**Software**

**Program Synthesizes UML Sequence Diagrams**

A computer program called “Rational Sequence” generates Universal Modeling Language (UML) sequence diagrams of a target Java program running on a Java virtual machine (JVM). Rational Sequence thereby performs a reverse engineering function that aids in the design documentation of the target Java program. Whereas previously, the construction of sequence diagrams was a tedious manual process, Rational Sequence generates UML sequence diagrams automatically from the running Java code. Moreover, there is no need to insert instrumentation code into the target Java program. Rational Sequence employs the Java Native Interface application programming interface to create a software profiler that plugs into the JVM. Once the user starts the target Java program, Rational Sequence acts as a nonintrusive observer, generating UML diagrams representing the observed activity. Every method call, object instantiation, or thread event of the target Java program is tracked by the profiler. Once the Java program has ended, the profiler generates a UML model that contains packages, classes, and all method calls observed during the execution of the target program. The user can control the way the UML model is generated by specifying, via the aspect source code, packages and/or classes to be included in the diagrams. Like the rest of Rational Sequence, the AspectJ component complies with the UML specification.

*This program was written by Matthew R. Barry and Richard N. Osborne of United Space Alliance for Johnson Space Center.*  
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**Aspect-Oriented Subprogram Synthesizes UML Sequence Diagrams**

The Rational Sequence computer program described in the immediately preceding article includes a subprogram that utilizes the capability for aspect-oriented programming when that capability is present. This subprogram is denoted the Rational Sequence (AspectJ) component because it uses AspectJ, which is an extension of the Java programming language that introduces aspect-oriented programming techniques into the language. The Rational Sequence (AspectJ) component is compiled with a target Java application program on an AspectJ compiler. The user then starts the Java application program. Thereafter, the Rational Sequence (AspectJ) component publishes every visible method call to a Universal Modeling Language (UML) sequence diagram. When the Java application program ends, a sequencer proceeds to generate a UML model that contains packages, classes, and all method calls that occurred during the execution of the program. The user can control the way the UML model is generated by specifying, via the aspect source code, packages and/or classes to be included in the diagrams. Like the rest of Rational Sequence, the AspectJ component complies with the UML specification.

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Since August 1997, the Advanced Composition Explorer NASA satellite has provided new data on GCR energy spectra. These new data were used to update the original model and greatly improve the accuracy of prediction of interplanetary GCR. The updated software was also simplified significantly, relative to the original software. The updated model and software are expected to provide highly accurate GCR-environment data for use by interplanetary-mission planners in planning for protecting astronauts against radiation and ensuring radiation hardness of electronic equipment.

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