

Machine code was the language of early programs, written in the instruction set of the particular machine, often in binary notation. In 1801, the Jacquard loom could produce entirely different weaves by changing the "program" – a series of pasteboard cards with holes punched in them. FORTRAN, the first widely used high-level language to have a functional implementation, came out in 1957, and many other languages were soon developed—in particular, COBOL aimed at commercial data processing, and Lisp for computer research. He gave the first description of cryptanalysis by frequency analysis, the earliest code-breaking algorithm. 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. A similar technique used for database design is Entity-Relationship Modeling (ER Modeling). Use of a static code analysis tool can help detect some possible problems. Different programming languages support different styles of programming (called programming paradigms). Sometimes software development is known as software engineering, especially when it employs formal methods or follows an engineering design process. However, readability is more than just programming style. After the bug is reproduced, the input of the program may need to be simplified to make it easier to debug. 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. However, Charles Babbage had already written his first program for the Analytical Engine in 1837. However, readability is more than just programming style. It is usually easier to code in "high-level" languages than in "low-level" ones. 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. Computer programmers are those who write computer software. Later a control panel (plug board) added to his 1906 Type I Tabulator allowed it to be programmed for different jobs, and by the late 1940s, unit record equipment such as the IBM 602 and IBM 604, were programmed by control panels in a similar way, as were the first electronic computers. Different programming languages support different styles of programming (called programming paradigms). A study found that a few simple readability transformations made code shorter and drastically reduced the time to understand it. Also, specific user environment and usage history can make it difficult to reproduce the problem. When debugging the problem in a GUI, the programmer can try to skip some user interaction from the original problem description and check if remaining actions are sufficient for bugs to appear. Assembly languages were soon developed that let the programmer specify instruction in a text format (e.g., ADD X, TOTAL), with abbreviations for each operation code and meaningful names for specifying addresses. Scripting and breakpointing is also part of this process.