COMPETITIVE VS FEED-FORWARD MODELING OF MUSIC RECOGNITION TASK

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Background

Most of the connectionist models designed for musical stimuli recognition seem to be unrealistic, for two reasons: firstly, because they are based on a tonal a priori knowledge; and because these models do not include a competitive learning phase.

Aims

This work is aimed at verifying how both competitive and feed-forward neural network models classify 4 groups of musical stimuli. On the basis of some previous research of ours, highlighting that salience, operatively defined as redundancy of interval or rhythmic parameters, is one crucial dimension for the recovery of melodies from memory, this research is to demonstrate that musically superficial characteristics are a sufficient basis for music categorization.

Method

Four classes of musical stimuli have been constructed for this purpose, by intercrossing two variables: tonality and salience, both on two levels: presence and absence.

According to these specifications, two series of 48 stimuli have been created by two different musicians. In the learning phase, both a competitive and a feed-forward model have been fed with half of the stimuli randomly split; half between the two composers, the other half used in the test phase.

Results

Competitive models give a much more consistent picture of what cognitive processing is, compared to feed-forward models. Actually a feed-forward neural network is a powerful tool for a variety of perceptual tasks although it shows a lack of psychological reality in typical learning algorithms, and the biological validity suffers from the architecture.

Conclusion

Neural networks can easily replicate human capabilities in a large variety of experimental tasks, even if each model has its own "style". In this case it appeared that the competitive strategy has obtain better results in detecting superficial cues, and in using them to separate and recall incoming patterns. At a generalization level it appears that tonality is an important dimension in the musical acculturation process. However other more superficial variables have to be taken in consideration in music categorization processes by natural and artificial cognitive systems. In this work, salience appeared as a relevant variable for music recognition by naive subjects, and the evidence is strengthened by the fact that the results were collected by means of a set of different neural network architectures.