# ABSTRACT

# AUTOMATIC MUSIC INSTRUMENT GENERATOR IN ACAPELLA BASED ON RECURRENT NEURAL NETWORK USING LATENT AUTOENCODER INPUT AND DISCRETE COSINE TRANSFORM

Author

Julian Saputra

19102008

Not everyone can create an instrument or background music for a song. Besides having knowledge of music, they should also possess experience in composing melodies. Based on this issue, this research designs a model for an automatic music instrument generator where the input is in the form of human vocal sounds with lyrics and tones. This input is then processed using a selected model and architecture to produce harmonious musical instrument notes as the output. In previous studies, researchers applied Recurrent Neural Network (RNN) as a method for automatic music composition, although the results were not yet perfect. In this study, a combination of Autoencoder utilizing Convolutional Neural Network (CNN) and Recurrent Neural Network (RNN) architecture is used, with inputs consisting of human vocal sounds and instrumental sounds. This research presents three schemes: Autoencoder-RNN, Autoencoder-Comb-RNN, and Discrete Cosine Transform (DCT)-RNN schemes. These three schemes have different types of sound inputs, namely short sound, comb-filtered sound, and DCT-based frequency sound. By combining autoencoder and RNN models, different models with varying specifications are obtained and their performance is evaluated in terms of both loss and creativity. The best model obtained in this research is the DCT-RNN scheme, specifically Model DCT-17, with an evaluation of performance resulting in an average loss of 0.02993620155, an average bias of 0.01588229974, and a standard deviation of 0.02059837636. Listening tests of the generated sound output within the frequency range of 0-1600 Hertz revealed clear, tonal, and harmonious sounds. This indicates that within this frequency range, there are numerous sound signals with diverse patterns compared to frequencies above it, as the generated sounds tend to have higher frequencies.

**Keywords :** *music instrument, autoencoder, convolutional neural network, recurrent neural network, discrete cosine transform*