# HARMONY PROGRESSION ANALYZER FOR MIREX 2012

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## ABSTRACT

Harmony Progression Analyzer (HPA) is a machine learning system for the harmonic analysis of popular musical audio. It is focused on chord estimation, although the proposed system additionally estimates the key sequence and bass notes. It is distinct from competing approaches in two main ways. First, it makes use of a new improved chromagram representation of audio that takes the human perception of loudness into account. Furthermore, it is the first system for joint estimation of chords, keys, and bass notes that is fully based on machine learning, requiring no expert knowledge to tune the parameters. This means that it will benefit from future increases in available annotated audio files, broadening its applicability to a wider range of genres.

## 1. SYSTEM DESCRIPTION

The readers are referred to [1, 2] for the techniques used in the HPA system.

## 2. SOFTWARE IMPLEMENTATIONS

So far we have released three HPA software packages:

- The MATLAB version (release date February, 2012). This is a complete software package of the HPA system, including the *chroma feature extraction*, the *chord estimation* and the *system retraining* modules. The package is designed for research purpose, but it also provides a graphical user interface for users who are less experienced with programming.

- The Standalone version (release date May, 2012). This is a standalone software package of the HPA system, featuring the *chromagram extraction* and the *chord estimation* functions. It also comes with a convenient command-line console for audio batch processing.

- The Vamp plugin for Sonic Visualiser (release date August, 2012). This plugin is for visualization and
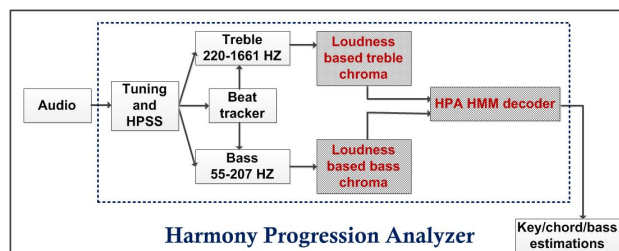
**Figure 1**. Components of the harmony progression analyzer (HPA).

the target users are musicians who are less experienced with additional library installation. The main functions include *Beat and Tempo detection*, *chromagram visualization* and *chord estimation*.

All the packages are freely available for research purposes and can be downloaded at `https://patterns.enm.bris.ac.uk/hpa-software-package`.

## 3. MIREX 2012

For the MIREX 2012 Audio Chord Estimation evaluation, we submitted four systems:

- HPA_in - an 'in-domain' HPA system that is trained on the MIREX dataset (218 music tracks).

- HPA_out - an 'out of domain' HPA system that is trained on a set of 522 music tracks covering a wide variety of genres.

- HPA_mix - the HPA system that is trained on all 740 music tracks available.

- HPA_Genre - the hyper-genre HPA system that is described in [2].

## 4. REFERENCES

[1] Y. Ni, M. Mcvicar, R. Santos-Rodriguez, and T. De Bie. An end-to-end machine learning system for harmonic analysis of music. *IEEE Trans. Audio, Speech, Lang. Process.*, 20(5), 2012.

[2] Y. Ni, R. Santos-Rodriguez, M. Mcvicar, and T. De Bie. Using hyper-genre training to exploit genre information for automatic chord estimation. In *Proceedings of ISMIR*, 2012.