Expanded Horizons:
Music Technology & Live Performance

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Session Overview
Modern technology is expanding the horizons of musical performance for vocalists and instrumentalists, as well as blurring the lines between performers, composers, and instrument designers. On today's stages, from the world of pop to orchestra and opera halls, laptops are becoming common as performance instruments. Students today see their favorite artists using computer software and a wide variety of controllers, including home-made and repurposed hardware, to create and perform live music. In this session, we will examine some of the recent developments in the field of live, technology-based music performance, and how music educators can explore them in the classroom.

Session Topics
Music Technology Overview
Technology in Live Performance
Benefits to Students and Programs
Repertoire
System Requirements & Options
Logistics
Mapping, Control, & Other Advanced Topics

Music Technology Overview
Very large field, encompassing any and all intersections of music, audio, and technology. Includes at least these:
- Notation (Finale, Sibelius, etc.)
- Pedagogy (SmartMusic, practice software)
- Synthesis, sampling, sound design
- Recording studios
- Live sound reinforcement
- Audio for film/video/game closely related

Technology in Live Performance
Broadly, using any of the above in live performance. In practice, the lines between the various forms of music technology above can easily blur.

Possible to outline some categories, but again these can be reconfigured, extended, or altered at will. Entirely possible to mix these in a concert, or even within a single work.
- Fixed media alone
- Live acoustic performer(s)/ensembles with fixed media
- Live acoustic performer(s)/ensembles with interactive and/or "live" electronics
- Live performer(s)/ensembles *performing* electronics

Benefits to Students and Programs
Many different benefits exist, both for students and music programs.
- Many students today are very interested in music technology
  - Very often, the most interested students do not participate in traditional music programs
  - We often see students apply for the B.M. Music Technology degree at UCM who have never engaged with their high school music programs in any way
  - Technology-oriented opportunities provide powerful means of engaging these students
  - Many students who *do* engage with traditional programs are also highly interested in music technology
- New field, so offers tremendous flexibility and opportunity for development (of new techniques, approaches, etc.)
  - Students can develop performance skills on digital/technological instruments
  - Can also develop composition, improvisation, and possibly even computer programming skills, depending on approach
    - Often, these latter skills are easier to develop via music technology than they are in traditional music classes
- With development of technological skills in student and/or teacher population, possible to collaborate in new ways
  - Large ensemble + technology
  - Work with other arts fields (dance, theatre, animation/video)
  - Work with other fields entirely (physics, engineering, computer science)

Repertoire
Depends on the specific ensemble in question, of course, but growing quickly these days for traditional large ensembles. Wind ensemble conductors likely have heard works incorporating electronics by Steven Bryant (e.g. *Ecstatic Waters*) or Alex Shapiro (e.g. *Paper Cut*). Frank Oteri has compiled an outstanding list of works for orchestra with electronics (http://www.americancomposers.org/orchestratech/oteri_list.htm). Quite a few works exist for choral groups as well (e.g. Panayiotis Kokoras, *Sonic Vertigo*).

Perhaps more important, however, is that many composers today are interested in this genre. It would be relatively easy to commission a new work for your group. Do make sure to work closely with the composer, however, to ensure that you can supply the technology required!

You are encouraged to explore other ensembles, as well, beyond the traditional large ensemble. Works involving electronics exist for everything from solo performers to large ensembles, and of course, new ensembles of tech-based performers are starting to appear as well. It is in this area that you will likely be most successful in engaging new populations of students. Laptop ensembles are particularly common in the college/university scene. Most of these make a point of blending performance with computer programming. UCM's New Technologies Ensemble follows a slightly different model, welcoming any sort of new technology, not just laptops.

Consider the possibility of programming works involving improvisation, or graphic/text-based scores. Many of the experimental works of the 1950s and 1960s, for example, work extremely well with ensembles incorporating technology, and provide student performers an extraordinary opportunity to experience music unlike anything they have ever seen or heard before.

System Requirements & Options
- Required: computer (or iPad/tablet), software, audio interface, loudspeaker(s), cables
- Options: various controllers, more software, more computers/iPads, microphones
- Also required: patience and a sense of humor—problems will occur. (But they occur with acoustic instruments, too.)

Logistics
Very important to pay attention to details ahead of time, and to work to eliminate possible areas of trouble. Think carefully through all the connections that must be made between equipment, and create detailed lists of the pieces you need. Make detailed stage plots, showing what goes where and how it is connected. Involve your students—they will learn an extraordinary amount in putting together a concert system.

Mapping, Control, & Other Advanced Topics
Getting beyond the basics is when the fun really starts. It's pretty simple to connect a USB/MIDI keyboard to a computer and use it to play an instrument in Garageband. What about other sorts of controllers?

The short answer is that anything sending data to your computer could be used as a controller. Many pre-built controllers are on the market (e.g. MIDI keyboards, MPC-style drum pads) and some, like the QuNeo, allow a great deal of flexibility. These flexible controllers enable you to configure the data they output many different ways, and that makes it easy to use that data to control different things in software. It's possible to build your own controllers as well—one easy way, if you have an iPad, is via the TouchOSC app.

You can take things a step further by using Max or other software to manipulate that data in the computer before passing it to the software that makes sound. Thus, pressing a single key on a MIDI keyboard could easily play a chord, or an arpeggio, or a sample of a funk band, or control your lighting system, or start a video… or start some other, complex process you have designed.

Useful Software
Many, many useful titles/apps out there, including:

Live Performance Software
- Ableton Live
- Traktor/Serato/Other DJ options
- MainStage
- FL Studio
- Bitwig
- MANY iPad apps!
- For control, TouchOSC is excellent. Splashtop can also be an interesting avenue for exploration.

Programming Environments
- Max
- Pure Data (Pd)
- SuperCollider
- CSound

Digital Audio Workstations (DAWs)
- Pro Tools (my favorite DAW, but not that useful for live performance)
- Logic and/or Garageband
- Audacity
- Digital Performer
- Cubase
- Sonar