Recent advances in robotic manufacturing with LTT

Logic table technology (LTT) of CEC Services coerces non-procedural, structured query language (SQL) to perform procedural processing as follows. Logic switches stored in a relational logic table are read using the substring (SUBSTR) function in SQL. (The query is located in a static SQL trigger and not as embedded SQL calls in a relatively non-portable, high order, procedural language such as C or PL/SQL). The query returns row numbers. Report Accounts (RA) is an accounting arithmetic engine where these row numbers represent the account numbers to be updated. RA performs all SQL functions in real time, uses less than ten relational tables, and is implemented in less than 50 lines of SQL code. LTT is important because it implements static SQL triggers which are 100% portable to any computer platform. Using the non-procedural language of SQL, this achievement is the first of its kind. LTT represents the first packaged implementation of *subject-oriented* software which is defined as a *disruptive technology* with potential to change significantly the way business uses databases in subsequent decades.

Recent advances in LTT include placing disparate logic switches within the same logic table. For example, the logic for accounting arithmetic and for construction of reports for financial instruments may both be contained within the same logic table. Large logic tables are typically sparsely populated, meaning that many blank switches exist between non-blank switches. Hence logic tables may be stacked, compressed by folding, and by alternate indexing. What also follows is that logic tables may be self-modifying. This is the simplest and most direct implementation of a real time, neural network known to date.

The pSUM project acquired its name from the acronym of “portable, Scalable, Useable, Maintainable”. These qualities are considered the most important characteristics for industrial strength software. pSUM is pronounced with a silent “p” as “Sum”. It is also a high performance database engine for the accounting arithmetic. pSUM is ideally adapted to the manufacturing sector which until now was unable to apply relational database technology to the factory floor. pSUM implements the programming instructions for robotic actions into a logic table. The robot in turn automatically manufactures complex parts from an inventory which also

is managed by pSUM in real time using a commercial relational database back end. When abstracted into a Petri Net, the logic of the static SQL triggers of LTT in pSUM matches exactly the pattern of the Kanban Cell as used just-in-time (JIT) inventory control. Therefore pSUM is the first known software implementation of a JIT Kanban Cell.

The pSUM life cycle was developed using the Software Development Methodology (SDM) of CEC Services. SDM is based on DoD-STD-2167A/2168, Mil-STD-498, and Business Object Notation (Nerson, Walden). SDM consists of three development efforts which may occur sequentially known as the waterfall model, concurrently known as the recursive model, or as a combination known as the aspect-oriented model. The efforts relate to problem domain (20%), solution domain (70%), and product delivery (10%). The problem domain contains collection of requirements (10%) and analysis of requirements (10%). The solution domain contains design based on analysis (10%) and implementation of design with unit testing (60%). The product delivery contains acceptance testing and user approval (10%).

Recent advances in software development from SDM include the following. The development schedule is proven so accurate that a linear statistic exists: the time taken for requirements is the basis for predicting the time of the entire schedule. For example with a team of 10 developers, if requirements take 1000 hours at 10%, then the entire project takes 10000 hours for about 25 work-weeks or 6 work-months. The completed user manual is also produced and delivered to the customer before one line of computer code is implemented. This is an innovative step because the user documentation becomes the requirements documentation for the project. For implementation, requirements are mapped on a one-to-one basis as classes and attributes into tables and columns, and task actions are mapped on a one-to-one basis into logic switches.

Pricing is available on request.

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