

Programs were mostly entered using punched cards or paper tape. They are the building blocks for all software, from the simplest applications to the most sophisticated ones. Scripting and breakpointing is also part of this process. The academic field and the engineering practice of computer programming are both largely concerned with discovering and implementing the most efficient algorithms for a given class of problems. Compilers harnessed the power of computers to make programming easier by allowing programmers to specify calculations by entering a formula using infix 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. For this purpose, algorithms are classified into orders using so-called Big O notation, which expresses resource use, such as execution time or memory consumption, in terms of the size of an input. However, readability is more than just programming style. As early as the 9th century, a programmable music sequencer was invented by the Persian Banu Musa brothers, who described an automated mechanical flute player in the Book of Ingenious Devices. Some languages are very popular for particular kinds of applications, while some languages are regularly used to write many different kinds of applications. 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. It affects the aspects of quality above, including portability, usability and most importantly maintainability. Also, specific user environment and usage history can make it difficult to reproduce the problem. However, Charles Babbage had already written his first program for the Analytical Engine in 1837. It is very difficult to determine what are the most popular modern programming languages. In 1801, the Jacquard loom could produce entirely different weaves by changing the "program" – a series of pasteboard cards with holes punched in them. He gave the first description of cryptanalysis by frequency analysis, the earliest code-breaking algorithm. 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. Many applications use a mix of several languages in their construction and use. In the 1880s, Herman Hollerith invented the concept of storing data in machine-readable form. It affects the aspects of quality above, including portability, usability and most importantly maintainability. Some languages are very popular for particular kinds of applications, while some languages are regularly used to write many different kinds of applications. In 1206, the Arab engineer Al-Jazari invented a programmable drum machine where a musical mechanical automaton could be made to play different rhythms and drum patterns, via pegs and cams. This can be a non-trivial task, for example as with parallel processes or some unusual software bugs. Use of a static code analysis tool can help detect some possible problems.