FPGA Piano-Playing Robot

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Abstract

A good piano partner is often hard to come by, and with the help of a Nexys 4 DDR FPGA board, we can show the reigns of the keyboard to a robotic companion. Our goal is to build a sound processing system as well as a robotic mechanism, able to be actuated to reproduce the processed sounds on a keyboard. The keyboard will be in a set location to eliminate the need for vision capabilities, while emphasizing the robot's ability to reproduce operator-played chords and melodies on the same keyboard as the operator. This project will showcase the ability to create a state machine with listening and playing capabilities, involving analyzing playable frequencies and creating a strategy for playing reproducible chords and melodies. Given difficulties of sequential operator-playing and robotic reproducing, alternate designs can include concurrent operator and robotic playing, showcasing a chord-progression interface for robotic actuation.