

The Unified Modeling Language (UML) is a notation used for both the OOAD and MDA. Some text editors such as Emacs allow GDB to be invoked through them, to provide a visual environment. Following a consistent programming style often helps readability. Proficient programming usually requires expertise in several different subjects, including knowledge of the application domain, details of programming languages and generic code libraries, specialized algorithms, and formal logic. In the 9th century, the Arab mathematician Al-Kindi described a cryptographic algorithm for deciphering encrypted code, in A Manuscript on Deciphering Cryptographic Messages. Some of these factors include: The presentation aspects of this (such as indents, line breaks, color highlighting, and so on) are often handled by the source code editor, but the content aspects reflect the programmer's talent and skills. Some text editors such as Emacs allow GDB to be invoked through them, to provide a visual environment. Unreadable code often leads to bugs, inefficiencies, and duplicated code. However, because an assembly language is little more than a different notation for a machine language, two machines with different instruction sets also have different assembly languages. In the 1880s, Herman Hollerith invented the concept of storing data in machine-readable form. New languages are generally designed around the syntax of a prior language with new functionality added, (for example C++ adds object-orientation to C, and Java adds memory management and bytecode to C++, but as a result, loses efficiency and the ability for low-level manipulation). Text editors were also developed that allowed changes and corrections to be made much more easily than with punched cards. It is usually easier to code in "high-level" languages than in "low-level" ones. Debugging is often done with IDEs. Standalone debuggers like GDB are also used, and these often provide less of a visual environment, usually using a command line. Popular modeling techniques include Object-Oriented Analysis and Design (OOAD) and Model-Driven Architecture (MDA). It is very difficult to determine what are the most popular modern programming languages. Following a consistent programming style often helps readability. Machine code was the language of early programs, written in the instruction set of the particular machine, often in binary notation. For example, when a bug in a compiler can make it crash when parsing some large source file, a simplification of the test case that results in only few lines from the original source file can be sufficient to reproduce the same crash. Expert programmers are familiar with a variety of well-established algorithms and their respective complexities and use this knowledge to choose algorithms that are best suited to the circumstances. Code-breaking algorithms have also existed for centuries. While these are sometimes considered programming, often the term software development is used for this larger overall process – with the terms programming, implementation, and coding reserved for the writing and editing of code per se. Auxiliary tasks accompanying and related to programming include analyzing requirements, testing, debugging (investigating and fixing problems), implementation of build systems, and management of derived artifacts, such as programs' machine code. Programmable devices have existed for centuries.