Kepler Telescope star data creates musical melody

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Why stop at the dark side of the moon to make music when you can look thousands of light years into space? That's what a team of Georgia Tech researchers have done, using data from two stars in our galaxy to create sounds for a national recording artist.

Over the years, researchers in Georgia Tech's Sonification Lab (SonLab) have converted numerical data into sounds to analyze stock market prices, election results and weather data. When the reggae/rock band Echo Movement called wanting to turn the movements of celestial bodies into music, SonLab looked to the heavens.

"The Sonification Lab receives a lot of requests to convert scientific data into sound, but this one was truly unique," said School of Psychology Professor Bruce Walker. "It's not often that we have a chance to help an actual star compose music."

Although pitches, tempos and rhythms could be created and tweaked, the band insisted that the finished product remain true to all data and feature a musically appealing, "heavenly" sound. With those restrictions in place, the musicians and Walker's team of students went to work with existing data gathered by NASA's Kepler telescope. Focused on a binary star (Kepler 4665989), Kepler recorded its brightness levels for more than a year. The star dimmed and brightened each time its companion star crossed its path, providing varying brightness measurements.

"Those numerical values were loaded into our Sonification Sandbox

software to create sequences of sonified musical pitches," said Riley Winton, a psychology student and leader of the project. "The process put us on the right track. When the band reviewed it and requested timbres instead of pitches, we audified the data.

In other words, the team played the varying brightness levels as waveforms to create a different sound. The lab then cleaned the signal and removed some of the ambient sound before sending audio pitches to the band. Echo Movement looped the sounds and composed them into a four-part harmony.

For the final step, the students used a different binary star (Kepler 10291683) to adjust the timbre even further by adding a tremolo effect. This created a shuddered, natural sound rather than a flat, computerized noise.

The final result is a melody that will be used in the intro of Echo Movement's song "Love and the Human Outreach," which will be released in September.

"People have made music with space sounds before, but largely using pulsars and space events that can be recorded in the radio spectrum. We wanted something completely off the chart," said band member David Fowler, who was encouraged by Edna DeVore at the SETI Institute to look at the Kepler Mission. "Discovering planets around other stars is a relatively new science worthy of everyone's attention and digs deep at the core of humanity's most basic quest to orient itself in reality," he said.

The Georgia Tech team will present the sonification process at the International Conference on Auditory Display (ICAD) in Atlanta June 18 – 21, 2012.

The project's goal, to create an authentic, aesthetic sound, was a success. The melody is further proof that sonification can be a valuable tool when working with large data sets.

"Sound is the best pattern recognition tool we have," said Walker. "Instead of visually scanning through a long list of numbers, looking for patterns or random occurrences, sometimes it's easier to create an audio file and listen for them. Very interesting patterns can often be discovered by using sound."

Provided by Georgia Institute of Technology

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