instance, as plain lists of parameters (as shown in Figure 3) or as parameters grouped in higher-level bundles in cases where dozens of similar sensors are used (as shown in Figure 4).

Associated with LibMapper, we proposed the development of a "toolbox" containing useful functions used repeatedly, *The Digital Orchestra Toolbox* (DOT)². An example of DOT object for dealing with boundaries in data streams is shown in Figure 5.

4. Conclusions

This talk presents an overview of the developments towards an open-source, platform independent software tool for the intuitive, collaborative development of mapping strategies for Digital Musical Instruments, the LibMapper.

A short demonstration of some of the functionalities of this tool will be presented during the talk.



Figure 3: Example of a LibMapper GUI. On the left side (Sources), controller parameters are displayed. Raw sensor outputs and higher-level parameters are available, such as information about the grip or the amount of energy used by a performer playing the *T-Stick* [Malloch and Wanderley, 2007a]. On the right side (Destinations), the inputs of the synthesis algorithm are displayed, in this case a granular synthesizer. The middle part of the figure allows the designer to create connections between both sides, effectively establishing mappings between controller and synthesis variables. On the top bar several functions are available such that designers can condition the mappings by defining an expression describing the behavior one wants to achieve or, for instance, limiting input and output ranges. Finally, options to save and load mappings are also provided.

⁽²⁾ In our case, these functions are developed in Max/MSP.



Figure 4: Example of another LibMapper GUI designed by Vijay Rudraraju [Rudraraju, 2011] for the use of multiple sensor sharing similar outputs (for instance, dozens of wireless nodes each containing a three-axis accelerometer, the green output nodes in the left of the figure). The list-based interface shown in figure 3 would not be practical in this case due to the amount of similar variables displayed.



Figure 5: An example of a DOT object, dot.boundary.

Acknowledgement

The work presented in this document has received support from the project CRÉATIVITÉ Instrumentale, funded with support from the French Agence Nationale de la Recherche, under the program la Création : Acteurs, Objets, Contextes 2008 - ANR-08-CREA-031.

References

- A. Hunt. «Radical User Interfaces for Real-time Musical Control». Doct.on Phil. thesis. University of York. UK. 1999.
- D. Kushner. «The Making of Arduino». *IEEE Spectrum*. October 2011.
- J. Malloch and M. M. Wanderley. «The T-Stick: From Musical Interface to Musical Instrument». In Proc. of the International Conference on New Interfaces for Musical Expression (NIME). pp. 66-69. 2007.
- J. Malloch, S. Sinclair and M. M. Wanderley. «A Network-based Framework for Collaborative Development and Performance of Digital Musical Instruments». In R. Kronland-Martinet, S. Ystad, and K. Jensen (eds.): CMMR 2007. Proc. of Computer Music Modeling and Retrieval 2007 Conference. LNCS 4969. Berlin Heidelberg: Springer-

Verlag, pp. 401-425, 2008.

- V. Rudraraju. A Tool for Configuring Mappings for Musical Systems using Wireless Sensor Networks». M.A. thesis, McGill University, 2011.
- H.-C. Steiner. «[hid] toolkit: a unified framework for instrument design». In Proc. of the International Conference on New Interfaces for Musical Expression (NIME). pp. 140-143, 2005.

3. About the author



Marcelo Mortensen Wanderley holds a Ph.D. degree from the Université Pierre et Marie Curie (Paris VI), France, on acoustics, signal processing, and computer science applied to music. His main research interests include gestural control of sound synthesis, input device design and evaluation, and the use of sensors and actuators in digital musical instruments. Dr. Wanderley has chaired 2003 International Conference on New Interfaces for Musical Expression and co-authored the textbook "New Digital Musical Instruments: Control and Interaction Beyond the Keyboard", A-R Editions. He is currently William Dawson Scholar and Associate Professor in Music Technology at the Schulich School of Music, McGill University, Montreal, where he directs the Centre for Interdisciplinary Research in Music Media and Technology (CIRMMT).