Informatik II

Übung 3

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Program Today

1. Feedback of last exercise
2. Repetition Theory
3. Next Exercise

Throwing eggs

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  - $s + (s-1) + (s-2) + \cdots + 2 + 1 = \sum_{i=1}^{n} i = \frac{s(s+1)}{2} \geq 100$. Therefore $s = 14$.

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  - $\sqrt{n}$

Hottest Path

```
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;
}
```

Sorting and Running Times

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Algorithm Quicksort($A[l, \ldots, r]$)

Input : Array A with length n. $1 \leq l \leq r \leq n$.
Output : Array A, sorted between l and r.

if $l < r$ **then**
    Choose pivot $p \in A[l, \ldots, r]$
    $k \leftarrow$ Partition($A[l, \ldots, r], p$)
    Quicksort($A[l, \ldots, k-1]$)
    Quicksort($A[k+1, \ldots, r]$)

Algorithm recursive 2-way Mergesort(A, l, r)

Input : Array A with length n. $1 \leq l \leq r \leq n$
Output : Array $A[l, \ldots, r]$ sorted.

if $l < r$ **then**
  $m \leftarrow \lfloor (l + r)/2 \rfloor$ // middle position
  Mergesort(A, l, m) // sort lower half
  Mergesort($A, m + 1, r$) // sort higher half
  Merge(A, l, m, r) // Merge subsequences

Algorithm NaturalMergesort(A)

Input : Array A with length $n > 0$
Output : Array A sorted

```
repeat
    r ← 0
    while r < n do
        l ← r + 1
        m ← l; while m < n and A[m+1] ≥ A[m] do m ← m + 1
        if m < n then
            r ← m + 1; while r < n and A[r+1] ≥ A[r] do r ← r + 1
            Merge(A, l, m, r);
        else
            r ← n
until l = 1
```

Stable and in-situ sorting algorithms

- Stabe sorting algorithms don’t change the relative position of two elements.

5	2	6	6	8	4
2	4	5	6	6	8

not stable

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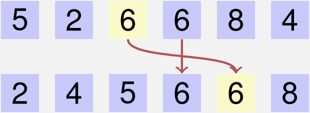

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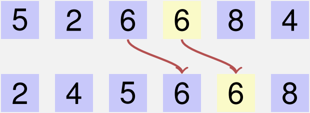

stable

- In-situ algorithms require only a constant amount of additional memory.

Bonus Exercise

Questions / Suggestions?