

2024/07/29

lab - 11 - 1 pm
524

- ① BigOh notation (asymptotic analysis for computing running time/space)
- ② Basic data structures - list, stack, queue, tree
- ③ Dictionaries, Binary Search Trees, Balanced Search Tree, Btree, Hash table, heap
- ④ Graph - basic representation of graph, BFS/DFS graph traversal algorithm, computing min spanning tree, shortest path

Binomial heaps, ...

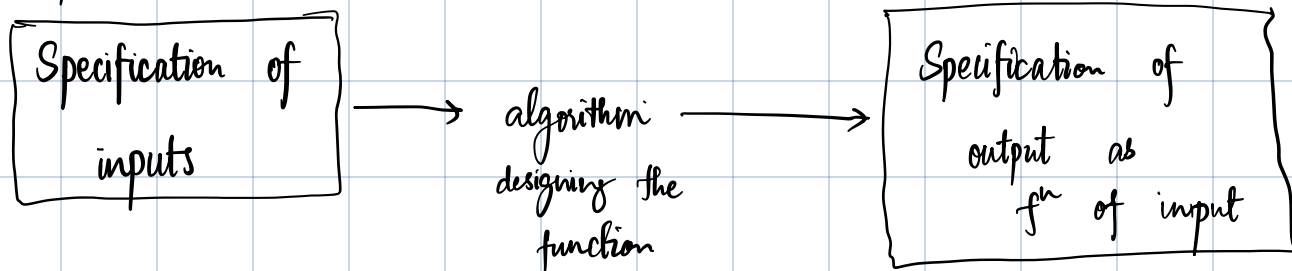
Book: Intro to Algorithm - CLRS

Algorithm : outline ; essence of a computational procedure ; step-by-step instructions

Program : An implementation of algorithm in some programming language

Data Structure : facilitates to organize data for given problem.

Algorithmic Problem



Does CS deal with non-algorithmic problems?

Ex: a set of 100 real no.

find the max.

Infinitely many input instances possible.

" " algorithms possible

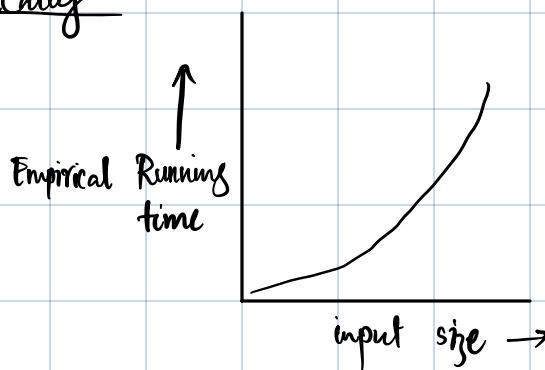
Efficiency

- ① running time
- ② Memory / space

Input: # of data points
bytes used to store them

Measuring running time empirically

system clock



Limitation of empirical running time

- ① error in measurement
- ② varies from hardware / software platform used

③ Experiments can be done only on a limited set of inputs, and this may not be indicative about all those inputs that were not considered.

④ You need to implement the algorithm.
!!!

Remedy: Develop a general methodology for analysing the running time of algo

- able to comment on running time by looking at high-level description of algorithm (instead of its implementation)
 - independent of hardware / software platform used.
- should take care of all possible inputs

Ex: computing largest no. of a given input set.

Input: A set of n numbers represented in array A .

Output: The max element of A .

current max $\leftarrow A[0]$

for $i = 1$ to $n - 1$ do

if current max $< A[i]$

then current max $\leftarrow A[i]$

return current max

Primitive operations

most basic
operations

- Data movement (assignment)
- arithmetic and logic operations
- control operations (branching - if else
call return
loop, etc)

By inspecting the algorithm we need to count the no.
of primitive operations