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Algorithm used in Embedded Computing Systems

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ABSTRACT: Early microprocessor-based design courses, based on simple microprocessors, emphasized input and output (I/O). Modern high-performance embedded processors are capable of a great deal of computation in addition to I/O Tasks. Various parameters need to be considered while designing for embedded system such as performance,cost , Compatibility. In this paper the various algorithms used in embedded systems are discussed.With the increasing deployment of computers as embedded systems that provide new and interesting services, the computing landscape is much richer and more diverse than it was even a decade ago. Developers can choose from an enormous variety of hardware, operating systems, and tools for the embedded systems they build.Since embedded systems are implemented for real time systems,the real time task scheduling is very important. The various real time scheduling algorithms are used. To design the embedded systems the selection of hardware as well as the scheduling algorithms are important.

KEYWORDS*:* Microprocessor, Embedded systems, Embedded Processors, Performance.

I.INTRODUCTION

With embedded systems moving toward faster and smaller processors and systems on a chip, it becomes increasingly difficult to accurately quantify embedded-system behavior. Probing a piece of silicon or accurately measuring timing values down to a nanosecond or less become more expensive and more difficult—in some cases, impossible.

An embedded system is a computer system with a dedicated function within a larger mechanical or electrical system, often with real-time computing constraints. It is embedded as part of a complete device often including hardware and mechanical parts. Embedded systems control many devices in common use today. Ninety-eight percent of all microprocessors are manufactured as components of embedded systems.

Several Scheduling algorithms are used for scheduling the real time task such as Rate monotonic scheduling algorithm etc .The real-time systems are classified into two types one is hard real time systems in which the deadlines should be met,second the soft real time systems in which the deadlines may or may not be met.

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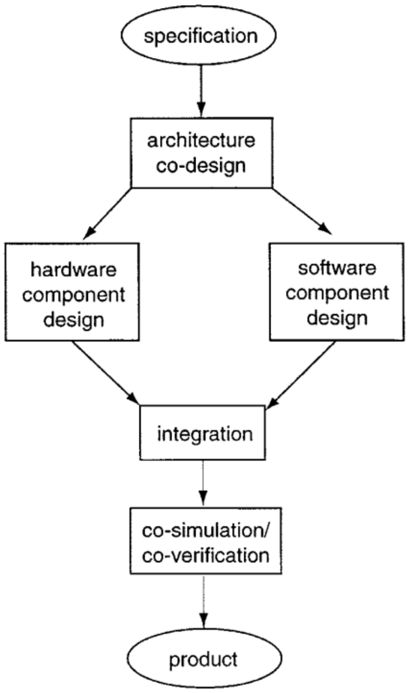

Figure 1:Methodology for Embedded System design

Figure 2:Embedded System

II. ENERGY EFFICIENT EMBEDDED SYSTEM

To perform major parts of the system's functionality, these mass productsrely, to a great extent, on sophisticated embedded computing systems with high performance and low-power dissipation. One key characteristic of many current and emerging embedded systems is their need to work across a set of differentinteracting applications and operational modes. In [1] the author proposes the energy efficient algorithm in multi mode embedded system, the power consumption is reduced upto 64%.

In [2] the author proposed a algorithm that reduces the embedded system cost by 47%.The hardware architecture of an embedded system defines the typeand interconnection of various hardware modules. Its software architecture defines the allocation of sequence of codes to specific general-purpose processors. Hardware–software cosynthesis is the process of obtaining the hardware and software architectures to meet performance, power, cost, and reliability goals.In this paper the author presented an efficient cosynthesis algorithm for synthesizing hierarchical distributed embedded system architectures

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A.ARTEMIS

To reduce the design time for highly programmable embedded multimedia systems, the Artemis (Architectures and Methods for Embedded Media Systems) project focuses on solving two research challenges. First, an architecture modeling and simulation environment is developed. Second, Artemis investigates the potential of using reconfigurable embedded computer architectures as a new means of enhancing the programmability of embedded systems.

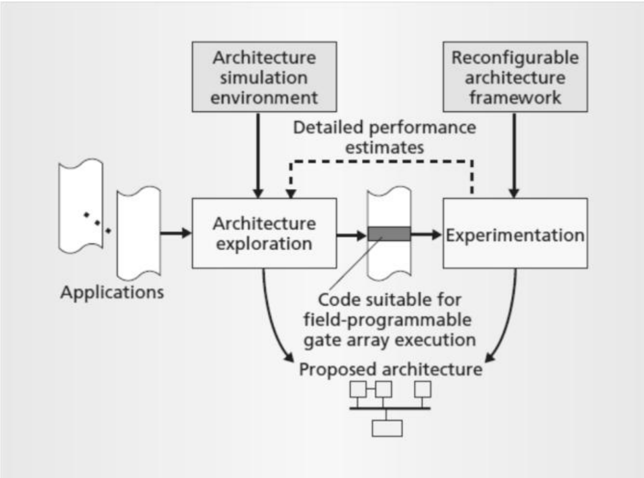

Figure 3:Artimis Architecture Workbench

The Artemis modeling and simulation environment facilitates the performance analysis of embedded-systems architectures in a way thatdirectly reflects the Y-chart design approach, recognizing separate application and architecture models for system simulation. An application model describes the application's functional behavior, including both its computational and communication behavior. The architecture model defines architecture resources and captures their performance constraints. This modeling methodology requires an application model to remain independent from architectural specifics, assumptions on hardware-software partitioning and timing characteristics.

In [3] the author proposes the modeling of embedded systems with SimBed, the simulation environment is proposed and study that compares three RTOSs. The power-consumption measurements show that RTOS overhead is a factor of two tofour higher than it needs to be, compared to the energy consumption of the minimal scheduler. In addition, poorly designed idle loops can cause the system to double its energy consumptionenergy that could be saved by a simple hardware sleep mechanism. The algorithm uses up-sampling, down-sampling, and a 128-tap FIR filter. The applications are chosen to be simple so that they can be sped up and/or layered atop each other to gradually increase the total system workload.

In [4],the performance of embedded is enhanced by using the Object analysis patterns. In that paper the construction of UML-based conceptual models of embedded systems is proposed. The object analysis patterns are created and the development artifacts are analyzed of several embedded systems, largely obtained from the automotive industry. The Structural Object Analysis and Behavioral Object Analysis are proposed. Structural and behavioral object analyses are commonly performed concurrently

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Example for UML:

1.ComputingComponent represents the central computing component of the system.

2. UserInterface is a class representing the user interface of a system.

3.GlobalFaultHandler is responsible for centralized fault handling in the system.

4.AbstractIndicator {abstract} inherits from abstract class Abstract Actuator and provides an interface for all indicators.

5.AbstractControl {abstract} inherits from abstract class Abstract Passive Sensor and provides an interface for all controls.

6.AbstractActuator {abstract} defines an interface for the Abstract Indicator class, taken from the Actuator-Sensor Pattern.

7.AbstractPassiveSensor {abstract} defines an interface for the Abstract Control class, taken from the Actuator-Sensor Pattern.

8.AbstractBooleanControl {abstract} defines Boolean controls.

9.AbstractIntegerControl {abstract} defines integer controls.

10.AbstractRealControl {abstract} defines real controls.

11.AbstractComplexControl {abstract}: Complex controls have the same basic functionality as the Control class, but additional, more elaborate, methods and attributes need to be specified.

12.AbstractBooleanIndicator {abstract} defines Boolean indicators.

13.AbstractIntegerIndicator {abstract} defines integer indicators.

14.AbstractRealIndicator {abstract} defines real indicators.

III.OPTIMIZATION MODELS FOR EMBEDDED SYSTEMS

In [5] Simulated Annealing optimization algorithm is proposed to demonstrate system reliability optimization techniques for distributed systems, because of its flexibility for various problem types with various constraints. SA is a stochastic algorithm with a performance which depends on the specification of the neighborhood structure of a state space, and parameter settings for its cooling schedule. The algorithm is based on randomization techniques,having its iterative improvement based on neighborhood (orlocal) search. Decreasing temperature in the cooling schedule corresponds to narrowing of the random search process in the neighborhood of the current solution.

In [6] the author proposes the genetic algorithm is proposed. The Genetic Algorithm is used for the embedded system hardware-software co-design. The result indicates that the Genetic Algorithm can solve the problem of embedded system hardware-software co-design. An important task of embedded system design is to find an effective way of hardware-software implement. Since Genetic Algorithm is a very effective way to solve combination optimization problem.The Genetic Algorithm is used to realize hardware-software partitioning.Hardware-software co-design is a methodology for solving design problems in processor based embedded systems. The hardware-software co-design methodology allows the concurrent design of both hardware and software thereby reducing the design cost and also meets the performance goals. Inspired by Genetic Algorithm, this paper proposes a hardware-software partitioning approach.

To evaluate the hardware-software partitioning algorithm based on GA, and to determinate several important parameters of the algorithm in this paper, we obtain a set of test data through the approach in [7]. The target of each set

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of test data contains different functional nodes, different connections between nodes, and different I/O variables of each connection, respectively.

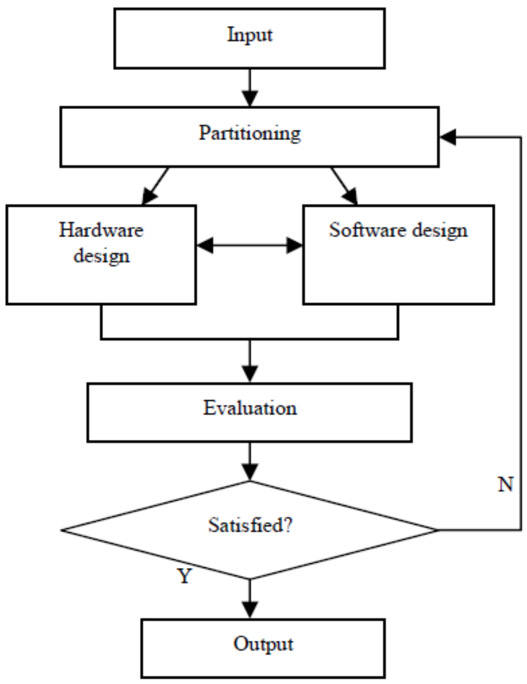

Figure 4: Flow chart Portioning

IV. CONCLUSION

In this paper the various algorithm and optimization technique is discussed .The designing of embedded system involves the reduction of cost, power consumption and other various factors. The algorithms are proposed to achieve the efficient system but for one algorithm can be used for one constraint.In future the novel algorithm can be proposed to achieve all the constraints in single algorithm

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