Automatic Detection of Applause in the Montreux Jazz Festival Concerts

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2^{nd} Workshop on Standards and Technologies in Multimedia Archives and Records

Section 1

Introduction

Context

Montreux Jazz Festival in numbers :

- audio and video recordings since 1966,
- 5000 hours of audio and video,
- 15 different recording formats.

Objectives

Montreux Jazz Digital Project @ MetaMedia Center :

- Archive digitization,
- Preservation and perpetuation of the archives,
- Valorization of the archives.

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LEMA :

- applause,
- speech,
- audio cuts,
- pops and clicks,
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metadata inclusion through digital audio signal processing techniques

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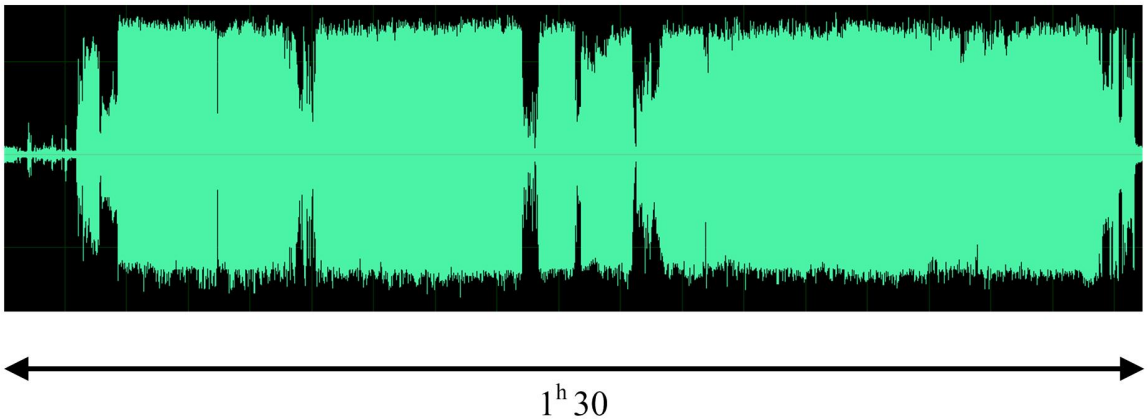
Interests of applause sounds



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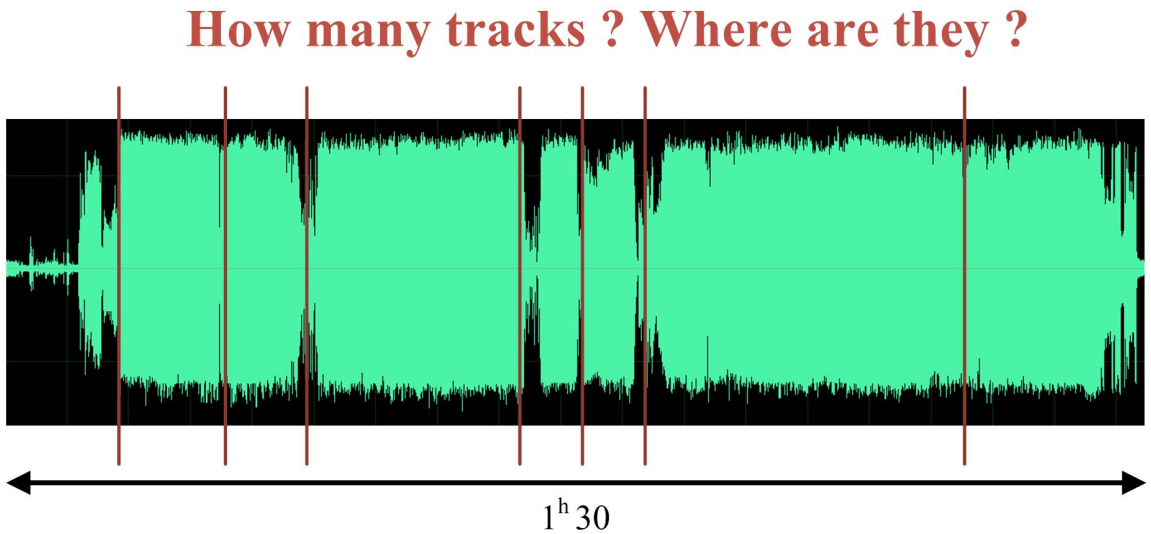

Applause sound position :
-> help-to-decision for automatic/manual track partitioning.

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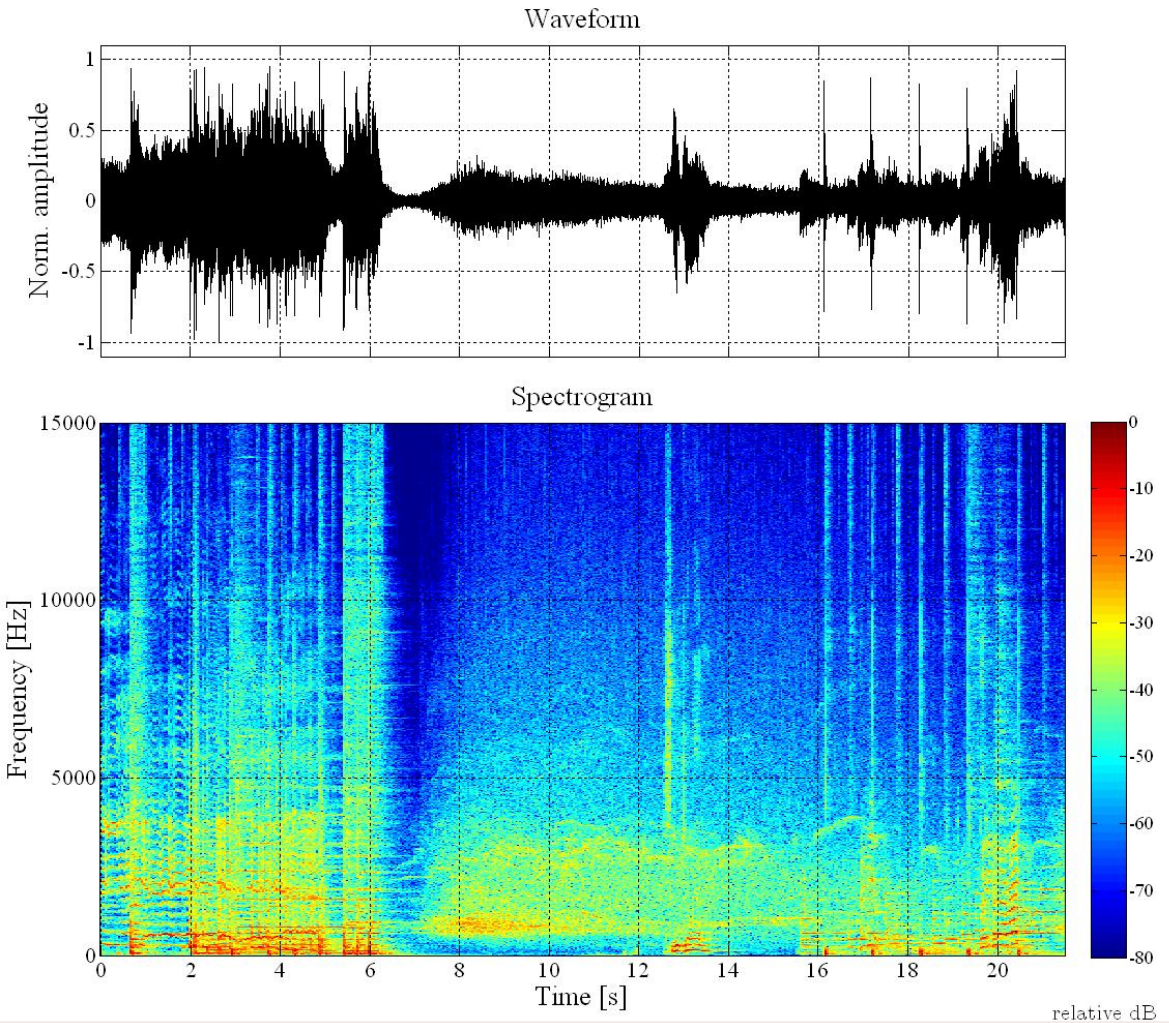

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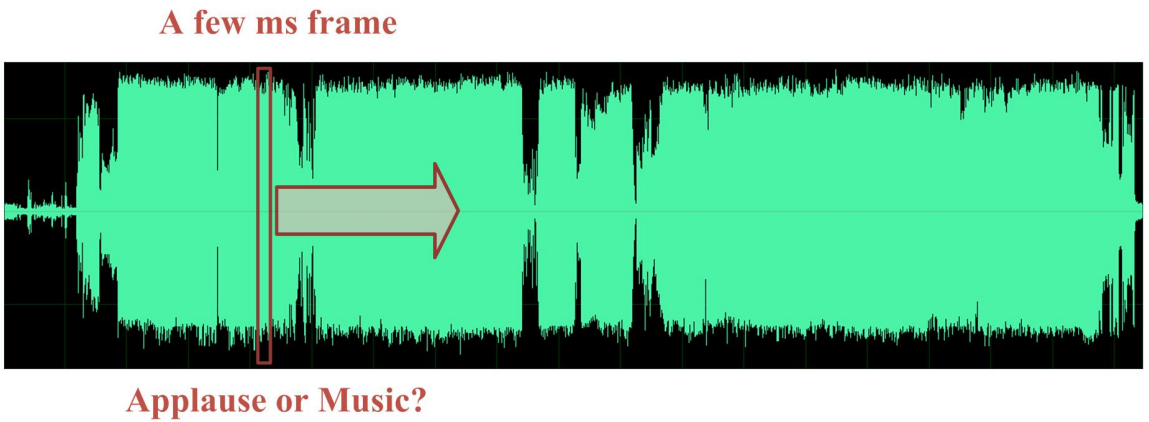
Section 2

Methodology

Frame by frame analysis



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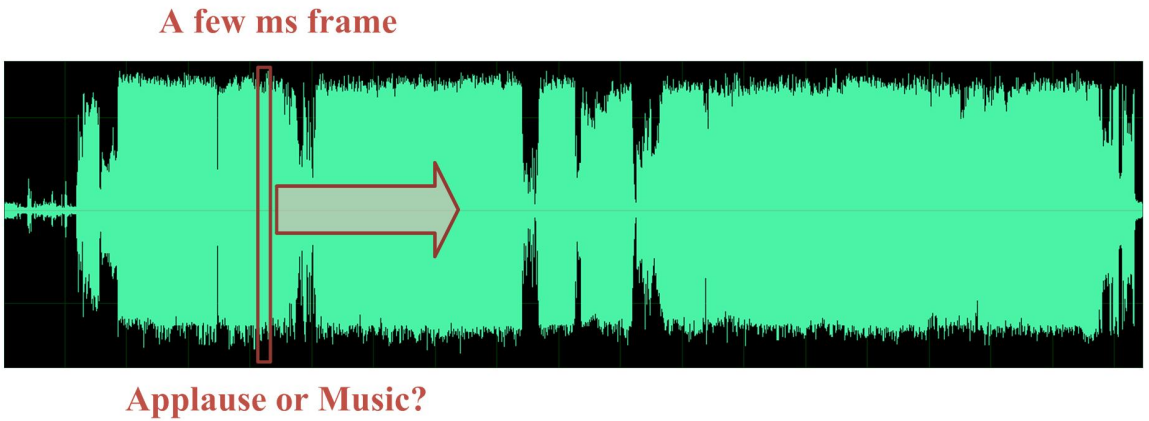

Binary classification problem

What is required :

- Audio features (spectral, temporal, spectro-temporal,...)
- Classifier (SVM, GMM, Decision Tree, Neural Network,...)

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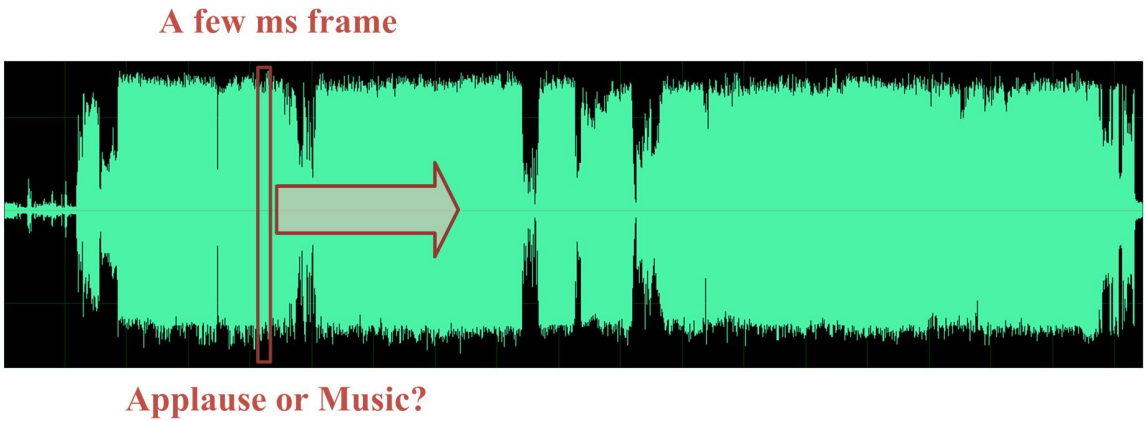

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Working philosophy :

- The least features as possible,
- The simplest classifier as possible

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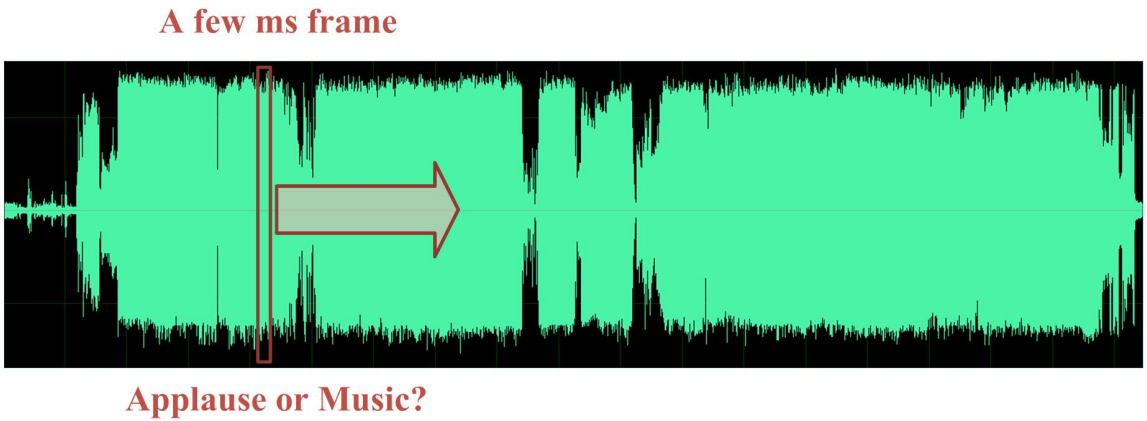

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How ? :
Kullback-Leibler divergence-based features optimization

Example

Spectral gravity center (SGC, in Hz)

$$SGC[q] = \frac{\sum_{f_{min}}^{f_{max}} f|\mathbf{Y}_q(f)|^2}{\sum_{f_{min}}^{f_{max}} |\mathbf{Y}_q(f)|^2},$$

- q : frame number,
- f : frequency (in Hz),
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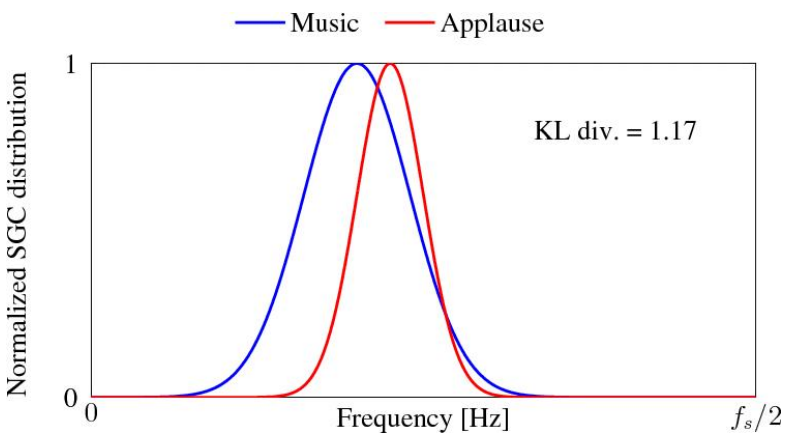

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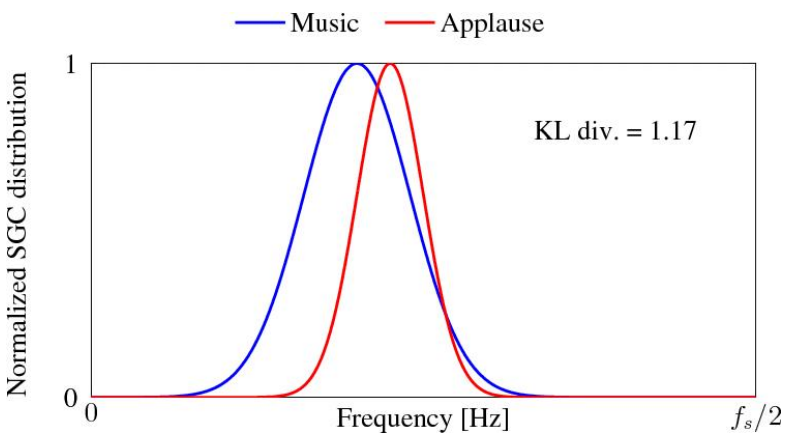

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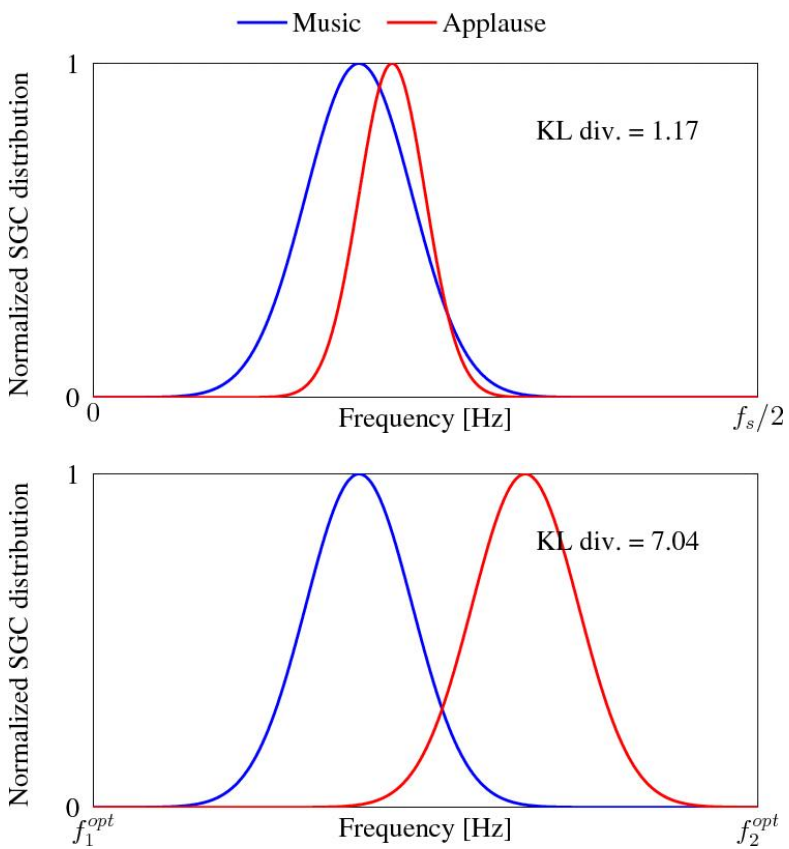

Section 3

Results

Database

Style	Length	Size
Hip Hop	39 min	440 Mo
Cuban music	1 h 08 min	766 Mo
Soul / Blues	1 h 02 min	709 Mo
Reggae	1 h 20 min	908 Mo
Salsa	1 h 12 min	813 Mo
Funk	1 h 32 min	702 Mo
Jazz / Bossa Nova	1 h 02 min	702 Mo
Experimental music	1 h 34 min	1064 Mo
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Blues	45 min	515 Mo

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Frame size (in samples / in ms)	2048 / 42
Frames «applause»	**12 757**
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Classification results

Spectral Gravity Center

True Detection: 94%
False Alarm: 3%

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Addition of a second feature

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Spectral Gravity Center
+
Spectral Roll-Off

True Detection: 98%
False Alarm: 4%

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Spectral Gravity Center + Spectral Roll-Off

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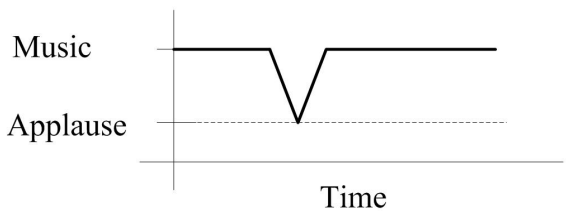
How decrease it ?



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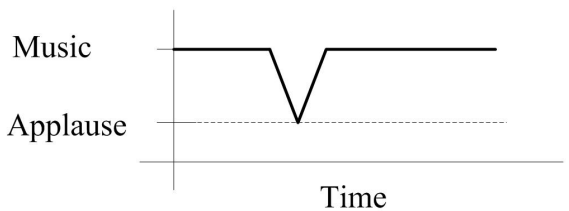
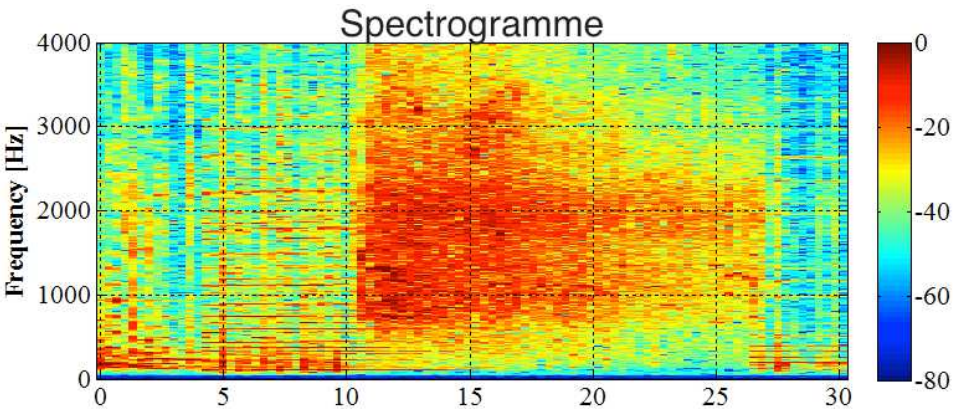


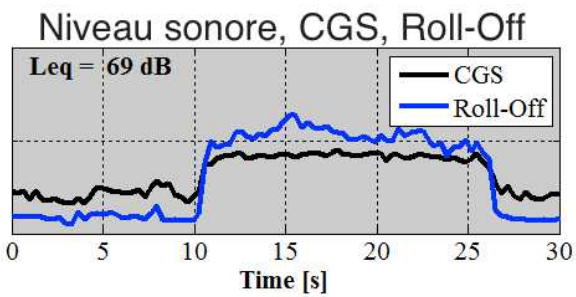
Suppress artefacts

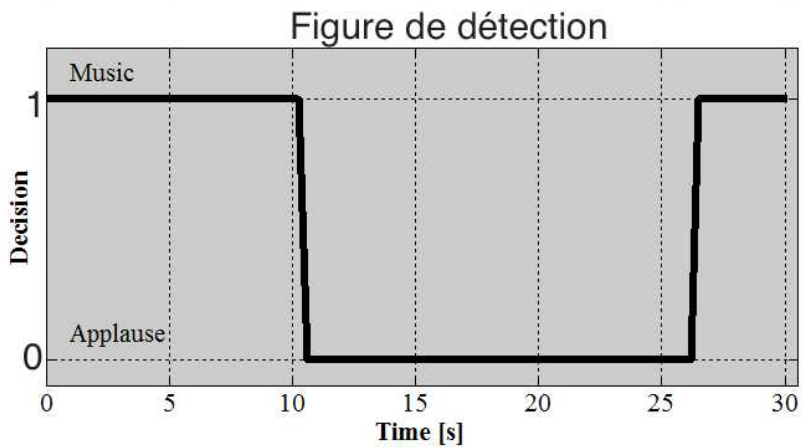
Spectral Gravity Center + Spectral Roll-Off + Temporal consistency

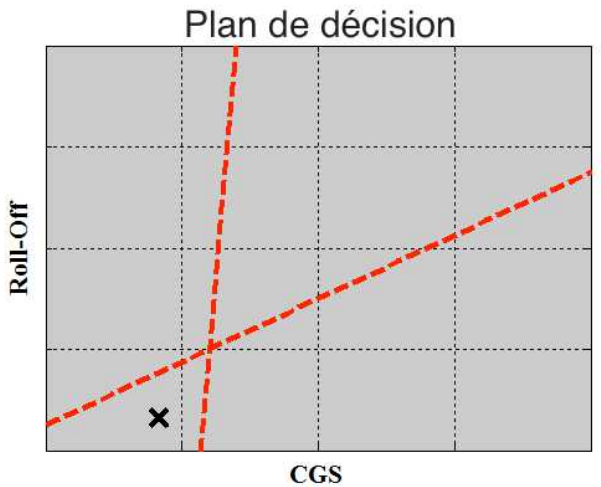
True Detection: **99%**
False Alarm: **2%**

Video demo









START STOP

Section 4

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- light and robust applause sound detection system,
- KL-based optimization features,
- implemented on a real-time Matlab environment.

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investigate more complex classifiers.

Thanks for your attention !