



Software Development of Embedded Systems by ISG - To Be Faster at Less Costs and Higher Quality

Dr. Rainer Gerlich, BSSE System and Software Engineering

SUMMARY:

ISG (Instantaneous System and Software Generation) automates the steps of software development, allows for an automated control of quality and minimises the required human resources. It is an answer to an ESA initiative on a methodology by which systems and software included therein can be built faster, less expensive at lower risks and higher quality.

ISG has been defined and implemented by BSSE based on experience gained by a number of projects, of which the first ones were executed on behalf of ESA. ISG has already been applied successfully to a real industrial project in the area of a larger embedded system including two micro-processors (μP), but it is not limited to this application area.

ISG VS. STATE-OF-THE-ART:

The current organisation of software development follows a sequential approach starting by requirements capture, followed by design, coding, testing, integration, acceptance and maintenance. Due to the phase-oriented execution a number of human interventions are required which consume a lot of human resources and time, and risks are identified rather late. While in other industrial areas like car mass production the organisation has been optimised towards minimum human intervention, obviously this did not happen in the area of software development.

ISG (Instantaneous System and Software Generation) introduces an organisation scheme (process model) which only requires human activities at the beginning of the generation process and after provision of the evaluation report by ISG at the end. The organisation of the development process has been changed such that all the generation steps between provision of system and reading of the report by the user can be automated. In fact, the ISG process model is driven by the goal of maximum automation.

Due to automation the generation process is very fast and does not require a lot of human resources. Hence, development costs and time are significantly reduced. Results from the executable system are immediately available. Therefore the final system can incrementally be approached by a number of iterations. Due to the immediate response from the real system risks can be identified and removed rather soon.

The first versions can automatically be generated and executed without any need to write source code in a programming language like C.

Current development approaches are mainly concentrating on production of software, but not on testing, verification and validation. In fact, more software is produced than can be tested. This leads to poor quality and a number of problems during development and later operation.

ISG ensures that what is automatically produced can also be checked and tested. In fact, it reduces by construction rules the continuum of test cases to a discrete number. Also, the construction rules allow for a high degree of reuse of development experience.

ISG allows for transparent distribution, i.e. the application can automatically be generated for every user-defined topology without any need to change source code, even for heterogeneous platforms based on different processor hardware and operating systems.

Consequently, ISG does not only reduce development time and costs by introduction of an automated process model, but it does also improve quality.

Due to the automated generation of the infrastructure no deep knowledge on the operating system is required, this saves time and allows a system engineer to carry out system development activities.

RELEVANCE:

The current software development techniques still require a huge amount of human resources. This results in a lack of software engineers. In fact, the competitiveness of companies and countries is seriously affected by the limited availability of human resources. Also, the cost of labour is a matter of competitiveness. To escape from these problems companies are more and more hiring engineers from countries with low labour rates. But this only does temporarily solve the problem, because the need for software is continuously increasing.

As ISG significantly reduces the amount of human man power it opens a door to escape from the current situation. Moreover, it does not only reduce the development costs this way, it also shortens the development time, a result which cannot be achieved when taking employers at low labour rates.

From this point of view, those companies which introduce the ISG approach into their organisation will become more competitive and they can sooner provide more products at higher complexity. They are not limited any more by the availability of human resources and engineers trained in software engineering. And - last but not least - such companies can increase the quality of their products, which also leads to an advantage regarding competition.

POINT OF CONTACT:

Dr. Rainer Gerlich
BSSE System and Software Engineering

Auf dem Ruhbuehl 181
D-88090 Immenstaad
Germany

Phone: +49/7545/91.12.58

Mobile: +49/171/80.20.659

Fax: +49/7545/91.12.40

e-mail: gerlich@t-online.de

internet: <http://home.t-online.de/home/gerlich/>