19 JAZZ PLAYING ROBOTS
Arizona
Department of Defense
$2 MILLION

Drop beats, not bombs.

That is the goal of a Department of Defense effort to teach robots how to play jazz music.

The *Defense Advanced Research Projects Agency* (*DARPA*) is spending $2 million to hire a team of musicians and researchers to develop musical machines including robots capable of performing a trumpet solo and jamming with human musicians.[286]

The Pentagon is spending $2 million to teach robots how to play jazz music.

Known as the Music Improvising Collaborative Agent (MUSICA), the system—it is hoped—will be "capable of musically improvising with a human player."[287]

The team working on the project is led by jazz musician Kelland Thomas and includes researchers from the University of Arizona, the University of Illinois at Urbana-Champaign, and Oberlin College.[288]

"We may be the first musicians ever funded by DARPA," laughs Thomas.[289]

"The goal of our research is to build a computer system and then hook it up to robots that can play instruments, and can play with human musicians in ways that we recognize as improvisational and adaptive," explains Thomas.[290]

Over the next five years, the team will attempt to develop "a robot that can manipulate musical instruments and accompany human musicians on stage."[291] Rather than simply "following chord progressions programmed into it, MUSICA will take cues from a long history of jazz royalty, including the great geniuses of improvisation, Miles Davis, Charlie Parker and John Coltrane. The software will play collaboratively, as if it were a human musician jamming at an open mic."[292]

"We're getting lots of video of musicians playing in front of a green screen together," says Thomas. "We're going to build a database of musical transcription: every Miles Davis solo and every Louis Armstrong solo we're going to hand-curate. We're going to develop machine learning techniques to analyze these solos and find deeper relationships between the notes and the harmonies, and that will inform the system – that'll be the knowledge base."[293]

The real test for success is when the robot stops sounding like Miles Davis and starts "producing something that sounds new."[294]

A robot capable of playing music is not a new idea. Mason Bretan, a PhD student from Georgia Tech, has been "jamming alongside 'Shimi' robots, which can partially improvise" and engineers "from Japan to Germany are already building robots you can program to play pre-written songs."[295]

"I think DARPA's interested in a program that will interact with humans," speculates Thomas. "Right now, a computer waits for us to tell it what to do. The idea [with MUSICA] is that the computer can communicate with us the same way we communicate with it. It might be able to anticipate needs or ask us for clarification on a goal, then help us plan that goal for the future."[296] The aim of the program is to "make computers more of an equal collaborator," Thomas said.[297] The long term goal is to create artificial intelligence by teaching computers how to be "more human" in thought and expression by jamming to jazz.[298]

"In my mind, jazz and improvisation in music represent a pinnacle of human intellectual and mental achievement," says Thomas. "The ability to, on the fly and in the moment, create melodies that are goal-directed, that are going somewhere, doing something and evincing emotion in the listener, is really, really amazing."[299]

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