Algorithms in Real Life

Overview

Algorithms lie at the heart of computing. We studied the design and analysis of various algorithms. This project will cover the application perspective of algorithms. How algorithms form the basis of every computer program/application, from Facebook to the Operating system itself. The project tries to present the conceptual map of the course through a real world view. The project also involves implementing some of the algorithms used in popular applications modularly as the theory tends to leave out a lot of little implementation details that turn out not to be so little when the time comes to implement.

Goals

An algorithm is viewed as a tool for solving a well-specified computational problem and the practical applications of algorithms are omnipresent. The following are some of the interesting examples I found and plan to cover in the project :

1. Gaming - Building games like Sudoku(Generator and Solver) involves implementing many interesting backtracking algorithms such as min-max algorithm, and alpha-beta pruning. These algorithms require a thorough understanding of graph algorithms and dynamic programming. Programming Chess engines involve multiple algorithms based on greedy approach.
2. Recommendation systems - Recommender systems are machine learning systems that help users discover new products and services. Every time you shop online, a recommendation system is guiding you towards the most likely product you might purchase. Similarly, social media applications like facebook involve friends and content recommendation systems. Algorithms used in recommendation systems involve matrix factorization and graphs.
3. Rating Algorithms - Different rating algorithms are used to rank players in many competitive games. Competitive programming platforms like codechef, codeforces use rating algorithms for rating participants in individual algorithms, calculate the Long Rating, Short Rating, and combined platform Rating.
4. Auto complete feature in text editor is implemented using a tree based trie data structure which involves multiple graph concepts and algorithms.

5. Various Maps and Smart City features involve graph concepts such as Travelling Salesman Problem, Shortest Path, Maximum Network Flow, Bridges, Minimum Spanning Tree and SCC.
6. Supply chain management - Supply chain management is the handling of the entire production flow of a good or service — starting from the raw components all the way to delivering the final product to the consumer. Managing the supply chain flow involves multiple optimization algorithms based on DP, graphs and greedy approach and real world data analysis.
7. Search Engines involve crawling, indexing and ranking algorithms.
8. OS Scheduling algorithms involve greedy and graph concepts.
9. Encryption and Decryption - Cryptography is associated with the process of converting ordinary plain text into unintelligible text and vice-versa. There are several data encryption algorithms available like TripleDES, AES, Blowfish, Twofish etc. which involve number theory and string matching concepts

I would try to explore most of these examples and present them efficiently in my project, I might add some other examples if I find something more interesting during the course of the project that will be a website/blog.

Timeline

I aim to cover at least two applications every 15 days.

By 20th October - Complete Recommendation systems and Rating Algorithms

By 5th November - Complete Gaming, AutoComplete and Search Engines

By 20th November - Complete Supply Chain management and Maps

If time permits I would try to cover OS scheduling and some of cryptography algorithms.

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