MUSIC COMPOSITION
USING
NEURAL NETWORKS

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ABSTRACT

Our project implements a neural network based musical composer which can compose music its own.Neural networks process information in a similar way the human brain does. Neural network model learns to predict which notes will be played at each time step of a musical piece after training the system with some classical compositions. The network can only produce textual representation of music so converting musical notes into digital music also come under this project.

Proposed System

In the project we try to implement a music composer with a training module which can be used train the system to teach the temporal dependencies of a song or a set of songs

Summary Of Tasks Done

- Play audio file
- Compare audio files
- Superimpose audio files
- Implent music similarity checking using c
- Implement neural network using python
- Use neural network to check music similiarity
- Create a program to train & compose music
- Create an interface for music composition

Related Works

- Character-based Musical composer with an LSTM
- RNN based network for producing polyphonic music
- A Novel Approach to Music Composing: Using Genetic Algorithm

Background Study

- Recurrent neural network,LSTM,Genetic Algorithm can be used for music composition.
- Neural network is most effective and efficient way to compose music
- The music similarity checking method can be used to cluster music files according to their similarity in tune and rhythm
- This can be used for training network with same category of songs.
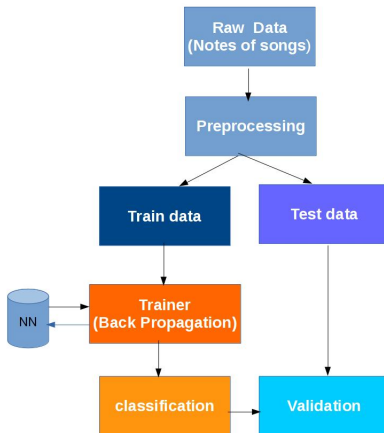
Architecture

Figure: Software Architecture

Architecture

- Three modules
- One for composition
- One for training
- Another one for utility functions like merging,comparing and playing two wav files etc.

Training Module

Trainig module carry out training activities.

- The keyboard notations of famous songs are collected from the internet and then these are converted into integer note values.

- This is divided into sample arrays of length 8,this will act as input dataset.The note after the 8th note will be the expected output.

- We add this to the dataset.The neural network is trained using this dataset using backpropagation algorithm

- Trained network is then stored to hard disk.
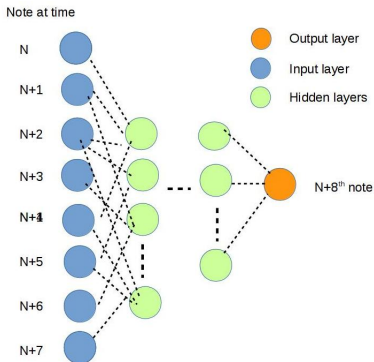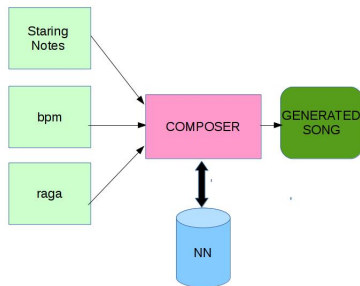
Neural Network structure

Figure: Software Architecture

Composition Module

Composition Module

- This composition module is used to compose music using the nueral network that we trained already.
- The compostion module loads the network and accepts inputs.For the initiation of network we accept 4 starting nodes. This 4 notes along with other 4 randomly generated notes are given as input to the network.
- After the first iteration the last four notes will be given as input.This process continues until desired number of notes are produced

Back Propagation

```
1.Assign all network inputs and output
2.Initialize all weights with small random numbers,
typically between -1 and 1
3.repeat
    for every pattern in the training set
    Present the pattern to the network
//Propagated the input forward through the network:
            for each layer in the network
                for every node in the layer
                    1. Calculate the weight sum of the
                        inputs to the node
                    2. Add the threshold to the sum
                    3. Calculate the activation
                        for the node
```

```
//Propagate the errors backward through the network
            for every node in the output layer
               calculate the error signal
            end
          for all hidden layers
              for every node in the layer
                  1. Calculate the node's signal error
                  2. Update each node's weight in the
                     network
              end
          end
     end
     Calculate Global Error
  4.end
```

Utilities Module

- The utilities module provide utilities for music composition like merging two songs and play a music file.
- Music similarity checking function is implemented in this module to cluster the songs in the same genre
- This will be useful for the training purpose.The system will be able to understand the various pattern following in each genre.
- A Library package called musly is used for this

Result

In the project we created a music composer with a training module which can be used train the system to teach the temporal dependancies of a song or a set of songs.The music similarity checking module can be used to cluster music files according to thier similarity in tune and rythm.Six raga is available in the composition module. The user can select one from the list and music composed will be in that raga. Also the beats per minute can be given as input.It determines the speed of the music

FUTURE WORKS

In future ,we are going to refine music recognition model by adding further human characterstics,We would like to extend the network which can learn time dependancy in each song.More automated clustering based learning can be implemented to increase efficiency

Conclusion

The computing world has a lot to gain from neural networks. Their ability to learn by example makes them very flexible and powerful. A music composition model based on neural networks successfully learned the global structure of a musical form, and used that information to compose new pieces in the form.
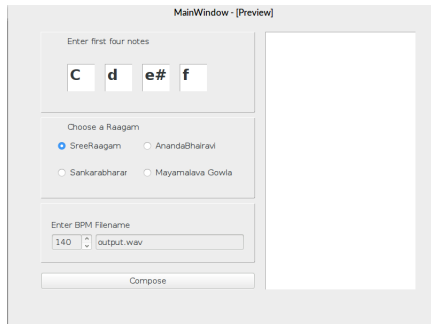
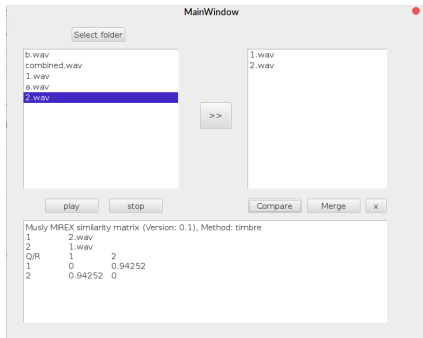Figure: Composition Module

Figure: utilities window

Biblography

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