

In the 1880s, Herman Hollerith invented the concept of storing data in machine-readable form. Readability is important because programmers spend the majority of their time reading, trying to understand, reusing and modifying existing source code, rather than writing new source 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. 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. This can be a non-trivial task, for example as with parallel processes or some unusual software bugs. 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. 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. The Unified Modeling Language (UML) is a notation used for both the OOAD and MDA. Programmers typically use high-level programming languages that are more easily intelligible to humans than machine code, which is directly executed by the central processing unit. 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. 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. The first step in most formal software development processes is requirements analysis, followed by testing to determine value modeling, implementation, and failure elimination (debugging). 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. The Unified Modeling Language (UML) is a notation used for both the OOAD and MDA. It involves designing and implementing algorithms, step-by-step specifications of procedures, by writing code in one or more programming languages. Whatever the approach to development may be, the final program must satisfy some fundamental properties. The choice of language used is subject to many considerations, such as company policy, suitability to task, availability of third-party packages, or individual preference. However, Charles Babbage had already written his first program for the Analytical Engine in 1837. Text editors were also developed that allowed changes and corrections to be made much more easily than with punched cards. Programmers typically use high-level programming languages that are more easily intelligible to humans than machine code, which is directly executed by the central processing unit. Code-breaking algorithms have also existed for centuries. Computer programming or coding is the composition of sequences of instructions, called programs, that computers can follow to perform tasks. Implementation techniques include imperative languages (object-oriented or procedural), functional languages, and logic languages.