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TOOL-ASSISTED HARDWARE SELECTION WITH "UBCS"

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ABSTRACT

A correct decision for selecting a certain system, based on well-founded information, is essential for the development of a new product and its success on the market. Especially small and mid-size companies only have no or very limited human and technical resources for running time-demanding tests. Therefore, a system supporting the correct selection of a certain hardware system is currently being developed at Harz University. This so-called "Universal Benchmark and Compare System", abbreviated "UBCS", supports developers when choosing suitable hardware. It contains various benchmark results of different target systems such as Microprocessors, Microcontrollers and Digital Signal Processors. Moreover, it also provides relevant information like technical specifications that are important for product development. "UBCS" is intended to suggest ideal hardware for a certain set of requirements. The paper focuses on "UBCS" from a point of view concentrating on the technical implementation, presents advantages resulting from using "UBCS" and provides a general view to present the project's development.

Index Terms **-** Benchmark, compare, Microprocessor, Microcontroller, Digital Signal Processor, system development

1. INTRODUCTION

In order to evaluate the performance of Microprocessors (MP), Microcontrollers (MC) and Digital Signal Processors (DSP) and to find out about their properties, benchmarks are required. Because of the huge variety of benchmarks and the problem of being comparable to each other, developers of new products often face the problem of having to perform these comparisons and tests and to look up appropriate information on their own. Furthermore, many benchmarks are only available under a commercial license, which means additional costs for the companies. To benchmark a set of systems leads to time- and resource-demanding work. For example, it is necessary to have access to the desired hardware as well as software environments, compilers, etc. Because of the human resources needed to do the work, especially small and mid-size companies cannot afford doing the benchmark work on their own.

So there are some benchmark results for common systems available, for instance online or in magazines. The posted results mainly focus on MP, but are available for some selected MCs and DSPs, too. There are also some companies which concentrate on benchmarking, like the U.S.-American non-profit organization "EEMBC", the "Embedded Microprocessor Benchmark Consortium" [1], or the "Standard Performance Evaluation Corporation" [2], abbreviated "SPEC". The websites of these companies contain various results calculated running their respective benchmark codes. Interested users may try to find their desired system in table listings. But comparing these systems is quite difficult, since the user has to know details about the test setup and the benchmark code used for testing.

From the user's point of view, a different approach is needed. Commonly, developers have certain demands for their new product, but they do not know enough about appropriate hardware being well suited for the future product. That is why it is more logical for the user to enter the mentioned demands into an assisting software system which then performs a detailed database search and presents optimal hardware solutions with accompanying data. Moreover, it is helpful to provide options so that the user may exactly specify the systems to be determined.

The software system currently being developed at Harz University, named "UBCS" ("Universal Benchmark and Compare System"), is intended to provide the described possibilities to the user. Complex and time-demanding searches and comparisons are passed over to "UBCS". So, the user is able to save a lot of time and money.

2. PRESENTATION OF "UBCS"

The purpose of "UBCS" is, as described above, to do a parametric search for optimal target systems based on user demands. Users shall select which benchmarks to apply for comparison, so that the benchmark code

may represent most of the algorithms used in the coding process later on. “UBCS” takes user demands as inputs and determines target systems out of a pool of data which fulfill these demands. For instance, it shall be possible to filter the search results to match only systems with a certain system clock speed or certain number of AD-Channels.

In order to perform such search operations, the definition of the system characteristics of “UBCS” is necessary. To enable parameterized searches a relational database forms the base of the system. This has the advantage of a central data pool, where the user-frontend can be used in a decentralized way via the Internet. The frontend itself serves as the human-machine-interface, enabling the user to communicate with “UBCS” and to tell the system certain demands. In order to use “UBCS” globally from anyone’s home or office PC, a web interface is needed. For servicing and administrating the system, a local frontend is to be used allowing reconfiguration, tests and input of new sets of data.

“UBCS” is intended to manage different benchmarks and the according results of the tested systems. So, the user is not limited when selecting appropriate algorithms for comparison. Of course, only benchmark results calculated running the very same versions of the algorithms may be compared to each other, keeping an eye on compiler settings as well. Otherwise, one major principle, the comparability, would not be satisfied. “UBCS” is intended to use “own” benchmarks, e.g. the Harz University benchmark modules [3], [4], [5], but also other benchmark code if the licenses allow it. That is why the system may be actualized and extended at any time.

Besides the benchmarks, there are other parameters which shall be keyed in, like memory configurations, clock rates and peripherals, for instance. By using additional information, the search as well as the presentation of the results can be performed in a more detailed way.

3. DEVELOPMENT AND PROGRAMMING

“UBCS” is currently set up by using a MYSQL relational database. The entity relationship model is designed by MYSQL Workbench and then directly transformed into the database. It is administrated using Workbench and the MYSQL Administrator. Figure 1 shows an excerpt of the ER-model.

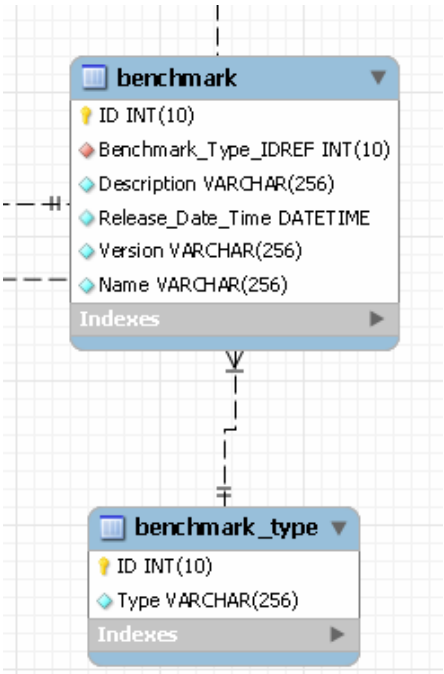

Figure 1: Excerpt from the ER-Model of the database

As shown in figure 1, there must be a description, a release timestamp and an exact version of each benchmark in the system. That is required for keeping the results comparable. Moreover, there must be a classification of the benchmark type (e.g. application-oriented, synthetic,…). The user can apply special filters to get results from these benchmark types only.

The benchmark itself may contain certain tests. These tests must contain some information about the system which was tested, a timestamp, the calculated value and the corresponding unit. Using the “public_access” attribute, the system administrator can decide whether or not to make the results of the benchmark public. Using this technique, it is possible to verify results before they are made public.

A provided ODBC-driver connects the data base to the frontends developed in C# and ASP.NET. There are two frontends, one for the user in order to do parameterized searches, and another one for administration and updating data. One of the forms for administration is shown in figure 2.

New data, in this case new memory types, can be entered using forms like the one shown in figure 2. The form also shows memory types already existing in the data base. To avoid duplicate entries, all data are preprocessed prior to saving.

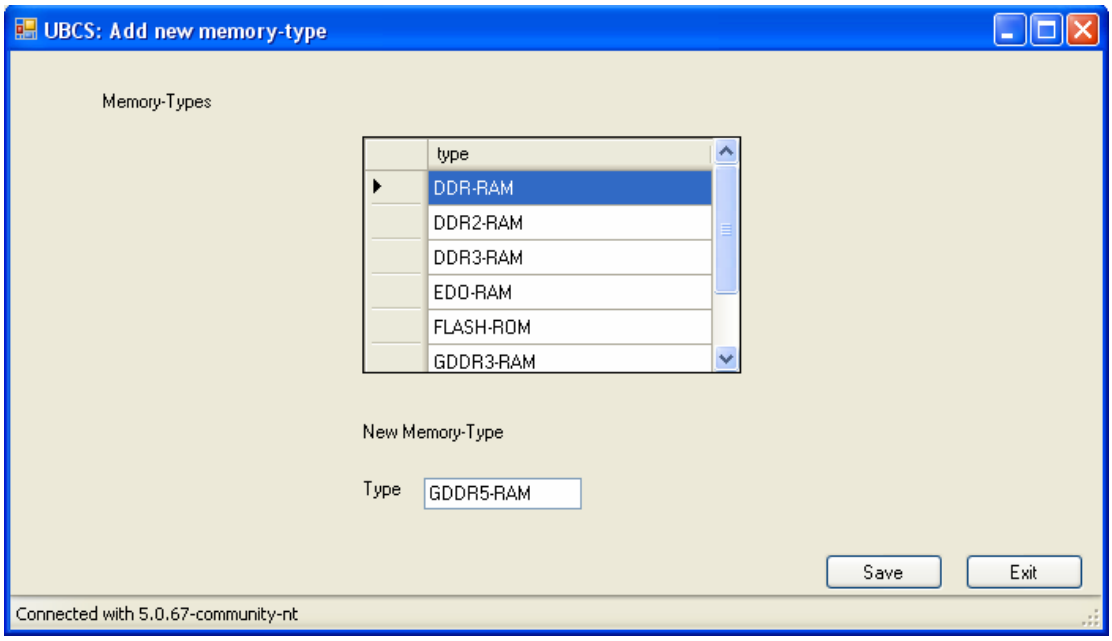

Figure 2: Form for adding new memory types

Adding new data shall only be available using the administrative frontend. By doing so, all data can be observed and tested by the Microcontroller Application Center of Harz University in an objective way.

The parameterized search shall be performed by web frontends, creating appropriate SQL-queries to be executed on the data base. The returned results are to be formatted and presented by the frontend again.

4. SUMMARY AND FURTHER DEVELOPMENT

"UBCS" is currently being developed. Because there is no similar system known to the authors, there are no experiences or criticisms from users yet. Despite of detailed planning and specification, only a first use test may reveal necessary extensions and changes. Because of the normalized data base and the modular frontends, changes can be done easily.

One major fact for the usability will be a wide base of data, referring to several different benchmarks. The more details and values there are in the data base, the more detailed a search may be processed. So, it is very important to provide the system with the latest benchmarks available, too.

Because the semiconductor industry is one of the most ever-changing industries in the world, data sets have to be updated continuously. Besides a high effort to keep track with the information, this fact also enables the system to provide the user with current price information which makes the costs more transparent. The data base is already prepared for this feature.

Summarizing the mentioned facts, "UBCS" is able to decrease the work for a user looking for an ideal system for a project. Because of less work for the user, time and costs are saved, too. Especially in the development process customer demands have to be processed very quickly, leading to a short time to market. There is not much time for detailed testing, so "UBCS" helps to make correct decisions in time.

5. ACKNOWLEDGMENT

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