netcat: Improvising with Computer Networks

*netcat*David Balatero and Brandon Lucia

Abstract

We have developed a system that examines arbitrary network communication between arbitrary computers and chooses how to play music corresponding to those communications in real time. We identify several key attributes of network communication, focusing on their origin and destination, the type of message (*i.e.*, port), and the timing of communications. Given a particular communication between computers, our system makes improvisational decisions based on the timing of messages to determine when notes are played, based on the type of message to determine the voice of the note, and based on the origin and destination to determine the pitch of the note.

Our system participates in improvisation in two ways:

1. **As an improviser:** the system passively listens to naturally occurring network communication to make improvisational decisions.
2. **As an instrument:** a person can create network traffic in real time, by taking specific actions – *e.g.*, browsing the Web, checking email, using low-level network communication software, *etc.* – that the system uses to make improvisational decisions.

Human improvisers can improvise with the system by playing it as an instrument or by playing along with it using conventional instruments. We have composed an improvisational piece of music called *netcat* that uses our system. The piece incorporates human improvisers on conventional instruments playing alongside our system. Our system improvises by generating improvised music from both passive and human-curated network traffic. *netcat* illustrates that computers, a pervasive form of technology, do, indeed, improvise. The piece further explores humans' interactions with technology that collaboratively create improvised music.

We perform *netcat* by using computers to send our system live Internet traffic, letting our system passively observe naturally occurring communication between multiple networked computers, and human performers playing cello, synthesizer, and drums. We are prepared to travel to Prague, perform the piece, and facilitate discussion on computers, technology and improvisation, and musical human-computer interaction in general at IAB 2014.