o.OM: Structured-Functional Communication between Computer Music Systems using OSC and Odot

Jean Bresson, John MacCallum, Adrian Freed
UC Berkeley — Center for New Music and Audio Technologies
IRCAM / UMR 9912 "STMS" CNRS — UPMC Sorbonne Universités

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Extended Frameworks for "In-time" Computer-Aided Composition
Open Sound Control (OSC)

- *lingua franca* for interactive media/arts programming
- binary encoding
- key/value store
- punctuation
- [http://opensoundcontrol.org/spec-1_0](http://opensoundcontrol.org/spec-1_0)

```
28 /synth/1/note/hz\0\0\0\0 ,f\0\0 440.
```
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- [http://opensoundcontrol.org/spec-1.0](http://opensoundcontrol.org/spec-1.0)

```bash
#bundle\0 2016-09-22T23:45:59.616117Z
28 /synth/1/note/hz\0\0\0\0 ,f\0\0 440.
28 /synth/1/gain/db\0\0\0\0 ,i\0\0 -20
28 /synth/2/note/hz\0\0\0\0 ,f\0\0 446.
28 /synth/2/gain/db\0\0\0\0 ,i\0\0 -32
...
```
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```plaintext
/synth/*/note/hz 440.
/synth/[1-3]/note/hz 440.
/synth/{1,3,5}/note/hz 440.
```
- superset of osc 1.1 (additional types)
- dynamic programming environment
- embedded in a host environment
- includes a small, lightweight expression language evaluator (o.expr)
- [https://github.com/CNMAT/CNMAT-odot](https://github.com/CNMAT/CNMAT-odot)

```plaintext
#bundle 2016-09-22T23:45:59.616117Z
/synth/1/note/hz 440.
/synth/1/gain/db -20
/synth/2/note/hz 446.
/synth/2/gain/db -32
```

```plaintext
#bundle 2016-09-22T23:45:59.616117Z
/synth/1/note/hz 440.
/synth/1/gain/db -20
/synth/1/note/midi 69.
/synth/1/gain/amp 0.1
/synth/2/note/hz 446.
/synth/2/gain/db -32
```

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–atomic
–preserves documentation
–preserves time stamp
–no type conversion
–decouples ‘what’ is computed from ‘where’ it is computed

–small, lightweight functional expression language
–function abstraction, and higher order functions
–no side effects

1.0:
–not designed
–brittle and awkward syntax
–multiple languages

2.0:
–designed :)…
OpenMusic: Visual programming environment for Computer-Aided Composition

http://repmus.ircam.fr/openmusic/

- Visual programming language built on top of LISP
- Used by composers to implement compositional processes (generation/ transformation of musical structures).
- Demand-driven execution
- Local state — Use graphical editors to visualise and edit input/intermediate/output data (scores, sounds, etc.)
- Specialised libraries for specific computing or musical approaches (chaos, probabilistic models, constraint programming, DSP, etc.)
The OM Composer’s Books

J. Bresson, C. Agon, G. Assayag (Eds.)
Collection Musique / Sciences
IRCAM - Editions Delatour France

Volume 3: 2016!
OSC communication with external systems in OpenMusic

- External input devices
- Control of spatial audio or real-time DSP
- Orchestration server
- Human-Computer Improvisation
- etc.

**o.OM : An implementation of odot in OM**

- Create — Process — Send — Receive OSC messages and bundles
- Format expressions in the *odot* language
- Evaluate *odot* expressions on OSC bundles
Use case 1: Control of realtime spatial audio synthesis

- Reduced and constant size of the streamed bundles
- Possibility to write open interpretive instructions, (freedom to choose or change the interpretation)
Use case 1: Control of realtime spatial audio synthesis
Use case 2: Receiving reception contour recognition data computed from live video capture

- Odot expressions used as mapping to graphical representation
- OSC bundles collected in a data-stream container
— Sequencer / timeline view of the OSC stream (visualisation and authoring)
— Possibility to personalise to representation (from OM or from outside, in the same language)
Advantages of using o. in OM/media environments:

— Embedding functional specification and programming within OSC
— Optimize and extends expressivity in communication frameworks
— Operate directly on the transferred data
— Sharing a common language between heterogenous environments