1. PROGRAM NOTES

T/ensor/~ (version 0.3) is a work-in-progress prototype of a dynamic performance system developed in MAX that involves adaptive digital signal processing modules and generative processes towards exploring the field and performance practice of human-machine improvisation. The system is the result of a pilot, six-month artistic research study entitled ‘Improvisation Technologies and Creative Machines: The Performer-Instrument Relational Milieu’ (ITCM) funded by the UK’s AHRC Creative Industries Clusters Programme project: Creative Informatics · Data Driven Innovation for the Creative Industries (Small Research Grants 2022).

The practice-led, artistic research design of the ITCM project and the framework that led to the development of T/ensor/~ (Fig. 1) involved the tracing of relevant theoretical and practical understandings that explore the technicity of musical improvisation while building upon the author’s prior research on the fields of free improvisation, contemporary music notation, and electro-instrumental music. The project also invited performers/improvisers — Christos Michalakos (drum kit), Francisco Sánchez Díaz (saxophone), Richard Craig (flute) — to test and to play with the developed system and explored via its practice-led research methodology whether the HCI performance setting promotes a dialogic and co-produced improvisational musical space.
2. PROJECT DESCRIPTION

At the core of the ITCM project that led to the development of the T/ensor/~ system was the epistemological tracing of what George Lewis calls, “creative machines” [9] [10] [11] as well as the encoding of relevant free improvisation technologies — with the word ‘techno-logy’ understood here as the rhetorical accounts (λόγος, lógos) that harbour the techne (téchnē, tékhne) and technique of free improvisation. In this regard, the design methodology involved:

- The developing of adaptive digital signal processing modules [5] [6] towards exploring the notions of ‘instrumentality’ and ‘liveness’ [3] [16], and the composing of performance settings where listening and sound become “the basis for the articulation and unfolding of time” [7]. (Fig. 2)
- The translating of the principles of the notational environments I have been developing the last ten years [13] [14] [15] into generative processes and prototypes (Fig. 3) in an attempt to encode and to simulate the performer-instrument feedback relationship of ‘interaction, resonance, and resistance’ [2] as traced in free improvisers’ accounts — see, for example, the notion of instrumental impulse as discussed by Derek Bailey [1], or the concept of biofeedback as presented by Evan Parker [8].

In this sense, the T/ensor/~ system, in its current version, can be understood both as an adaptive instrument/environment that affords ‘the testing of boundaries and the uncovering of threshold conditions’ [17] through ‘encounters between modalities of listening’ [10], and as a composed, improvising/generative machine.

![Fig. 2. Sketch of the adaptive DSP processes in Tensor/~](image)
that attempts to incorporate and to simulate into feedback mechanisms a material-dialogic ‘techno-logy’ and method for (free) improvisation.

The key artistic research, open-ended question of this work-in-progress is the encoding of the concept of “syn-schediasmos” [14] [15] — a compound of the Greek prefix syn- (syn-) as found in the word σύνθεσις (synthesis: composition), and the Greek noun σχεδιασμός (schediasmos) as found in the word αυτοσχεδιασμός (autoschediasmos: improvisation) — towards an envisaging of ‘composition’ and ‘improvisation’ as componential and dialogic settings, and as “critically imbued aesthetic spaces” [9]. Interestingly, the Greek prefix syn- and the Latin prefix con- that can be found in the semantically parallel words σύνθεσις (synthesis) and composition, originate from the prepositions σύν (sún) and cum respectively, both meaning ‘with’. In this regard, the word tensor aims in functioning as a metonym for the “in-between” [12] in an attempt to direct one’s attention to the “abstract machine” [4] that diagrammatises the relational milieu of correspondences between people, instruments, and ‘techno-logies’ — the ensorcelled bodies and muscles that “make music together” [9] and ‘co-draw’ (σχεδιάζω, schediazo: to draw) the improvised journey in ‘with-ness’[14] [15].

Fig. 3. Sketch of the generative processes in T/ensor/~ (Emboldened lines: audio signals; Dashed lines: control signals)
3. PERFORMANCE NOTES

Our proposal for the NIME 2023 conference involves a c.10–12 minute improvised performance with the system (drum kit performer and T/ensor/~ version 0.3). Performers on stage: Christos Michalakos – Abertay University (drum kit); Dimitris Papageorgiou (system/levels monitoring). Technical requirements can be found in the table below.

Table I. Technical Requirements

<table>
<thead>
<tr>
<th>Equipment provided by the author</th>
<th>Equipment provided by the conference</th>
</tr>
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<tbody>
<tr>
<td>· Laptop with T/ensor/~ 0.3</td>
<td>· Drum Kit</td>
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<tr>
<td>· Audio Interface (RME UCX)</td>
<td>· Two large diaphragm condenser microphones</td>
</tr>
<tr>
<td>· MIDI controller for levels monitoring</td>
<td>(example: AKG 414) – drum kit overheads</td>
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<tr>
<td></td>
<td>· One dynamic microphone (example: SM57) – snare</td>
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<tr>
<td></td>
<td>· One dynamic microphone (example: Audix D6) – inside kick drum</td>
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<tr>
<td></td>
<td>· One condenser microphone (example: Neumann U87) – floor, facing kick drum</td>
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<tr>
<td></td>
<td>· Mic pre-amplifier with ADAT connectivity</td>
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<tr>
<td></td>
<td>(example: Scarlet OctoPre; ADAT to the audio interface provided by the author)</td>
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<tr>
<td></td>
<td>· Powered stereo monitors (example: Genelec 8040, 8050 or similar)</td>
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<td></td>
<td>· Two pairs of headphones with ¼ TRS (on-stage monitoring; performer &amp; author)</td>
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<tr>
<td></td>
<td>· Headphones amplifier/splitter</td>
</tr>
<tr>
<td></td>
<td>· Cabling infrastructure [5x XLR m-f (mics); 2x ¼ TRS to XLR m (RME to monitors); 1x ¼ TRS m-m (RME to headphones amplifier) &amp; 2x ¼ TRS m-f extension cables (amplifier to headphones); 2x 4-way power extension leads]</td>
</tr>
</tbody>
</table>

4. MEDIA LINK(S)

- Edited excerpts from the ITCM test & play sessions with drummer/improviser Christos Michalakos (T/ensor/~ versions 0.1 & 0.2): https://tinyurl.com/n7fp4vzt
- The ITCM project website: https://tinyurl.com/2nm2ei4k

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REFERENCES