Title: Constraints and Markov chains for a Cognitive Model of Jazz Improvisation: Adding Chords

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Introduction:
Jazz improvisation is a prototype of the mental activity common to Speech Recognition and other areas of interest in Artificial Intelligence. In a short amount of time, decisions must be made in the context of a given structure, which is why modeling jazz improvisation is of wide interest in areas as diverse as Cognitive Theory, Computer science, Mathematics and Statistics, Neuroscience and Music Education amongst others. Our goal is to develop an algorithm with a very different philosophy than ones found in software whose improvisations are based on rules. Rule based softwares such as Impro-Visor still lack the complexity of musical creativity in its improvisations.
A pattern based algorithm developed by former Georgia State student Jonathan Spencer has the melody and rhythm incorporated so the next step to build on this work will be to incorporate the chords that are present, while not letting the chords dictate melodic content.

Method:
In order to do this, we need to look at the chords as constraints while maintaining the Markov philosophy and the probabilities of concatenation because renormalization is not sufficient, since the probabilities will change when renormalized. The two main methods that will be used are non-homogeneous Markov processes and Bayesian Statistics.

Results:
The software will be developed subsequent to the theoretical aspect of the algorithm. In the future, chords will be incorporated using the theories and research done in this project.

Discussion:
These algorithms do not have to be genre specific to jazz, given that they are based on the actual patterns of a corpus. There have been implementations with classical music, fiddling, blue grass, etc. It is thought that this algorithm might even transcend music and be used to study creativity in areas such as gaming as well where improvisation is seen to play a significant role, given that players have to respond creatively while acquiring certain patterns of response as a result of rules and constraints.