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Uncovering the meaning of four semantic attributes of sound : Bright, Warm, Round and Rough

Victor Rosi¹, Olivier Houix¹, Nicolas Misdariis¹, Patrick Susini¹

¹ Sound perception and sound design group, STMS Lab (IRCAM-CNRS-SU), Paris, France

Context

The present study aims to understand the use and the definition of four terms selected from the sound lexicon developed by Carron et al. [4]. Bright (*brillant*), round (*rond*), warm (*chaud*) and rough (*rugueux*) are four terms vastly used in the French language for sound description in sound creation processes such as music performance, orchestration, sound engineering or sound design. Yet, they lack formal, standardized definitions. The goal is to **get definitions, or semantic portraits, for each word with corresponding sound samples from a musical instrument dataset.**

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Interviews with sound experts

Methods

- **Participants** : 32 French-fluent sound experts (musicians, composers, sound engineers, sound designers, acousticians ...)
- **Sound dataset** : *Studio online Library & Vienna Symphonic Library* (~600 musical instruments sound samples)
- **Duration** : ~2h10
- **Structure** : Divided in four parts (for each term)
- **Questionnaire** :
 - Q1 : Frequency and context of use of the studied term
 - Q2 : Definition of the studied term
 - Q3 : Sound samples for the studied term
 - Q4 : Sound samples for the opposite of the studied term
 - Q5 : Definition of the opposite of the studied term
 - Q6 : Investigation of the affect aspect of the studied term

Text processing (Q2)



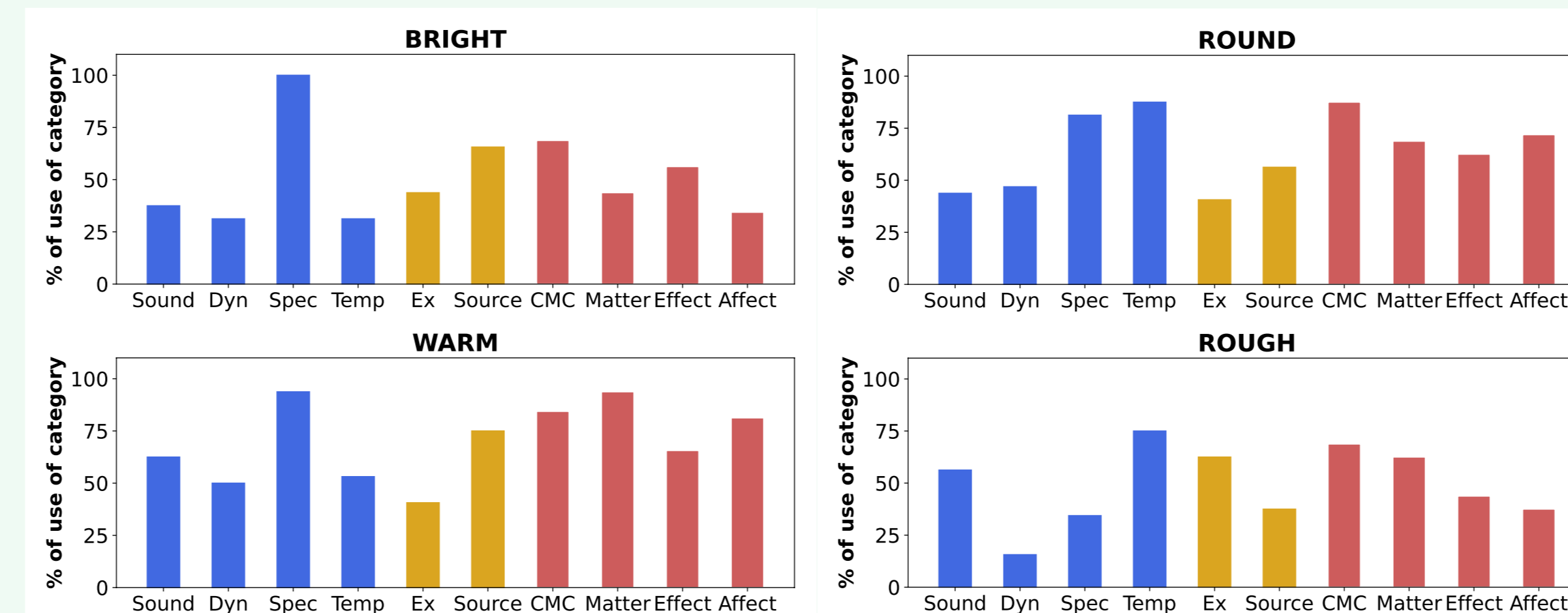
Ex : Bright (Brillant)

- Tokenization
- Lemmatization^[2]
- Lemma/Interviewee frequency for each term

Semantic Analysis

- 10 categories of **sound description** with verbal examples translated in English along with the original verbatims in French.
- Categories were validated with the top 50 lemmas by 4 experts - **Fleiss' kappa** : $\kappa = 0.69$ ($p < 0.001$)

Acoustic	
Sound specific semantic	nasal (<i>nasal</i>), resonant (<i>résonnant</i>), noisy (<i>bruité</i>)
Dynamic	<i>forte, piano, crescendo</i>
Spectral	high-pitch (<i>aigu</i>), harmonics (<i>harmoniques</i>), medium (<i>medium</i>)
Temporal	attack (<i>attaque</i>), release (<i>décroissance</i>), steady (<i>stable</i>)
Source related	
Excitation mode	rub (<i>frotter</i>), vibrato, breathing (<i>souffler</i>)
Source	trumpet (<i>trompette</i>), voice (<i>voix</i>), orchestra (<i>orchestre</i>)
Metaphoric - extracted from literature [1] [3] [4] [5]	
Crossmodal correspondance (CMC)	warm (<i>chaud</i>), harsh (<i>dur</i>), clear (<i>clair</i>)
Matter (shape, density, material)	round (<i>rond</i>), full (<i>plein</i>), organic (<i>organique</i>)
Effect	enveloping (<i>enveloppant</i>), scratching (<i>qui gratte</i>)
Affect	pleasant (<i>agréable</i>), aggressive (<i>agressif</i>), straightforward (<i>franc</i>)



Use of description strategies for the four terms

Definitions & Sound samples

- A **bright** sound has most of the spectral energy in the high frequencies. It is often a high-pitched sound that can be composed with a sharp attack. → Glockenspiel *hard stick* Trumpet *brassy*
- A **warm** sound tends to be a low-pitched or mid-low-pitched sound. It gives a feeling of spectral richness in the mid-low frequencies. It has a rather soft attack and it is a fairly pleasant sound that gives a sensation of envelopment. → Bass clarinet *ordinario* Cello *ordinario*
- A **round** sound has a soft attack and is temporally stable. It tends to also have a soft release or a long resonance. A **round** sound is spectrally perceived as full with a spectral balance located in the mid-low frequencies. → Doublebass *pizzicato* Marimba *soft stick* Tuba *ordinario*
- A **rough** sound is temporally unstable ; it presents fast temporal variations that can bring some sort of noise. It gives a rubbing/scratching sensation. → Winds *flutterzunge* Bassoon *multiphonics* Strings *sul ponticello*



Online survey (in progress)

Goal : Reduce/Hierarchize the quantity of relevant information in order to build more robust definitions

Corpus : Phrases extracted from Q2 and Q5 for each term, based on the most occurring lemmas

Populations : French-fluent sound experts

Questions (example) :

- According to you, the meaning of the concept "high-pitched sound" is : *accurate / vague / incomprehensible*
- In your opinion, is a bright sound a high-pitched sound ? *Strongly agree ... Strongly disagree / Non relevant*

Perspectives

- Annotation procedure on the sound dataset with the 4 terms - *Best-Worst Scaling* [6]
- Sound feature extraction procedure^[7] - *Regression task*
- Validation - *Comparison Definitions/Sound features*

References

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