Research Paper on C Language

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Abstract: - C is a structured, procedural programming language that has been widely used both for operating systems and applications and that has had a wide following in the academic community. Many versions of UNIX-based operating systems are written in C. C has been standardized as part of the Portable Operating System Interface POSIX. C language programming is most one of important basic curriculums for computer curriculum teaching in science and engineering college. This paper discusses about formal verification techniques targeting C based VLSI design descriptions. Recently there are lots of attentions into the use of C programming language (or its extensions) for describing hardware as well as software with an intention to support hardware-software co-design processes with a single language. Here we first discuss about such design methodologies by which system level descriptions for hardware-software combined systems can be uniformly and smoothly refined into implementation in RTL for hardware and assembly languages for software. Starting from regular C programming language descriptions, the design methodologies repeat a number of small refinement steps and gradually adding more and more details into the target designs.

We also discuss about formal verification of system level descriptions in those design methodologies from the viewpoint of formal verification. Since such descriptions have essentially concurrency and C must be extended to be able to represent such concurrency, an effective and efficient formal verification of synchronization of concurrent processes is one of the most important issues in system level designs. We present model checking and equivalence checking methods targeting the design methodology that can check correctness of design descriptions with preliminary experimental results. The proposed formal verification methods will support the design methodologies and are very efficient by utilizing the fact that the design methodologies consist of lots of small refinement steps.

Introduction
C programming is an ANSI/ISO standard and powerful programming language for developing real time applications. C programming language was invented by Dennis Ritchie at the Bell Laboratories in 1972. It was invented for implementing UNIX operating system. C programming is most widely used programming language even today. All other programming languages were derived directly or indirectly from C programming concepts. C programming is the basis for all programming languages. This C programming tutorial explains all basic concepts in C like history of C language, data types, keywords, constants, variables, operators, expressions, control statements, array, pointer, string, library functions, structures and unions etc.

This C programming tutorial is designed for the new learners, students and also for the corporate level developers who want to learn and refresh their C programming skills.

History
- The C programming language is a structure oriented programming language, developed at Bell Laboratories in 1972 by Dennis Ritchie
- C programming language features were derived from an earlier language called “B” (Basic Combined Programming Language – BCPL)
- C language was invented for implementing UNIX operating system
- In 1978, Dennis Ritchie and Brian Kernighan published the first edition “The C Programming Language” and commonly known as K&R C
- In 1983, the American National Standards Institute (ANSI) established a committee to provide a modern, comprehensive definition of C. The resulting definition, the ANSI standard, or “ANSI C”, was completed late 1988.
Features of C programming language:
- Reliability
- Portability
- Flexibility
- Interactivity
- Modularity
- Efficiency and Effectiveness

Uses of C programming language:
The C programming language is used for developing system applications that forms a major portion of operating systems such as Windows, UNIX and Linux. Below are some examples of C being used.
- Database systems
- Graphics packages
- Word processors
- Spreadsheets
- Operating system development
- Compilers and Assemblers
- Network drivers
- Interpreters

Key points to remember in C language:
1. The C language is structured, middle level programming language developed by Dennis Ritchie
2. Operating system programs such as Windows, Unix, Linux are written in C language
3. C89/C90 and C99 are two standardized editions of C language
4. C has been written in assembly language

C language tutorial reference E-books & research papers:
- Wikipedia C* Programming