UNIVERSITÄT SALZBURG

Fachbereich Computerwissenschaften

EINLADUNG

zum Gastvortrag am

Donnerstag, 16. Juni 2011,
16:00 Uhr, T02

Institutsgebäude Jakob-Haringer-Str. 2, Itzling

von

Prof. Hans P. Zima

Principal Scientist, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, California, USA and *Professor Emeritus, University of Vienna, Austria*

zum Thema:

„ Fault Tolerance for High-Performance Computing in Space"

Abstract

Future missions of deep space exploration will require a high degree of autonomy supported by an enhanced on-board computational capability. Earth-based mission controllers will be unable to directly control distant spacecraft and robots to ensure timely precision and safety, or to support "opportunistic science" by capturing rapidly changing events, such as dust devils on Mars or volcanic eruptions on a remote moon in the solar system. Furthermore, the high data volume yielded by smart on-board instruments would overwhelm the limited bandwidth of spacecraft-Earth communication, enforcing on-board data analysis, filtering, and compression.

Emerging many-core technology is expected to provide the low-power, high-performance computational capability needed for the support of such missions. Fault tolerance for such systems will face new challenges, but also provide opportunities that do not exist for traditional space-borne systems. In this talk we present an introspection-based approach that provides adaptive fault tolerance for future on-board systems. The goal is to enable a software system to become self-aware of its health, performance, and power consumption by monitoring its execution behavior, reasoning about its internal state, making decisions or recommendations about appropriate changes of the system or system state when necessary, and supporting recovery from faults. Emphasis is placed on application-oriented fault tolerance that takes into account knowledge about the application and the algorithms with which it is implemented. We will focus on on-going work at the Jet Propulsion Laboratory that allows the user to categorize applications with respect to the required level of fault tolerance and the mechanisms required to implement such a specification. In this context we are studying methods that can provide automatic support for the generation of fault-tolerant software. Specifically, we will describe how automatic analysis of the control and data flow in source programs can be exploited to automatically generate correctness assertions for critical sections of a program, or to generate redundant code that can be embedded in a self-checking programming framework.

Univ.-Prof. Dr. Marian Vajtersic (Host)