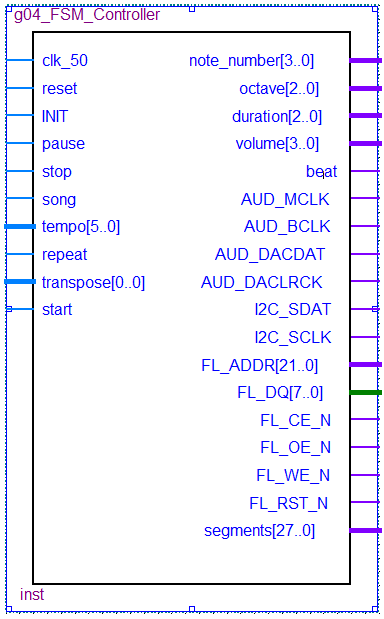


Figure Pinout Symbol of Controller

# Description of System (detailed)

# Description of User Interface

**2**

**1**

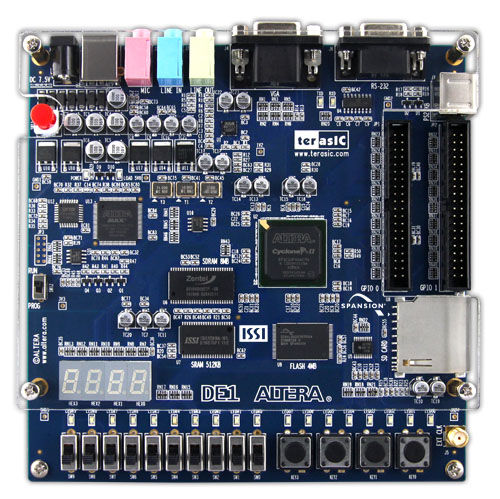


Figure User Interface Guide

# Testing and Simulation

The music box controller system is composed of a large number of interacting components. As such, it was important to thoroughly test each feature individually to ensure it was behaving correctly. Only once the individual features were confirmed to be working satisfactorily, a complete integration test was performed to verify the communication between the elements of the system.

## Feature Testing

### Display Features

Note information for each note is displayed on the board’s 7 segment displays. See for details of the mapping of each item to be displayed. In order to test that this feature worked correctly, we programmed the device and verified the numbers on the 7 segment displays matched the corresponding entries in the .mif files for our songs.

Another display feature is the beat LED. The LED would flash once per beat, at a rate input by the user on the slide switches. To test this, we mapped the slide switches to our module’s tempo input and again programmed the device. We ensured that any change in the tempo was reflected accurately in the flashing beat LED.

### Control Features

The control of the music box is a key feature of the system. The user has control over the following:

* Starting
* Stopping
* Pausing
* Choosing repeat mode or one-shot mode
* Transposing down one octave
* Selecting one of two songs
* Tempo

See for the mapping onto the board’s inputs.

Each control feature was tested by assigning the appropriate pins, programming the board and using the previously verified display features of the system, confirming that the playback was responding correctly.

# FPGA resource utilization

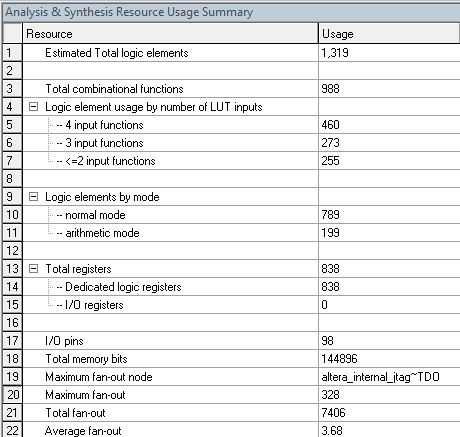


Figure Resource Usage Summary

# Conclusion

# Works Cited

"Altera DE1 Board." Terasic.com. Terasic Inc, n.d. Web. 10 Apr. 2015.

