Informatik II

Übung 3

FS 2019

Program Today

1. Feedback of last exercise

2. Python Short Exercises

Throwing eggs

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  - Binary search. Worst case: $\log_2 n$ tries.
- What would you do if you only had one egg?
  - Start from the bottom. n tries.

Throwing Eggs

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- First approach: intervals of equal length: partition n into k intervals: maximum number of trials $f(k) = k + n/k - 1$
  Minimize maximum number of trials:
  $f'(k) = 1 - n/k^2 = 0 \Rightarrow k = \sqrt{n}$.
  $n = 100 \Rightarrow 19$ Trials. $\Theta(\sqrt{n})$
- Second approach: take first throw trial into account by considering decreasing interval sizes. Choose smallest s such that $s + s - 1 + s - 2 + ... + 1 = s(s+1)/2 \geq 100 \Rightarrow s = 14$.
  Maximum number of trials: $s \in \Theta(\sqrt{n})$

Asymptotically both approaches are equally good. Practically the second way is better.

Hottest Path

```java
int current = 0;
List<Integer> route = new ArrayList<Integer>();
route.add(0);
while (!food[current]) { // termination criterion
  float max = -1;
  int next = -1;
  for (int j = 0; j < edges.length; ++j) {
    if (edges[current][j] != 0 && max < popularity[current][j]) {
      max = popularity[current][j];
      next = j;
    }
  }
  route.add(next);
  current = next;
}
```

Quiz

Consider the following three sequences of snap-shots (steps) of the algorithms (a) Insertion Sort, (b) Selection Sort and (c) Bubblesort. Below each sequence provide the corresponding algorithm name.

5	4	1	3	2
1	4	5	3	2
1	2	5	3	4
1	2	3	5	4
1	2	3	4	5

5	4	1	3	2
4	1	3	2	5
1	3	2	4	5
1	2	3	4	5

5	4	1	3	2
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1	4	5	3	2
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1	2	3	5	4
1	2	3	4	5

selection

5	4	1	3	2
4	1	3	2	5
1	3	2	4	5
1	2	3	4	5

bubblesort

5	4	1	3	2
4	5	1	3	2
1	4	5	3	2
1	3	4	5	2
1	2	3	4	5

insertion

Quiz

Execute two further iterations of the algorithm Quicksort on the following array.
The first element of the (sub-)array serves as the pivot.

8	7	10	15	3	6	9	5	2	13
2	7	5	6	3	**8**	9	15	10	13

Quiz

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2	7	5	6	3	**8**	**9**	15	10	13
2	3	5	6	**7**	**8**	**9**	13	10	**15**

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Questions / Suggestions?