Title: Interstellar

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L2ORK TWEETER INTERNATIONAL ENSEMBLE MEMBERS
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1. PROGRAM NOTES

"Interstellar" is the latest work co-created by the members of the L2Ork Tweeter International Ensemble. Led by its founder and Director Dr. Ivica Ico Bukvic, the performance features live performers over 5,000 miles apart and integrates projection mapping co-developed by a visual artist Thomas Tucker and Bukvic. Tightly integrated sync of the ensuing telematic electronic music that blends EDM and Ambiental is made possible using L2Ork Tweeter free and open-source software platform that also interfaces with the MadMapper software responsible for the visual projection mapping.

"Interstellar" is commissioned by the Alexandria VA Office of the Arts. It is inspired by StudioKCA's "Interstellar Influencer (Make an Impact)" installation on display in Alexandria's Waterfront Park. Like the installation, this piece tells the story of an asteroid whose impact shaped Chesapeake Bay over 35 million years ago.

L2Ork Tweeter International Ensemble members who originally co-created the work were (listed in alphabetical order): Ivica Ico Bukvic (Director, on site), Uma Futoransky (Buenos Aires, Argentina), Gala Gonzalez Barrios (on site), Justin Kerobo (on site), Joaquín Montecino (Buenos Aires, Argentina), Jacob Alan Smith (North Carolina), Lauti Sosa (Buenos Aires, Argentina), Caden Vandervort (Virginia), and Lane Wills (Virginia). The final roster of community members who will perform at NIME 2025 will be announced at the concert. They are joined by a visual projection artist Thomas Tucker.

2. PROJECT DESCRIPTION

L2Ork Tweeter is a free and open-source program inspired by the unprecedented COVID-19 pandemic that has required a vast majority of the human population to practice prolonged social distancing. It is designed to bring communities together by empowering users around the world to engage in collaborative music making even over slow internet connections. It facilitates the exploration of audio synthesis, and the rich variety of sounds one can generate using a customized frequency modulation algorithm. Tweeter supports up to twelve concurrent performers and as many additional guests, or audience members, as the server bandwidth allows, who can observe a performance live over the internet with pristine audio quality. Each user is given a customizable instrument with a tracker that can be populated by up

to 64 loop-enabled keystrokes or notes. This intentional constraint requires users to build complexity through interaction with other users. It is in part inspired by the popular social media platform Twitter that imposes a similar design constraint of allowing only up to 280 characters per Tweet. As a result, L2Ork Tweeter can be seen as a musical counterpart to Twitter.

Fig. 1. Interstellar's October 19, 2024 premiere promotional poster.

What arguably sets L2Ork Tweeter apart from other technological solutions to telematic musicking, are four key traits [1]:

1. It allows for perfect sync regardless of the distance and latency, and is particularly conducive towards contemporary, tightly-synced EDM-style musicking;
2. Its audio output, regardless of whether the observer is a co-performer or an audience member, is pristine, regardless of the internet connection quality, or bandwidth (as long as the internet connection is steady with no interruptions in connectivity, or minimal interruptions for no longer than one second, and offers 5mBit upload and download speed, it will be deemed as adequate);
3. It provides a rich set of tools for musical co-creation and instruction over distance, and
4. It embeds its artistic artifacts with the software, including all the necessary materials for their future reproduction, thus also serving as a preservational platform.

Since its 2020 introduction, the Virginia Tech Linux Laptop Orchestra (L2Ork) and the L2Ork Tweeter International Ensemble ensemble have premiered six new co-

created works across four continents, spawning a new satellite community ensemble located in UNTREF, Buenos Aires. For additional information, please consult the prior publication [1], the project website, and/or the project's YouTube channel (https://youtube.com/vtdisis).

3. PERFORMANCE NOTES

The work is envisioned to be performed telematically. Doing so requires the physical presence of the ensemble director or one of the ensemble performers at the performance venue who can use their own hardware (two laptops) for the live audio-visual output. In this scenario, the venue organizers should only need to provide one audio output (typically 1/8" stereo headphone jack) and one HDMI video output to the main screen. One laptop will be used for the audio-visual projection, while the other will be used for the performance by the ensemble member who will be attending in person. Both laptops will need to have access to a stable internet connection (ethernet preferred, WiFi is also an option—stable connection is more important than the bandwidth, as Tweeter requires very little of it, with the Zoom connection with telematic performers taking up most of the bandwidth needs). Here, we define stable connection being a stable connection (WiFi or wired) with no connectivity interruptions (or minimal interruptions that last no more than a second) and with the upload and download bandwidths of at least 5mBit. This is the approach the ensemble wishes to explore for this performance, with the L2Ork ensemble director being present.

As an alternative, the hosting venue can install Pd-L2Ork free open-source software on the computer (all major OSs are supported) that is connected to the venue's PA system. The same computer should have a reliable network connection to the internet. In parallel, the desktop of the same computer should be projected onto the performance venue's screen showcasing the software's main window that displays performer activity. Next to the software window there should be a Zoom session window with performers. The software's main window may need to be zoomed out to accommodate both (using CTRL + and CTRL – and then resizing the unused portions of the window). Zoom session should not have audio connected, as performers will use the same to verbally communicate with each other to coordinate during the performance. Optionally, select performers can also be present on stage in which case they also need to have stable wired or WiFi access (please see the paragraph above for a definition of a stable connection). Optionally, other listeners (audience) in and outside the venue can experience the performance by connecting using the same free software. For a detailed overview of window positioning, please consult the following video: https://www.youtube.com/watch?v=U113g37Byrs.

The projection mapping will be adapted to the venue capacity. This may involve projecting onto different structures and walls, as needed. The same can be also implemented as a remote off-site telematic projection that will be accessible to the

audience via a Zoom projection that may require a supplemental projection screen or be integrated into the existing projection. The final iteration of the projection mapping element will be determined in consultation with the conference organizers and venue staff.

The work can also be presented as a fixed media video, in which case a downloadable video will be provided. If applicable, stereo audio output should also be mixed to the venue PA system's subs.

4. MEDIA LINK(S)

- Video: https://www.youtube.com/watch?v=c1O-3g2tkoQ

Additional online resources are linked below:
- L2Ork: https://l2ork.music.vt.edu
- Pd-L2Ork: https://l2ork.music.vt.edu/main/make-your-own-l2ork/software/
- L2Ork Tweeter: https://l2ork.music.vt.edu/main/make-your-own-l2ork/tweeter/

Follow L2Ork on:
- Instagram: https://instagram.com/L2Ork
- Facebook: https://facebook.com/L2Ork
- X: https://x.com/L2Ork

5. JOIN US

L2Ork is a Virginia Tech 1-credit-hour area six course open to all majors. No prior music experience necessary. Look us up on the university's timetable of classes under MUS 3314 L2Ork. L2Ork is also an International Ensemble open to all music enthusiasts with members spanning multiple countries and continents. If you are unable to enroll in the class, you are always more than welcome to join our community. To inquire please contact the L2Ork founder and director Dr. Ivica Ico Bukvic at ico@vt.edu.

6. ACKNOWLEDGMENTS

Ensemble members without whose creativity, commitment, and participation this project would not have been possible.

7. ETHICAL STANDARDS

The participants in the ensemble were community members and volunteers. The ensuing crowdsourced content is attributed to all co-creators and co-performers. The commission funds allocated for performers have been equally distributed across all participants regardless of their geographic location or nationality. There is no known conflict of interest associated with the creation and production of this work. This project does not involve any form of data collection beyond recording of the ensuing live crowdsourced telematic work.

8. REFERENCES

[1] I. Bukvic, "Latency-, Sync-, and Bandwidth-Agnostic Tightly-Timed Telematic and Crowdsourced Musicking Made Possible Using L2Ork Tweeter," New Interfaces for Musical Expression, the University of Auckland, New Zealand, 2022.