**Algo-Assignment-2**

**Question 1: Bubble Sort**

1. **Given examples of Complexity of Best, Worst Case analysis of the above three parts.**

**Ans:** The best of bubble sort is O(N) as it is possible to upgrade it ! as O(N) is an assumption it could be improved ! On average or Worst Case of bubble sort can go to O(N^2) which is too slow time taking and in some cases it might N swaps !

**2) Is BubbleSort Stable? A Sort is called stable if there are two values in the array which are equal that the value which comes first should come first after sorting.**

**Ans :** Yes! The Bubble Sort is a stable Algorithm because order of any two elements is preserved in sort.

**Question 2: Selection Sort**

1. **SelectionSort Implementation using the following in mind?**

**Ans:** In Selection Sort we repeatedly find the minimum number in unsorted data

putting it in the beginning and maintaining the array

**A)Write the SelectMinIndexWithinRange function as described and discussed in class.**

**Ans :** The SelectMinIndexWithinRange function is use to find the Minimum number in a given range and returns the index

**B) Analyse its Time Complexity analysis**

1. **Is SelectionSort Stable? A Sort is called stable if there are two values in the array which are equal that the value which comes first should come first after sorting.**

**Ans :** No! Selection sort is not a stable algorithm, e.g If the given data is sorted it still compares each element and there is no breaking out ! as it’s ( best, average , worse case is ) O(N^2) which is inefficient for large amount of data

1. **Where SelectionSort beats BubbleSort? And where BubbleSorts beat SelectionSort?**

**Question 3: Insertion Sort**

1. **Its Time Complexity Analysis**

**Ans:** On average insertion sort takes O(N^2) time but it comparability better and fastest running algorithm in N^2

1. **Is InsertionSort Stable? A Sort is called stable if there are two values in the array which are equal that the value which comes first should come first after sorting.Give its Best and Worst Time Cases.**

**Ans :** Yes! Best case of Insertion sort is O(N) on average and worst it takes O(N^2) time to sort . More efficient in practice then most other O(N^2) Algorithms. But it is less efficient on large list then more advanced algorithms like ( Merge Sort , Quick Sort , Heap Sort)

# **Arithmetic, Population and Energy - a talk by Al Bartlett**

Prof Al Bartllet in his one hour talk . Has given the introduction to arithmetic of steady growth including an explanation of the concept of doubling time . He explains the effect of steady growth on the population of Boulder. He examined the consequences of steady growth in a finite environment and observed this growth on many energy materials.

**About Exponential function** : He says that if you are going to describe the size of anything that is growing steadily e.g you can show 5% of the population of the world written on an exponential function that will show how large that growing quantity will be .

The growth in any doubling time is greater then the total of all preceding growth. He show this by **Gain of Wheat on ChessBoard**

|  |  |  |
| --- | --- | --- |
| Square number | Gain Square | TotalGrain on board |
| 1 | 1 | 1 |
| 2 | 2 | 3 |
| 3 | 4 | 7 |
| 4 | 8 | 15 |
| 5 | 16 | 31 |
| 6 | 32 | 63 |
| 7 | 64 | 127 |

64 2^63 2^64 -1

As you can see the table. At this rate it will consume the total grain of the world! Other thought is is there much gain in the world ?? This shows how doubling can affect.

* **President Jimmy Carter:** On April 18, 1977

“ Each of these decades (1950, 1960) more oil was consumed then in all of mankind previous history “

This above statement defines the 7% growth each year in the world oil consumption and tells us how fast the need for oil will grow.

Further he talks about the work of “M.King Hubbert “ **( The Hubbert curve)**

Dr Hubbert (1974) empirically approximates the full cycle of growth , peaking and subsequent decline to zero of the production of finite non-renewable resources.

He further compact quotations neatly identifying the cause of the problem of **Boulder Country** “ It is one of the fast growing areas in the nation “ . Population growth is causing all the enumerated problems but as i will demonstrate, regional planning is not a solution because it will enlarge the problems and make them worse.

**Smart Growth:** We hear a lot about “smart growth “ as though “smart growth “ was a magic key to achievement of sustainability. A central ingredient in “smart growth” is regional planning encourages more population growth. Barlett (1994,1988) clear that smart growth can’t solve the problem by saying

“ smart growth destroys the environment “

“Dumb growth destroys the enviroment “

The only difference is that “smart growth “ destroys the environment with good taste.

**“** Center to do things that we must recognize that population growth is the immediate cause of all our resources and environmental crises**”**

**AL Barlett** describes the case of ordinary steady growth by a bacteria **example.**

**“** Imagine a bacteria growing steadily in a bottle theu double the number every minute .

How much time does it take to full the bottle with bacteria ?

**Ans:** If we put no bacteria in a bottle at **11:00 AM** and at Noon **12:00** We will see the bottle will be full with bacteria **“**

**Data from US Coal “ Annual Energy Review”** Barlett says that we are setting on half of the world Coal supply which is enough for over 500 years. Coal today supplies about (20%) of the energy that is used in the **US.**

**Conclusion:** Barlett discusses the widespread economic growth and population in west society . He explained the sustainability in the context of **first law sustainability**

**“** you cannot sustain population growth in the tates if consumption of resources **“**