

BopBot

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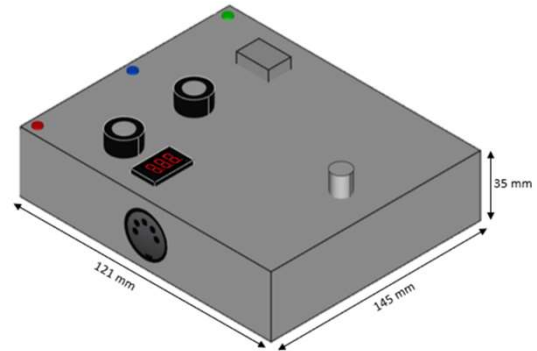
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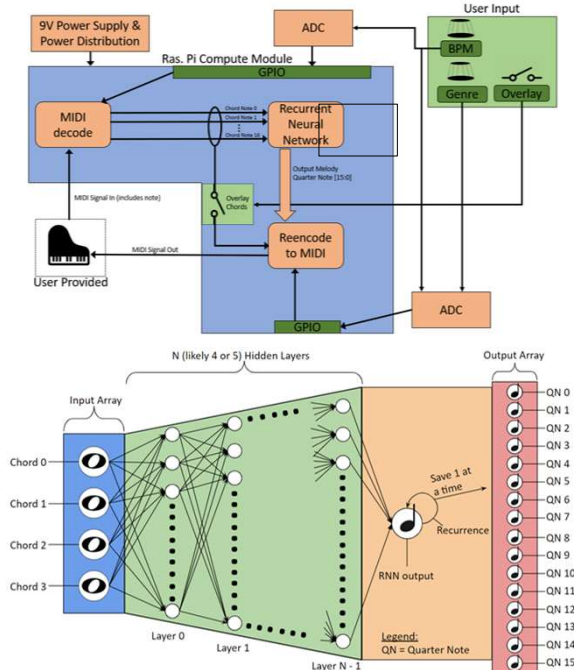
Abstract

The most memorable songs often feature a compelling (vocal) melody. Musicians often struggle to write melodies that are catchy and unique. The BopBot can inspire this creative process by offering melodies based on what you play into the machine. After inputting a basic chord progression, the BopBot will generate and play back a cohesive and interesting sequence of notes using machine learning.

System Overview



Block Diagrams



The BopBot comes in the form factor of a musician's foot pedal. First, the user inputs a chord progression, aided by a metronome at the specified BPM (beats per minute). After the melody is generated, the melody and chord progression can be played back in a loop.

Results

At CDR, the BopBot's software component was mostly complete. The controls and neural network functioned completely on a Raspberry Pi Compute Module 3+, which was to be incorporated into a final PCB and enclosure design. The BopBot was able to take in live input from an electric piano and generate a melody based on this input.

The results of the neural network melody improved greatly between MDR and CDR; however, determining the quality of a melody is a difficult task. To solve this, a survey was conducted to determine whether the BopBot's output could fool people into thinking it was "human-made." It was found that the BopBot could fool people 24% of the time, not far behind other music-generating neural networks.

Specifications

System Requirements	System Specifications
Sizing	Can fit into a musician's pedal board (typically around 170x138mm).
Power	Powered by a typical music pedal power supply (9V, 1700mA maximum).
Timing	Completes melody generation in an amount of time that is conducive for live music. Less than 5 seconds is acceptable.
Musical Requirement	4 musical genres to choose from for models: Rock, Blues, Classical, Pop.
Machine Learning Performance	Neural network design must have less than 23,000 neurons in each of the 3 layers (fewer if using 4 layers) in order to generate a melody within 5 seconds on a 1 GHz processor.
Memory Usage	Each neural network must be smaller than 200 MB such that the microprocessor has enough data memory (SDRAM).

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