Institut für Betriebssysteme und Rechnerverbund
Abteilung Distributed and Ubiquitous Systems

Übungen zur Vorlesung

Algorithms for context prediction in ubiquitous systems

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2 Exact prediction approaches

2.1 High-level and low-level context prediction

In the lecture we have discussed the IPAM algorithm. Consider the following scenario:
Possible Events: A,B,C; $\alpha = 0.8$; Observed Sequence: A-A-B-A-C-$\cdots$

a) Calculate the prediction of the IPAM algorithm on observing the input sequence.

2.1.1 solution

Calculation rule: For the preceding row, however, every column is multiplied with $0 \leq \alpha \leq 1$ and column c_i is increased by $(1 - \alpha)$.

Possible Events: A,B,C
$\alpha = 0.8$
Observed Sequence: A-A-B-A-C-$\cdots$

Step 1 – Input: A

	A	B	C
A	0.3333	0.3333	0.3333
Default	0.3333	0.3333	0.3333

Prediction: A (0.3333), B (0.3333), C (0.3333)

Step 2 – Input: A

	A	B	C
A	0.4667	0.2667	0, 2667
Default	0.4667	0.2667	0, 2667

Prediction: A (0.4667), B (0.2667), C (0.2667)

Step 3 – Input: B

	A	B	C
A	0.3733	0.4133	0.2133
B	0.3333	0.3333	0.3333
Default	0.3733	0.4133	0, 2133

Prediction: A (0.3733), B (0.4133), C (0.2133)

Step 4 – Input: A

	A	B	C
A	0.3733	0.4133	0.2133
B	0.4667	0.2667	0.2667
Default	0.4986	0.3306	0,1706

Prediction: A (0.3733), B (0.4133), C (0.2133)

Step 5 – Input: C

	A	B	C
A	0.2986	0.3306	0.3706
B	0.4667	0.2667	0.2667
C	0.3333	0.3333	0.3333
Default	0.3989	0.2645	0,3706

Prediction: A (0.3989), B (0.2645), C (0.3706)

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2.2 Computational complexity of the Boyer-Moore algorithm

a) Derive the computational complexity of the Boyer-Moore algorithm

2.2.1 Solution

Worst case complexity: $O(n)$. Derived in [1]

2.3 Computational complexity of the ONISI algorithm

a) Derive the computational complexity of the ONISI algorithm

2.3.1 Solution

Worst case complexity: $O(n^2)$. Derived similar to the naive analysis of the Boyer-Moore algorithm with $n = m$.

Literatur

[1] Richard Cole. Tight bounds on the complexity of the boyer-moore string matching algorithm. In *Proceedings of the second annual ACM-SIAM symposium on Discrete algorithms*, Symposium on Discrete Algorithms, pages 224 – 233, 1991.