

Identification of Musical Instruments by means of the Hough-Transformation

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Abstract. To distinguish between the sounds of different musical instruments, certain instrument-specific sound features have to be extracted from the time series representing a given recorded sound.

The Hough Transform is a pattern recognition procedure that is usually applied to detect specific curves or shapes in digital pictures (Shapiro, 1978). Due to some similarity between pattern recognition and statistical curve fitting problems, it may as well be applied to sound data (as a special type of time series data).

The transformation is parameterized to detect sinusoidal curve sections in a digitized sound, the motivation being that certain sounds might be identified by certain oscillation patterns. The returned (transformed) data is the timepoints and amplitudes of detected sinuses, so the result of the transformation is another ‘*condensed*’ time series.

This specific Hough Transform was then applied to sounds played by different musical instruments. The generated data was investigated for features that are specific for the musical instrument that played the sound. Several classification methods were tried out to distinguish between the instruments and it turned out that RDA (a hybrid method combining LDA and QDA) (Friedman, 1989) performs best. The resulting error rate is better than those achieved by humans (Bruderer, 2003).

References

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Keywords

PATTERN RECOGNITION, SOUND PROCESSING, HOUGH TRANSFORM