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# Multifog: a Multi-Level Control Device for FOG Granular Synthesis in Max/MSP

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**Abstract.** In this session we present a device to provide real time granular synthesis in Max/MSP with a multi-level control utility: a technical explanation and multiple sound examples are given.

The device has originally been conceived as a part of the concert patch for the work *exp.doc...et juv.* for saxophone and live electronics, composed by Marta Gentilucci as final project within the IRCAM Learning Program *Cursus 1* (first performance: IRCAM Espace de Projection 27th March 2010).

**Key words:** real time granular synthesis, FOF, FOG, Max/MSP.

## 1 Why *exp.doc...et juv.* has led to Multifog

Speaking about the acoustic sound and the electronically processed one, Marta Gentilucci's personal approach was and is always led off the sonic specificity of the chosen instrument. Then the starting point of her compositional works is often anticipated by a long preparatory collaboration with the instrumentalist: this is what we can call the first creative input toward the written piece.

In the specific case of *exp.doc...et juv.*, the compositional interest was how to rhythmically articulate a tenuto sound thanks to different manner of pronouncing it: with the position of mouth, tongue, lips and teeth on the reed and on the mouthpiece. Taking into account the micro variations of the saxophone sound during a standard tenuto and moreover during the standard *détachés*, the staccati, i.e. *tu*, *tu-ku*, *wa-wa*, these play-techniques were analyzed in details and developed, magnified and multiplied in many sub-categories: a sort of mapping has been created, a categorization of the articulated sound.

It came to evidence that the problematic of rhythmical articulation has to be managed also at the level of sound synthesis: managing the micro-rhythm for every voice (partial or groups of partials) of the polyphonic texture by creating a bank of amplitude envelopes, which are responsible of a synthetic musical phrase/gesture/trajectory, not only statically but also dynamically conceived. Starting by composing synthesized sounds within the workspaces Open Music and OMChroma, a necessity stood out: the development of instruments to translate some aspects of this non-real time approach into an environment for

real-time synthesis, for example by shaping banks of amplitude envelopes and writing them in form of colls for Max/MSP.

The proposal to use the [fog~] synthesis engine was extremely proper to this necessity because of its capability to design the micro-level and the internal rhythm of the sound. The almost natural evolution of the compositional thought process connected to the technical necessity has led to the creation of our Multifog instrument.

## 2 Real Time Granular Synthesis with Multifog

Formant Wave-form (FOF) synthesis ([1]) is a technique originally conceived for the generation of singing voices: its extension to sampled waveforms ([3]) has led to a particular kind of granular synthesis thus called FOG. The increasing power of computing machines has later allowed the implementation of algorithms for the real time employment of such techniques, and in particular of the [fog~] object for the MSP framework ([6],[4]). This engine offers large low level sound design possibilities; it can also be guided by SDIF files containing PSOLA analyses ([2],[5]), allowing the specification of higher level synthesis parameters as well as sound features matching the ones of the analyzed real source. Interpreting a single [fog~] object as a monophonic instrument, the articulation of complex sound structures has to be designed according to the compositional need.

Our device has been conceived to control orchestras of multiple granular engines with a musical approach: the user can access all the low level synthesis parameters with a graphical interface, as well as the dynamical articulation of the voices in the orchestra and the superposition of multiple orchestras playing different structures; moreover, the settings for individual orchestras can be stored in different presets and easily be recalled during the performance. A particular feature regards the possibility of defining variable amplitude envelopes for each sound generated by the single voices: sets of text lists defining curves can be handled by each voice at desired rates, thus providing a controlled internal variation to the synthesized texture.

## 3 Further Development

Multifog is a first implementation of a device which will be extended to deeply exploit several possibilities. Granular synthesis can realize several standard audio effects such as time stretching and pitch transposition: we have already created some presets for blind versions of these techniques. Nevertheless, the presets paradigm can be expanded with the use of PSOLA analyses: it will allow methods for instrumental multiplications based on appropriate modifications of a single original analysis within the different [fog~] voices ([7]).

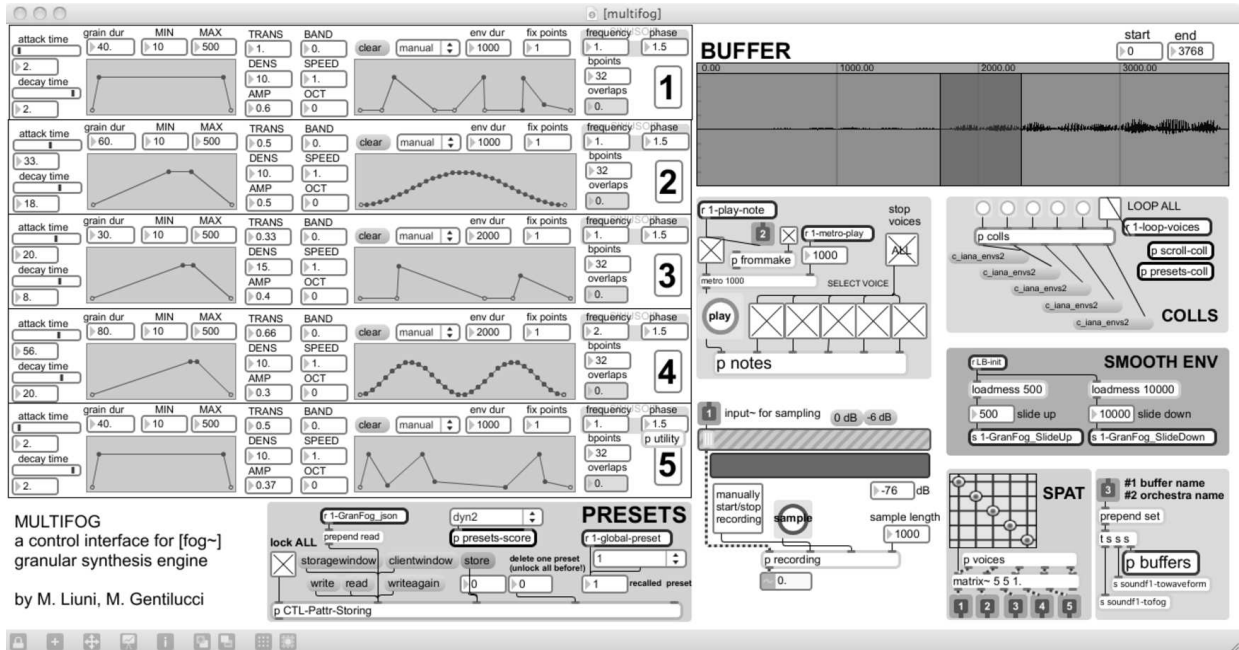


Fig. 1. A screenshot of the [multifog] Max/MSP object.

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