Dynimax : a browser to stretch, to scrub and to visualize bioacoustical structures

Maxence Mercier [1,5], Joseph Razik [2,3,4,5], Yann Doh [4,5,6], Sébastien Paris [2,3,4,5], Maia Hoeberechts [5,8], Vincent Roger [2,4,5,7], Hervé Glotin [2,3,4,5]

(1) TRIPINLAB.com, France
(2) Université de Toulon, Aix Marseille Univ, CNRS, LIS, DYNI team, Marseille, France
(3) BRILAM, STIC AmSud ; (4) EADM GDRS CNRS MADICS, France
(5) SABIOD.org ; (6) DIRAC ONG : (7) NortekMed, France
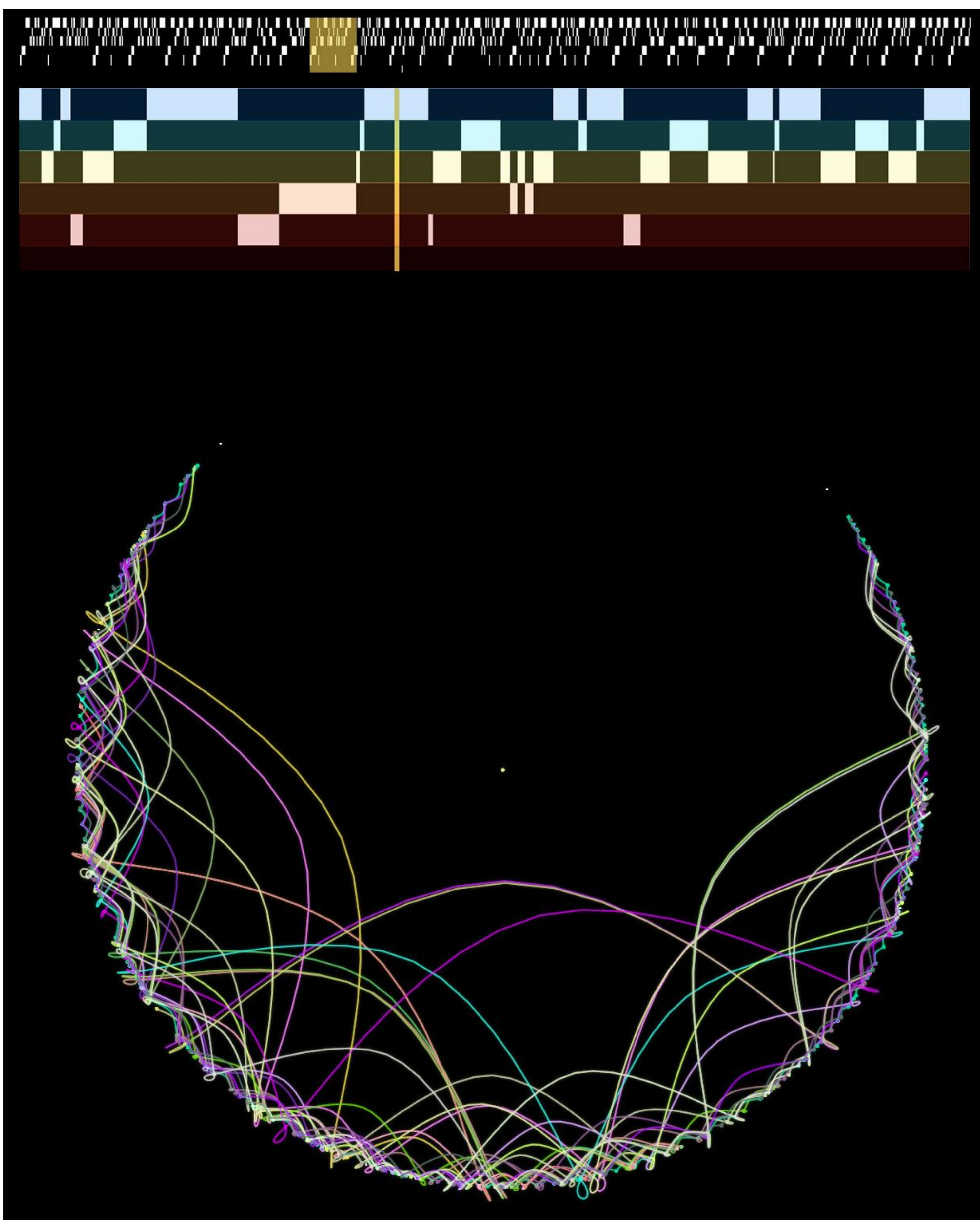(8) Ocean Network Canada, Victoria Univ. Vancouver, Canada

maxence.mercier@tripinlab.com, joseph.razik@univ-tln.fr, sebastien.paris@univ-tln.fr, herve.glotin@univ-tln.fr, yanndoh.m2@gmail.com

Demo video

Dynimax is an interface (Mercier 2018) for quick navigation, stretching, scrubbing and visualizing the structure of bioacoustical, e.g. the songs of humpback whale.

A first tool allows the user full control over the playback head of an audio player with various real-time audio playback techniques. It also allows a time stretching to play sound at a free speed without changing the pitch. A scrubbing function based on a vocoder (Roebel 2003) allows the user to freely control a read head at a free speed without changing the step, with real-time sonogram. This is a convenient way to quickly navigate through large data set and or, high speed audio recording. It is a valuable tool for extremely slow speed reading, particularly useful for micro-sound analysis. The user can then control the playback speed and freeze the sound. If these techniques are common in music software, they are here adapted for bioacoustic, with high quality resampling and resynthesis to allow *extreme* stretching over time with less artifact.

A second tool, called "Circular score", proposed in Mercier 2015, aims to highlight the temporal structure of a sequence, depicting the links between similar tuples (Ngrams). In this bioacoustical version, the circular score displays consecutive Ngrams in the form of a sequence of curves linking consecutive instances of a Ngram. The demonstration1 is given on humpback whale song, where the matrix contains the units learned from unsupervised IHMM decomposition (Bartcus 2015). This matrix could be alternatively issued from sparse coding (Razik 2015, 2016). We see that each curve connects two identical tuples of song units. The resulting circular score illustrates the structure of the main sequence at the chosen subsequence scale. It shows the connection between sections that are easier to organize visually compared to a linear layout, thus it is adapted to visualize long sequence. This representation is useful for quick multiscale inspection and comparison of songs. For this purpose a multistream version of Dynimax is being distributed.

Bartcus , Chamroukhi , Glotin , Hierarchical Dirichlet Process Hidden Markov Model for Unsupervised Bioacoustic analysis - application to whale song decomposition, IEEE IJCNN 2015, http://sabiod.org/workspace/IHMM_Whale_demo

Mercier et al, http://sabiod.org/dynimax/dynimaxdemo.mov Dynimax OSX demo

Mercier, Glotin, Dynimax: a tool for bioacoustics exploration, invited symposium, IMéRA - Institute for Advanced Study Mediterranean Exploratory of Interdisciplinarity, April 2018

Mercier, Razik, Glotin. Synthèses d'interactions multimodales parcimonieuses pour l'écriture de l'œuvre Iquisme et l'analyse de ses percepts. In Journées d'Informatique Musicale, Montréal, 2015. http://razik.univ-tln.fr/pdfs/mercier_2015.pdf

Razik, Glotin, Hoeberechts, Doh, Paris, 'Sparse Coding for Efficient Bioacoustic Data Mining: Application to Whale Songs', 978-1-4673-8493-3/15, IEEE Int. Conf. on Data Mining Workshops, ICDM EADM 2015 ,

Roebel Axel, A new approach to transient processing in the phase vocoder . 6th International Conference on Digital Audio Effects (DAFx). London, p. 344-349, 2003