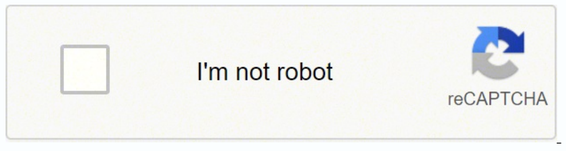


Next

Algorithm computer programming pdf

Sorting algorithm

In computer science, a **sorting algorithm** is an algorithm that puts elements of a list in a certain order. The most-used orders are numerical order and lexicographical order. Efficient sorting is important for optimizing the use of other algorithms (such as search and merge algorithms) that require sorted lists to work correctly; it is also often useful for canonicalizing data and for producing human-readable output. More formally, the output must satisfy two conditions:

1. The output is in nondecreasing order (each element is no smaller than the previous element according to the desired total order);
2. The output is a permutation, or reordering, of the input.

Since the dawn of computing, the sorting problem has attracted a great deal of research, perhaps due to the complexity of solving it efficiently despite its simple, familiar statement. For example, bubble sort was analyzed as early as 1956.[1] Although many consider it a solved problem, useful new sorting algorithms are still being invented (for example, library sort was first published in 2004). Sorting algorithms are prevalent in introductory computer science classes, where the abundance of algorithms for the problem provides a gentle introduction to a variety of core algorithm concepts, such as big O notation, divide and conquer algorithms, data structures, randomized algorithms, best, worst and average case analysis, time-space tradeoffs, and lower bounds.

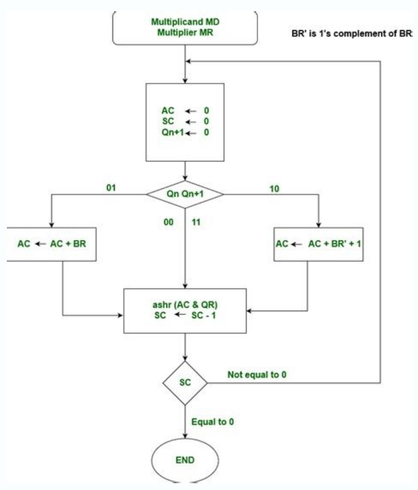
Classification

Sorting algorithms used in computer science are often classified by:

- Computational complexity (worst, average and best behaviour) of element comparisons in terms of the size of the list (n). For typical sorting algorithms good behavior is $\mathcal{O}(n \log n)$ and bad behavior is $\mathcal{O}(n^2)$. (See Big O notation.) Ideal behavior for a sort is $\mathcal{O}(n)$, but this is not possible in the average case. Comparison-based sorting algorithms, which evaluate the elements of the list via an abstract key comparison operation, need at least $\mathcal{O}(n \log n)$ comparisons for most inputs.
- Computational complexity of swaps (for "in place" algorithms).
- Memory usage (and use of other computer resources). In particular, some sorting algorithms are "in place". This means that they need only $\mathcal{O}(1)$ or $\mathcal{O}(\log n)$ memory beyond the items being sorted and they don't need to create auxiliary locations for data to be temporarily stored, as in other sorting algorithms.
- Recursion. Some algorithms are either recursive or non-recursive, while others may be both (e.g., merge sort).
- Stability: **stable sorting algorithms** maintain the relative order of records with equal keys (i.e., values). See below for more information.
- Whether or not they are a comparison sort. A comparison sort examines the data only by comparing two elements with a comparison operator.
- General method: insertion, exchange, selection, merging, *etc.*. Exchange sorts include bubble sort and quicksort. Selection sorts include shaker sort and heapsort.
- Adaptability: Whether or not the presortedness of the input affects the running time. Algorithms that take this into account are known to be adaptive.

Stability

Stable sorting algorithms maintain the relative order of records with equal keys. If all keys are different then this distinction is not necessary. But if there are equal keys, then a sorting algorithm is stable if whenever there are two records (let's say R and S) with the same key, and R appears before S in the original list, then R will always appear before S in the sorted list. When equal elements are indistinguishable, such as with integers, or more generally, any data where the entire element is the key, stability is not an issue. However, assume that the following pairs of



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A Computer Technique for Solving Linear Fractional Programming Problems by Using Dinkelbach's Algorithm

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ABSTRACT

In this paper, we introduce a computer oriented technique for solving linear fractional programming (LFP) problems by converting it into a equivalent linear programming problem (LP). Then the LP problem is solved by using the well known computational programming language COBOL. For illustration purpose, some examples are solved to demonstrate the technique.

Keywords: LFP, LP, ANPL, Objective function.

I. Introduction

Linear fractional programming (LFP) is a mathematical programming problem in which the ratio of two linear objective functions which is also a ratio of two linear functions is optimized over a set of linear constraints. problem. Whose determination of LFP becomes a constant ratio of two linear functions. It was first introduced by mathematician B. Metzner and his associates developed the field of LFP in 1960's. There are many techniques for solving LFP problems, such as Charnes and Cooper [1962], Cooper [1962], [1971] method, Bitran and Novaes's [1973] method, Martos [1964] method etc. In this paper, we have presented a computer oriented technique for solving LFP problems by converting it into a equivalent LP. It transforms the objective function as a subtraction of two linear functions by multiplying denominator with a parameter. Then we find the value of the transformed objective function becomes zero.

LFP has lots of applications in business and economics such as, a company may want to maximize profit per unit of time or to minimize risk asset to capital, investment debt to equity ratio etc. In this topic section, we have outlined the paper.

II. Preliminaries

We have started our work by discussing some basic definitions and preliminaries in Section II. In Section III, we have discussed Charnes and Cooper's method. In Section IV, Dinkelbach's algorithm. In Section V and in Section VI, we have presented our developed computer code in ANPL and some examples are solved by using our code and Dinkelbach's respectively. Finally, we have drawn conclusions and discussed in Section VII.

Professor of LFP arise when it becomes important to optimize the efficiency of some activities. In this section, we have discussed some basic definitions and preliminaries about LFP.

General Fractional Programming (GFP):

Mathematically LFP problems are defined as follows',

$$Maximize \quad z = \frac{f(x)}{g(x)} \tag{2.1}$$

$$subject\ to: \quad Ax \le b \tag{2.2}$$

$$x \ge 0 \tag{2.3}$$

Where $x, c \in R^n$, $A \in R^m \times R^n$, m or $n \times n$ matrix, $b \in R^m$ and $f(x) = cx + \alpha$ and $g(x) = dx + \beta \neq 0$.

Relation of LFP with LP:

There is a close relation of LFP with LP. We have discussed this in details as follows':

Case 1: If $d = 0$ and $\beta = 1$ then (2.1) transforms into an ordinary LP. Then (2.1) becomes

$$Maximize \quad z = cx + \alpha$$
$$subject\ to \quad Ax \le b$$
$$x \ge 0$$

Case 2: If $d \neq 0$ and $\beta \neq 1$ then (2.1) transforms into the following LP.

$$Maximize \quad z = \frac{c}{d} x + \frac{\alpha}{d}$$
$$subject\ to \quad Ax \le b$$
$$x \ge 0$$

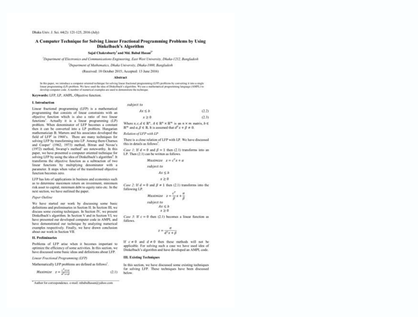
Case 3: If $c = 0$ then (2.1) becomes a linear function as follows.

$$z = \frac{\alpha}{dx + \beta}$$

If $c \neq 0$ and $d \neq 0$ then these methods will not be applicable. For solving such a case we have used idea of Dinkelbach's algorithm and have developed an ANPL code.

III. Existing Techniques

In this section, we have discussed some existing techniques for solving LFP. These techniques have been discussed below.



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Dynamic Programming Algorithms in Speech Recognition

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In a series of previous papers entitled "Dynamic Programming" we have presented the whole range of the main concepts, methods and techniques which stand behind the general name of Dynamic Programming. Starting from the Richard Bellman's Principle of Optimality, we have continued with the presentation of the Dynamic Programming paradigm, the Functional Equation technique, the Backward Induction method, the Sequential Analysis method, the Problem's Dimensionality, the Inclusion and Decomposition principles, the Optimal Substructure property, the Overlapping Subproblems property, the Memoization technique, the Top-Down and Bottom-Up techniques, the Dynamic Programming Algorithm's Complexity, the Greedy Algorithms, the Linear Programming and the Integer Linear Programming. The present paper presents two alternatives for implementation of the algorithm: Chart Parsing. The paper assumes the reader's familiarity with the previously mentioned techniques.

Keywords: *dynamic programming, speech recognition, word decision.*

Introduction

Within the speaking recognition field, research has been done for more than 50 years. Fundamental research in various parts of it did not stop and new methods algorithms and techniques are developed every year. Despite the existence of a large number of different speaking methods, different algorithms and techniques, the whole field is still confined within strong limits.

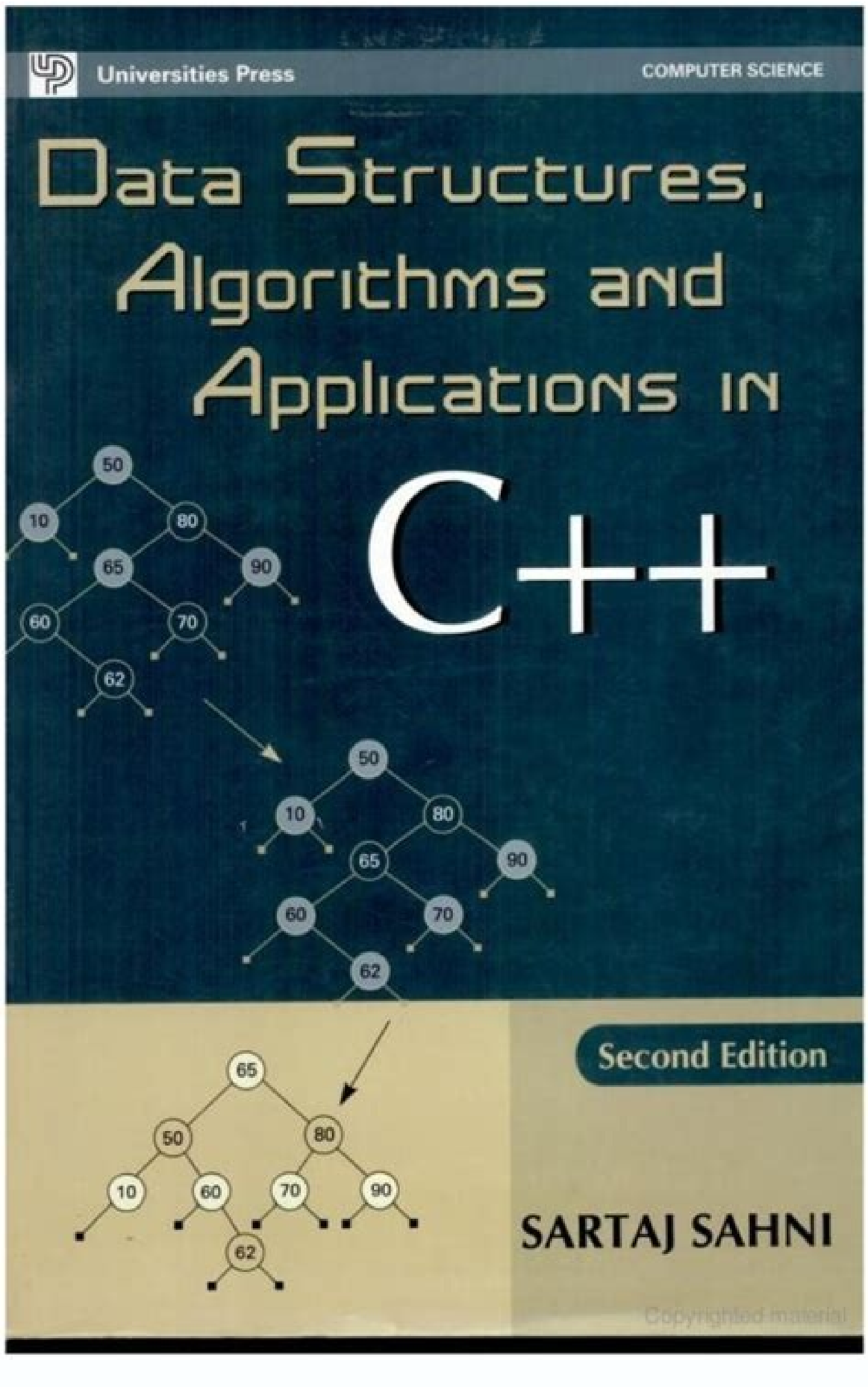
Although the problem seems to be resolved, the computer has a certain number of limitations which are not allowing it to perform at a human level. Despite the great research units or great performances obtained in various domains, the computer is still far from the performances shown by the human brain. Improving performances or even recognition rates is extremely difficult, because of a number of reasons:

- Dimension of recognizable vocabularies: spontaneous texts degrade of speaking to the dictionary words;
- Dependence of pronunciation on the speaker: speaker dependent systems, speaker independent systems accommodating later at each speaker;
- Dependence of pronunciation on the environment: environmental noise, reverberation, echo, variety of microphones;
- Continuous speech recognition systems are based on the general principles of pattern recognition, but the practical methods of implementation have been used so far can be divided into two main categories:
  - Deterministic Methods based on Pattern Matching Techniques;
  - Statistic Methods.

The pattern matching methods base their work on comparing the unknown sequence (the test pattern) with each of the sequences describing the possible utterances to be recognized (reference patterns). The comparison is made according to a given criterion, usually a distance between the two sequences. The unknown sequence will be labeled in the end with the reference pattern which is the closest to the test pattern. The most frequent used method for measuring the similarity between two sequences is the minimum distance method. The distance between two sequences is usually determined by establishing a correspondence between their components. Both sequences must be first normalized to have the same length. This normalization can be linear or non-linear. The linear normalization supposes a uniform extension or compression of one of the sequences, in order to become equal in length with the second one. The non-linear normalization is usually more complex and is based on the hypothesis that the sequences to be compared are formed by unequal but similar parts, which have different lengths. Each part of the first sequence must be compared with the corresponding part of the second sequence, but because the lengths of these parts are unknown, all the possible combinations between the divisions of the two sequences must be tested, in order to find the optimum one. All these possible combinations can be represented by a two-dimensional grid. The matching path has to be found, which minimizes the global distance between the two sequences. Usually, it is not necessary to calculate all the distances between all the possible pairs of points. Good results can be obtained calculating the distances only in the points situated near enough to the diagonal of the grid. If the two sequences are relatively similar, the matching path is near enough to the diagonal. The global distance is found gradually, beginning from the origin and ending in the point (I, J). The recursive relation which can be applied is:

$$d_{i,j} = |x_i - y_j| + \min(d_{i-1,j}, d_{i-1,j-1}, d_{i,j-1})$$

The symbol $d_{i,j}$ represents the global distance assigned to the point (i, j). The minimum distance between sequences is determined using a dynamic programming algorithm, which is presented in the following section.



Algorithm development in computer programming. Why is algorithm important in computer programming. Dynamic programming in computer algorithm. Algorithm and flowchart computer programming. Algorithm are written in computer programming language. Definition of algorithm in computer programming. Algorithm computer programming importance. Computer programming algorithm examples.

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Process for creating executable programs Part of a series onSoftware Development Main Activities Processes Requirements Design Construction Test Debugging Implementation Maintenance Paradigms and Models Software Engineering Agile Cleanroom Incremental Prototyping Spiral V Model Cascade Methodologies and Structures ASD DevOps DAD DSDM FDD IID Kanban Lean SD LeSS MD MSF PSP RAD RUP SAFe Scrum SEMAT TSP OpenUP UP XP Support Disciplines Configuration Management Documentation Software Quality Assurance Project Management User Experience Practices ATDD BDD CCO CI CD DD PP SBE Stand-up TDD Tools Compiler Debugger Profiler Designer GUI Modeling IDE Automation Construction Release Automation Automation Infrastructure as Code Testing Infrastructure Standards and Knowledge Bodies BABOK CMMI Standards IEEE ISO 9001 Standards ISO/IEC PMBOK SWEBOK ITIL IREB Glossaries Artificial Intelligence Computer Science Electrical and Electronic Engineering Software Development Schemes vte Computer programming is the the process of designing and constructing an executable computer program to achieve a specific calculation result or to perform a particular task. Programming involves tasks such as analyzing, generating algorithms, accuracy of profiling algorithms and consuming resources, and implementing algorithms in a chosen programming language (commonly called encoding).[1][2] The source code of a program is written in one or more languages that programmers can understand, rather than machine code, which is executed directly from the central processing unit. The purpose of programming is to find a sequence of instructions that automates the execution of a task (which can be complex as an operating system) on a computer, often to solve a given problem. problem. programming therefore usually requires skills in several topics, including knowledge of the application sector, specialised algorithms and formal logic. Accompanying and programming tasks include testing, debugging, source code maintenance, implementation of systems for compiling and managing derived artifacts, such as computer program machine code. These can be considered part of the programming process, but often the term software development is used for this wider process, while the term programming, implementation or coding is reserved for the actual writing of the code. Software engineering combines engineering techniques with software development practices Reverse engineering is a related process used by designers, analysts and programmers to understand and re-implement. [3] History of Ada Lovelace, whose notes added at the end of Luigi Menabrea's work included the first algorithm designed to be developed by an analytical engine. She is often recognized as the first computer programmer in history. See also: Computer program is History, Programming is History and History of Programming Languages Programmable devices have existed for centuries. Already in the ninth century, a programmable musical sequencer was invented by the Persian brothers Banu Musa, who described an automated mechanical flutist in the Book of Ingenious Devices. [4][5] In the 1206, the Arab engineer Al-Jazari invented a programmable drum machine in which a mechanical music machine could play different rhythms and in the 1801 the Jacquard frame could produce completely different tiles by changing the "program" a series of cards with perforated holes. Decryption algorithms have also existed for centuries. In the ninth century, Arab mathematician Al-Kindi described a cryptographic algorithm for code decryption. in a manuscript on decipher cryptographic messages. gave the firstcryptoanalysis by frequency analysis, the first code decryption algorithm.[8] The first computer program is generally dated to 1843, when the mathematics Ada Lovelace published an algorithm to calculate a sequence of Bernoulli numbers, which was to be performed by Charles Babbage's analytical engine[9]. Once the data and instructions were stored on external perforated cards, which were kept in order and placed in program decks. In the 1980s, Herman Hollerith invented the concept of data storage in a machine readable form.[10] Later, a control panel (plug board) added to its Tabulator Type I of 1906, allowed it to be programmed for several uses, and at the end of the 1940s, recording devices such as IBM 602 and IBM 604, were programmed by power plants in a similar way, as well as the first electronic computers. However, with the concept of computer program stored in 1949, both programs and data were stored and manipulated in the same way in computer memory.[11] The machine code was the language of the first programs, written in the instruction set of the particular machine, often in binary notation. Assembling languages were soon developed that allowed the programmer to specify instructions in a text format (for example, ADD X, TOTAL), with abbreviations for each operation code and meaningful names to specify addresses. However, since 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. Wired control panel for an IBM 402 accounting machine. compiler languages High-level languages have made the process of developing a simpler and more understandable program, and less related to the underlying hardware.First tool related to the compiler, the A-0 system, was developed in 1952 [12] from Grace Hopper, which also conized the term â € ™ compiler '. [13] [14] Fortran, the first high-level language widely used to have a functional implementation, amounted to 1957, [15] and many others Languages were soon developed â in particular, COBOL aimed at processing commercial data, and Lisp for computer search. These compiled languages allow the programmer to write programs in syntactically richer terms, and more able to assign code, making it easier to locate different sets of machine instructions through compilation and heuristic declarations. Compilers have harnessed the power of computers to make programming easier[15], allowing programmers to specify calculations by entering a formula using infix notation. Source code See also: Computer programming in the age of punched paper Programs have mostly been inserted using punched cards or paper tape. By the end of the 1960s, data storage devices and computer terminals became cheap enough to create programs by typing directly into computers. Text editors have also been developed that have allowed editing and corrections to be done much more easily than with punched cards. Modern Programming Quality Requirements Whatever the approach to development, the final program must meet some basic properties. The following properties are among the most important:[16] [17] Reliability: how often the results of a program are correct. This depends on the conceptual correctness of the algorithms and the minimization of programming errors, such as errors in resource management (e.g. buffer overflows and race conditions) and logical errors (such as splitting from zero or off-by-one errors). Robustness: how much a program predicts problems due to errors (not bugs). This includes situations such as erroneous, inappropriate or corrupt data, unavailability of needed resources such as memory, operating system services and network connections, error of and unexpected power outages. Usability: the ergonomics of a program: the ease with which a person can use the program for their intended purpose or in some cases even for unforeseen purposes. Such issues can make or break its success even independently independently Other problems. This involves a wide range of textual elements, graphics and sometimes hardware that improve clarity, intuition, cohesion and completeness of the user interface of a program. portability: the range of hardware and operating system platforms on which the source code of a program can be compiled/interpreted and executed. This depends on the differences in the programming structures provided by the different platforms, including hardware and operating system resources, the expected behavior of the hardware and operating system and the availability of platform-specific compilers (and sometimes libraries) for the language of the source code. responsibilities: the ease with which a program can be modified by its present or future developers in order to make improvements or customize, correct errors and security holes, or adapt it to new environments. good practices[18] during initial development make the difference in this regard. this quality may not be directly obvious to the end user, but may significantly affect the fate of a program in the long term. Efficiency/performances: measure system resources a program consumes (processor time, memory space, slow devices such as disks, network bandwidth, and to some extent also user interaction:) less, better. This also includes careful resource management, such as cleaning temporary files and deleting memory losses. this is often discussed in the shadow of a chosen programming language. Although language certainly affects performance, even slower languages, such as python, can run programs immediately from a human perspective. speed, resource use and performance are important for programs that block the system, but the efficient or time of programmer is also important and isat the cost: more hardware can be cheaper. The ease with which a human reader can understand the purpose, the flow of control, and of source code. It affects the quality aspects above, including portability, usability and especially maintainability. Readability is important because programmers spend most of their reading time trying to understand and modify existing source code, rather than writing new source code. Unreadable code often leads to bugs, inefficiencies and duplicate code. One study found that some simple readability transformations made the code shorter and drastically reduced the time to understand it. [19] Following a consistent programming style often helps readability. However, readability is more than just programming style. Many factors, having little or nothing to do with the computer’s ability to compile and execute code efficiently, contribute to readability. [20] Some of these factors include: Different styles of indent (white space) Comments Naming conventions for objects (such as variables, classes, functions, procedures, etc.) This (e.g. indents, line breaks, color highlighting and so on) are often handled by the source code editor, but the content aspects reflect the talent and skills of the programmer. Various visual programming languages have also been developed with the aim of solving readability problems by adopting non-traditional approaches to code structure and display. Integrated Development Environments (I.D.Es) aim to complement all these aids. Techniques such as code rewriting can improve readability. Algorithmic Complexity The academic field and the engineering practice of computer programming are both largely interested in discovering and implementing the most efficient algorithms for a given class of problems. For this purpose, algorithms are classified into orders The so-called BIG or, which expresses the use of resources, such as the execution time or memory consumption, in terms of the size of an input. Experienced programmers have familiarized with a variety of well-established algorithms and their complexity and use this knowledge to choose algorithms more suited to the circumstances. Chess algorithms such as "Programming a Computer for Playing Chess" were an article of the 1950's that evaluated a "minimum axis" algorithm that is part of the history of algorithmic complexity. A course on the Deep Blue (chess computer) of IBM is part of the computer curriculum of Stanford University. Methodologies The first step in most formal software development processes is the analysis of requirements, followed by tests to determine value modelling, Implementation and elimination of failures (de There are a lot of different approaches to each of these tasks. A popular approach to requirement analysis is Use Case analysis. Many programmers use forms of development of Agile software where the various stages of formal software development are more integrated together in short cycles that require few seventies More than years. There are many approaches to the software development process. The most common modelling techniques include object-oriented analysis and design (OOAD) and model-based architecture (MDA). The Unified Modeling Language (UML) is a notation used for both OOAD and MDA. A similar technique used for the design of databases is Entity-Relationship Modeling (ER Modeling). Implementation techniques include imperative languages (object-oriented or procedural), functional languages and logical languages. Measure the use of the main language Article: Measure the popularity of the programming language is very difficult to determine which are the most common modern programming languages. Methods to measure the popularity of programming languages include: counting the number of job advertisements that mention the language,[22] the number of books sold and courses that teach the language (overrated importance) new languages) and estimates of the number of existing code lines written in the language (this underestimates the number of users of commercial languages such asSome languages are very popular for particular types of applications, while some languages are regularly used to write many different types of applications. For example, COBOL is still strong in enterprise data centers[23] often on large mainframe computers, Fortran in engineering applications, writing languages in Web development, and C in embedded software. Many applications use a mix of different languages in their construction and use. New languages are generally designed around the syntax of an older language with new features added, (e.g. C+ adds object orientation to C, and Java adds memory management and bytecode to C,+ but as a result, loses efficiency and low-level manipulation ability.) Main article: Debug The first known real bug caused a problem in a computer was a moth, trapped inside a Harvard mainframe, recorded in a log entry dated September 9, 1947.[24] Bug was already a common term for a software flaw when this bug was found. Debugging is a very important task in the software development process as defects in a program can have significant consequences for its users. Some languages are more prone to certain types of defects because their specification does not require compilers to perform as much checks as other languages. Using a static code analysis tool can help detect some possible problems. Normally the first step in debugging is to try to reproduce the problem. This can be a non-trivial task, for example as with parallel processes or some unusual software bugs. In addition, the specific user environment and usage history can make it difficult to reproduce the problem. After the bug is played, the program entry may need to be simplified to make debugging easier. For example, a bug in a compiler can make it crash when analyzing a large source file, a simplification of the test case that translates into a few lines from the original source file can be sufficient to reproduce the accident. The programmer will try to remove some parts of the original test case and to check if the problem exists yet. When you debug the problem A in a GUI, the programmer can try to skip some user interaction from the original description of the problem and check if the remaining actions are sufficient to make bugs appear. Even writing and breakage are part of this process. Debugging is often done with IDE. Standalone debugger as GDB are also used, and they often provide less than a visual environment, usually using a command a command. Some text editors like Emacs allow GDB to be invoked through them, to provide a visual environment. Programming languages Main articles: Programming language and List of programming languages The different programming languages support different programming styles (called programming paradigms). The choice of language used is subject to many considerations, such as corporate policy, work suitability, availability of third-party packets or individual preference. Ideally, the most suitable programming language is selected for the task at hand. The advantages of this ideal consist of finding enough programmers who know the language to build a team, the availability of compilers for that language and efficiency with which the programs written on a given language perform. The languages form an approximate spectrum from "low" to "high level"; The "low-level" languages are typically more machine-oriented and fastest to run, while "high-level" languages are more abstract and easier to use but perform less quickly. It is usually easier to encode in "high level" languages than in those "low level". Allen Downey, in his book How to think like a computer scientist, writes: The details look like In several languages, but some basic instructions appear in almost every language: Input: collect data from the keyboard, a file, or some other device. Output: view data on the screen or send data to a file or other device. Arithmetic: Perform basic arithmetic operations such as addition and multiplication. Conditional execution: Check certain conditions and execute the appropriate sequence of instructions. Repetition: Do some actions repeatedly, usually with some variation. Many computer languages provide a mechanism for calling functions provided by shared libraries. If the functions of a library follow the appropriate run-time conventions (e.g. method of passing arguments), then those functions can be written in any other language. Programmers Main Articles: Programmer and Software Engineer Computer programmers are those who write computer software. Their tasks usually consist of: Prototyping Coding Debugging Documentation Integration Maintenance Requirements Analysis Software architecture Testing Specifications Although programming has been presented by the media as a somewhat mathematical subject, some research shows that good programmers have strong skills in natural human languages, and that learning code is similar to learning. Learning a foreign language.[25] [betterÃ¨ sourceÃ¨ need] See also Programming Portal Computer Programming Scheme ACCU Association for Computing Machinery Computer Network Hello World Program Institution of Analysts and Programmers National Coding Week Object Hierarchy System Programming Computer Programming in the Era of Perforated Cards The Art of Computer Programming Women in Informatics History of Computer Programming Women in Informatics References ^ Bebbington, Shaun (2014). “What’s the code”. Tumblr. Original archived on 29 April 2020. Retrieved 3 March 2014. ^ Bebbington, Shaun (2014). “What’s programming?” Tumblr. Original archived on 29 April 2020. URL accessed on 3 March ^ Eliam, Eldad (2005). Reverse: Secrets of Reverse Engineering. Wiley, p. 3. 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