

	aero	c-struct	c-pluc	c-bowed	i-pluc	i-struct	i-clink	membr
aero	74	14	5	3	2	1		
c-struct	12	69	10	5	1			2
c-pluc	1	7	58	29	1	2		2
c-bowed	3	6	33	52	1	3		
i-pluc		7		14	79			
i-struct	2	2	4	11	2	51		30
i-clink	11						89	
membr				6		17		78

Table 5. Confusion matrix (expressed in percent of the sounds of the original class listed on the left) of the evaluated fusion between the CREM and the Iowa database using the 20 most relevant descriptors selected by IRMSFP.

	aero	c-struct	c-pluc	c-bowed
aero	72	9	10	9
c-struct	12	12	34	42
c-pluc	23	47	28	3
c-bowed	28	34	24	14

Table 6. Confusion matrix (expressed in percent of the sounds of the original class listed on the left) of the CREM database classification based on Iowa database training.

CREM T1	Iowa T1	Iowa T2	CREM-Iowa T1
Edur Acor	AttSlp Dec	AttSlp Acor ZCR	AmpMod Acor RMSenv
Hdev Hnois HTris3			
Sflat	SFErg ERoff	Sflat SRoff SSkew	Sflat SVar SKurt Scre
ErbGKurt	ErbKurt ErbFErg ErbRoff ErbSlp ErbGCent	ErbSprd ErbFErg ErbGSprd	ErbFErg ErbRoff

Table 7. Comparison of the most relevant descriptors estimated by IRMFSP.

most relevant selected features shows a significant effect of the content of database rather than on the taxonomy. However the timbre modeling interpretation applied to timbre classification remains difficult. Future works will consist in further investigating the role of descriptors by manually constraining selection before the classification process.

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8. REFERENCES

- [1] T. W. Anderson. *An Introduction to Multivariate Statistical Analysis*. Wiley-Blackwell, New York, USA, 1958.
- [2] R. Battiti. Using mutual information for selecting features in supervised neural net learning. *IEEE Trans. on Neural Networks*, 5(4):537–550, Jul. 1994.
- [3] E. Ambikairajah, J. Epps, and L. Lin. Wideband speech and audio coding using gammatone filter banks. In *Proc. IEEE ICASSP'01*, volume 2, pages 773–776, 2001.
- [4] N. F. Fletcher and T. D. Rossing. *The Physics of Musical Instruments*. Springer-Verlag, 1998.
- [5] L. Fritts. Musical instrument samples. Univ. Iowa Electronic Music Studios, 1997. [Online]. Available: <http://theremin.music.uiowa.edu/MIS.html>.
- [6] M. Goto, H. Hashiguchi, T. Nishimura, and R. Oka. Rwc music database: Music genre database and musical instrument sound database. In *Proc. ISMIR*, pages 229–230, Oct. 2003.
- [7] J. M. Grey and J. W. Gordon. Perceptual effects of spectral modifications on musical timbre. *Journal of Acoustic Society of America (JASA)*, 5(63):1493–1500, 1978.
- [8] S. McAdams, S. Winsberg, S. Donnadieu, G. Soete, and J. Krimphoff. Perceptual scaling of synthesized musical timbres: Common dimensions, specificities, and latent subject classes. *Psychological Research*, 58(3):177–192, 1995.
- [9] N. Misdariis, K. Bennett, D. Pressnitzer, P. Susini, and S. McAdams. Validation of a multidimensional distance model for perceptual dissimilarities among musical timbres. In *Proc. ICA & ASA*, volume 103, Seattle, USA, Jun. 1998.
- [10] B.C.J. Moore and B.R. Glasberg. Suggested formulae for calculating auditory-filter bandwidths and excitation patterns. *Journal of the Acoustical Society of America*, 74:750–753, 1983.
- [11] G. Peeters. Automatic classification of large musical instrument databases using hierarchical classifiers with inertia ratio maximization. In *115th convention of AES*, New York, USA, Oct. 2003.
- [12] G. Peeters, B. Giordano, P. Susini, N. Misdariis, and S. McAdams. The timbre toolbox: Audio descriptors of musical signals. *Journal of Acoustic Society of America (JASA)*, 5(130):2902–2916, Nov. 2011.
- [13] G. Peeters and X. Rodet. Automatically selecting signal descriptors for sound classification. In *Proc. ICMC*, Göteborg, Sweden, 2002.
- [14] E. Schubert, J. Wolfe, and A. Tarnopolsky. Spectral centroid and timbre in complex, multiple instrumental textures. In *Proc. 8th Int. Conf. on Music Perception & Cognition (ICMPC)*, Evanston, Aug. 2004.
- [15] G. Torelli and G. Caironi. New polyphonic sound generator chip with integrated microprocessor-programmable adsr envelope shaper. *IEEE Trans. on Consumer Electronics*, CE-29(3):203–212, 1983.
- [16] E. v. Hornbostel and C. Sachs. The classification of musical instruments. *Galpin Society Journal*, 3(25):3–29, 1961.