Franz's Allegro CL Used for Scheduling the Hubble Space Telescope Discovery of Earendel

SPIKE Intelligent Scheduling System Developed with Allegro Common Lisp Helped Astronomers Detect the Farthest Star Ever Seen

Lafayette, Calif., March 31, 2022 — Franz Inc., an early innovator in Artificial Intelligence (AI) and leading supplier of Graph Database technology for Entity-Event Knowledge Graph Solutions, today announced that its Allegro CL (Allegro Common Lisp) dynamic object-oriented development system used by the Space Telescope Science Institute to develop the SPIKE Hubble Space Telescope observation scheduler has aided in the discovery of "Earendel," the farthest star ever seen in the universe.

Earendel is the latest discovery from the Hubble Space Telescope, which has been observing the cosmos for more than 30 years. The light from Earendel has taken nearly 13 billion years to reach Earth and is the most distant ever discovered. Astronomers estimate the star existed within the first billion years after the universe's birth in the big bang. This record-breaking discovery may shed light on the era of very early star formation.

"We almost didn't believe it at first, it was so much farther than the previous most-distant, highest redshift star," said Astronomer Brian Welch of the Johns Hopkins University in Baltimore, lead author of the paper describing the discovery, which is published in the March 30 journal *Nature*. The discovery was made from data collected during Hubble's RELICS

(Reionization Lensing Cluster Survey) program, led by co-author Dan Coe at the Space Telescope Science Institute (STScI).

The Hubble Space Telescope uses an observational scheduling system called SPIKE, which was created using Franz's Allegro CL. SPIKE is an operational application of artificial intelligence technology that has supported NASA's Hubble Space Telescope since its launch and is integrated with a large and complex spacecraft ground system. SPIKE was developed for the Hubble Space Telescope, but was designed for generality and flexibility. It has been adapted for several other astronomical scheduling problems as well as to problems unrelated to astronomy.

"We are thrilled that our Allegro Common Lisp played a part in the discovery of this new, important star," said Dr. Jans Aasman, CEO of Franz Inc. "The SPIKE scheduling system exemplifies the unique power of Allegro Common Lisp to create an intelligent application framework using multi-objective evolutionary algorithms that can integrate both generic and application-specific components — producing unparalleled flexibility over time. We look forward to future discoveries from Hubble as well as the James Webb Telescope, which also relies on SPIKE for multi-user scheduling."

SPIKE Intelligent Scheduling System

"Efficient use of astronomical observatories is very important to the scientific community, since the demand for research-grade telescopes far exceeds the supply. The need for efficient scheduling is especially important for space-based facilities due to their very high cost, limited numbers, and unique scientific potential. The general approach taken in SPIKE is scheduling as constraint-directed search, but also incorporates novel approaches to both the quantitative representation and propagation of hard constraints and "soft" preferences, and to the use of scheduling search strategies

based on multistart stochastic repair." *(Source: SPIKE, Mark D. Johnston and Glenn E. Miller Space Telescope Science Institute, 01.14.93)*

Allegro Common Lisp (Allegro CL)

Allegro CL is a dynamic object-oriented development system especially suited to enterprise-wide, complex application development. The complexity of today's software applications and the explosion of data size are pervasive in all fields ranging from Life Sciences to Manufacturing to Financial Analytics..

Allegro CL is an effective system for developing and deploying applications with billions of objects to solve complex problems in the real world.

Industry Recognition and Upcoming Speech

Franz Inc. has earned numerous industry awards over the past decade and most recently named a 2022 KM World 100 Companies that Matter in Knowledge Management.

Join Dr. Jans Aasman, CEO of Franz Inc. as he speaks about Knowledge First Design for Dynamic Intelligent Contact Centers and Beyond at the Knowledge Graph Conference May 2-6, 2022 at the University of New York Cornell Tech campus and online.

About Franz Inc.

Franz Inc. is an early innovator in Artificial Intelligence (AI) and leading supplier of Graph Database technology with expert knowledge in developing and deploying Knowledge Graph solutions. The foundation for Knowledge Graphs and AI lies in the facets of semantic technology provided by AllegroGraph and Allegro CL. AllegroGraph is a graph based platform that enables businesses to extract sophisticated decision insights and predictive analytics from highly complex, distributed data that cannot be uncovered with conventional databases. Unlike

traditional relational databases or other NoSQL databases, AllegroGraph employs semantic graph technologies that process data with contextual and conceptual intelligence. AllegroGraph is able to run queries of unprecedented complexity to support predictive analytics that help organizations make more informed, real-time decisions. AllegroGraph is utilized by dozens of the top Fortune 500 companies worldwide. To learn more about Franz and AllegroGraph, go to franz.com.

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