Towards Models of User Preferences in Interactive Musical Evolution

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ABSTRACT

We describe the "bottom-up" construction of a system which aims to build models of human musical preferences with strong predictive power. We use Grammatical Evolution to construct models from toy datasets which mimic real-world user-generated data. These models will ultimately substitute for the subjective fitness functions that human users employ during Interactive Evolution of melodies.

Categories and Subject Descriptors: I.2.2 [Automatic Programming]: Program Synthesis; I.5.5 [Implementation]: Interactive Systems
General Terms: Human Factors
Keywords: Interactive Evolution, Grammatical Evolution

1. INTRODUCTION

This work is concerned with the use of evolutionary techniques for modelling the fitness functions of human users of an interactive evolutionary system for producing pleasing musical pieces. The overall aim is to construct a model from human-generated historical data that can be used as a predictor for future user behaviours. Such predictors would be very desirable in interactive systems as they can be used to ease the congestion produced by the user while allocating fitness scores. Specifically, we show here how a predictor may be constructed in a "bottom-up" manner using a set of toy problems as foundation for further experiments on human-generated historical data.

In previous work we applied Genetic Programming to the task of learning the preferences used by human users of an Evolutionary Drummer [1]. Initial results were promising however subsequent analysis combined with the addition of melody to the system indicated that the problem was too difficult for GP to solve successfully. This difficulty was not limited to GP; experiments were also carried out using ANNs and SVMs. Two main conclusions were drawn from previous work; firstly, the search space of melodies that human users navigate through is far too large. Secondly, human users can tire easily and their choices may become inconsistent; presenting inconsistent data to *any* black box system in order to make generalisations is expecting too much.

2. EXPERIMENTS AND RESULTS

With these conclusions in mind, the melody evolver system was redesigned with a smaller search space. Instead of

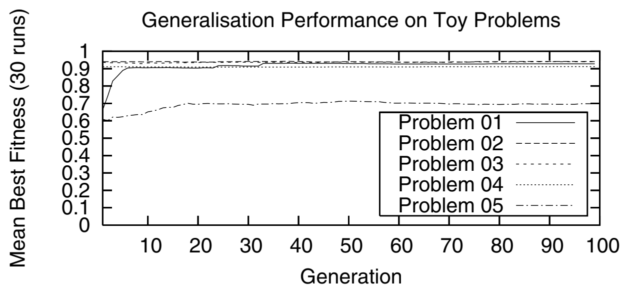

Figure 1: Generalisation performance scores on the 5 toy problems (normalised to values between 0 and 1). GE achieves a score upwards of 70% on all problems.

allowing free-form evolution of all instruments, drum patterns, tempos and melody lines, the system instead combines presets of these into candidate solutions for evolution. To address the inconsistency issue, five toy datasets were created which mimic situations where the user:

1. consistently picks a song that has a specific drumbeat, ignoring all other attributes.
2. always picks a song that has a particular drumbeat and melody, which work well together.
3. likes a particular drums and melody combination when it is played at a particular tempo, but not at other tempos.
4. likes a drums and melody combination played with a particular instrument and tempo.
5. is only interested in the percussion sequence but has an ordered set of preferred beats over others.

For each problem, 100 training and 100 testing cases were generated and 30 runs of Grammatical Evolution were performed, measuring generalisation performance at each generation. Results are shown in Figure 1.

3. CONCLUSIONS AND FUTURE WORK

By reducing the search space and by forcing a more consistent behaviour through toy datasets, we have shown it is possible to learn preferences with Grammatical Evolution from historical data with a good degree of accuracy. The obvious next step for this work is to run the experiments on human-generated data now that a firm foundation has been established.

4. REFERENCES

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