The ObieAlto project: Looking for correlations between perceptual properties and constructional data

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Listening to 25 viola: no direct mapping between perception, construction parameters and acoustical properties

The ObieAlto project: looking for relationships between construction parameters & sound quality

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BACKGROUND

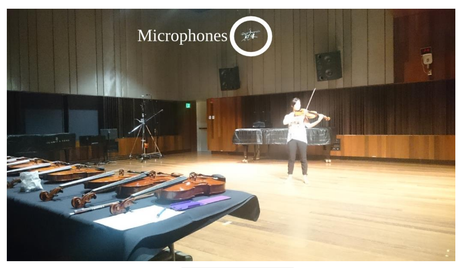
While the outline geometry differs slightly between violins, it can vary considerably between violas, which are less standardised. During the 2016 Oberlin workshop (run by the VSA), a group of instrument makers have collectively designed the so-called ObieAlto outline. 25 violas were then built following this model, and set-up with the same strings.

OBJECTIVE

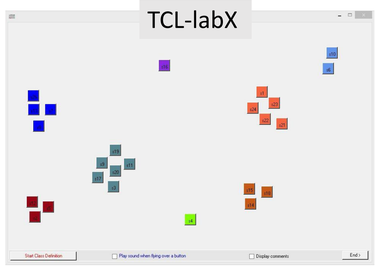
Searching for relationships between construction data, acoustical parameters and sound quality evaluations by listeners.

METHODS

- Recordings of two short musical excerpts (low/high register) by a professional player in a studio



- Free sorting task (20 international violin makers + 10 French players)

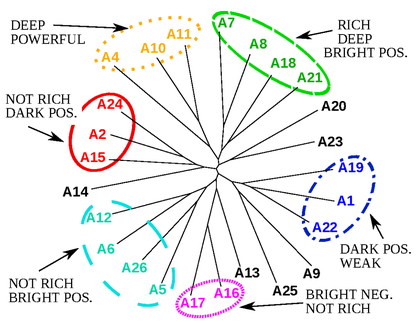


- Sound radiation measurements

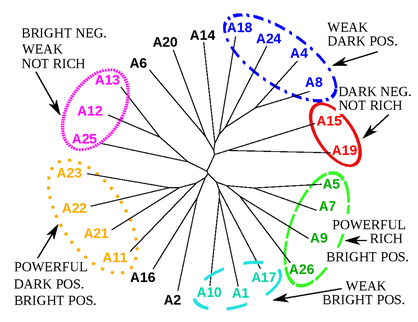
- Calculation of various audio descriptors on the recordings
- Construction data provided by the makers (weight of the plates, wood density, dimension of the f-holes,…)

RESULTS

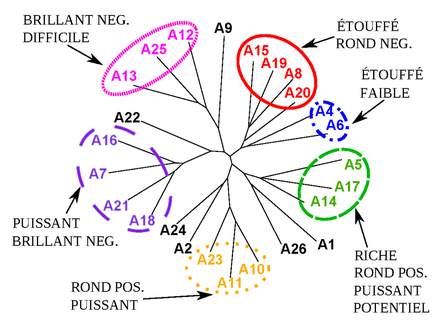
- **Free sorting task : statistical and linguistic analyses**



Low register (makers)

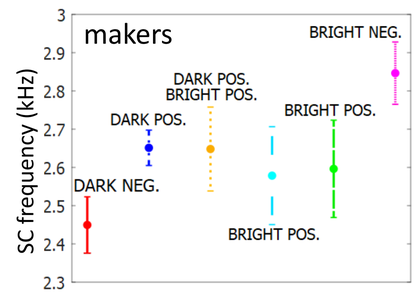


High register (makers)

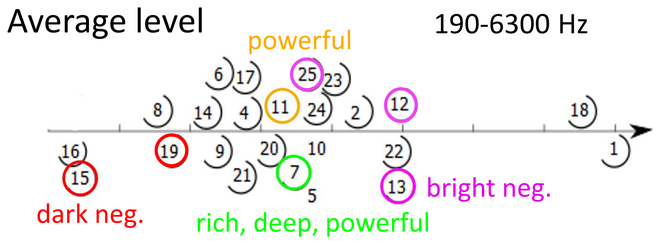


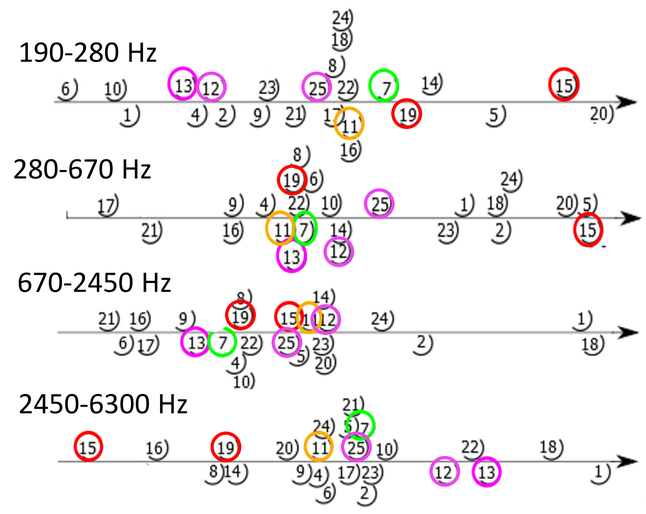
High register (players)

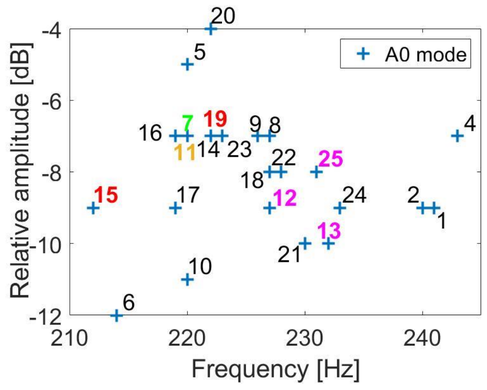
- The only **link with audio descriptors** was found between the spectral centroïd and the high register categorisation



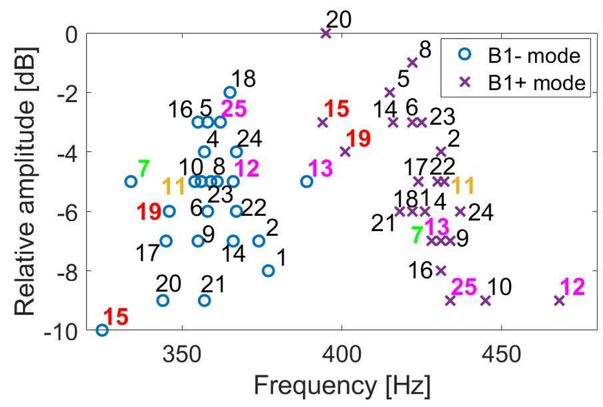
- **Link with radiation measurements**



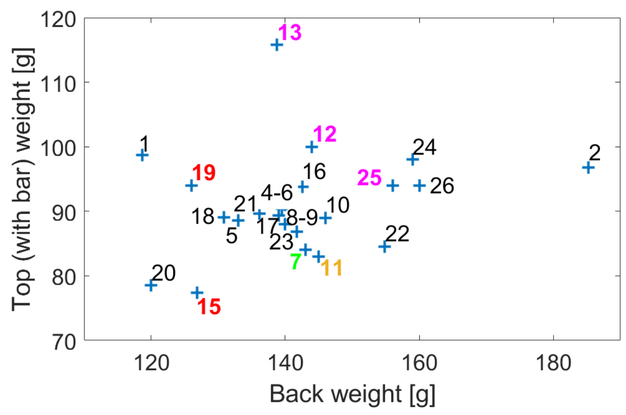




Amplitude (relative to the max over the 25 violas) and frequency of the three main signature modes



- **Link with construction parameters**



=> Dark neg. (in the high register): lower than average signature mode frequencies + high radiation level in low frequency bands and low level in high frequency bands

Bright neg.: the opposite

CONCLUSION

- Large variability between the participants (20 makers and 10 violists) -> complexity of the task + high diversity of criteria
- But still some groups of instruments share relatively consensual features.
- Very few relationships found between these perceptual features and the construction parameters -> the multiplicity of the parameters during the building process allow instrument makers to obtain a certain set of perceptual properties with very different strategies.
- Only the perceptual feature related to brightness/darkness for the high register seem to correlate, and only for the extremes, with acoustical properties (SC calculated on the recordings, frequencies and amplitude of the three main modes and average sound radiation level)

Play audio