Exploiting Anchor Text for the Navigational Web Retrieval at NTCIR-5

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WEB-7

Introduction

Taxonomy of queries on the Web

- Navigational
  - A user has a Web site in mind and requires to reach that site
  - In NTCIR-5 Navi-2 Subtask, a hypothetical user requires to find the representative pages of an item (e.g., person and product)
- Informational
  - A user searches for Web sites that provide knowledge for his/her information need

Contribution of our research

- Exploiting anchor text in Navigational Web Retrieval
  - Modeling anchor text
  - Extracting synonyms from anchor text for query expansion
- Combining different information types
  - anchor text, page content, link structure

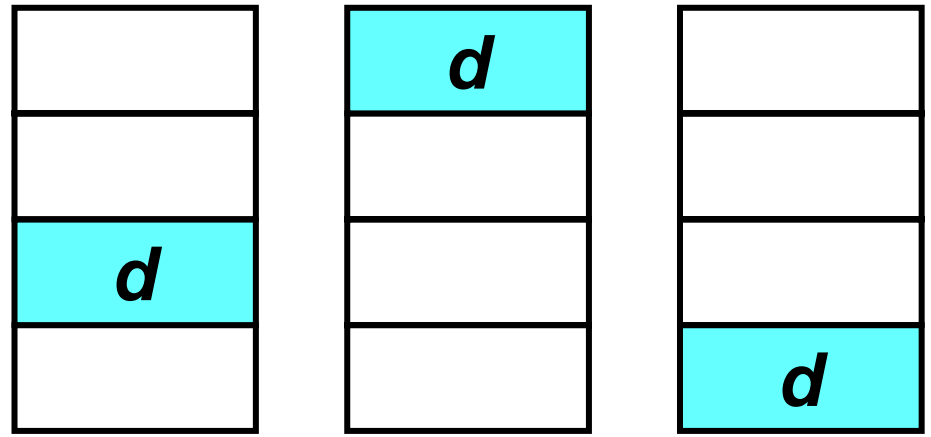
System overview

- We use different information types to compute the score (RSV) of document *d* with respect to query *q*

- Anchor text: $P(d \mid q)$
- Page content: Okapi BM25
  - Indexing with word and bi-word
- Link structure: PageRank $P(d)$
  - The probability that a user surfing on the Web reaches document *d*

Combining different scores

- Scores computed by different information types have different meanings
- The final score of *d* is determined by a weighted harmonic mean of the ranks



Final score of *d*

$$\frac{1}{\alpha \times \frac{1}{3} + \beta \times \frac{1}{1} + \gamma \times \frac{1}{4}}$$

Reality is …

- The best performance was obtained with

$$\alpha = 0.8 \quad \beta = 0.2 \quad \gamma = 0$$

Anchor Content Structure

- Anchor text was definitely effective for Navigational Web Retrieval

Modeling anchor text: Basis

- $P(d \mid q)$: probability that document d is the representative page for the item expressed by query q

$$\arg\max_d P(d \mid q) = \arg\max_d P(q \mid d) \times P(d)$$

Computation of $P(q \mid d)$ is crucial

$$\frac{\#\text{inlinks of } d}{\#\text{inlinks in collection}}$$

Computation of $P(q \mid d)$

- We assume independence of terms in q

$$P(q \mid d) = \prod_{t \in q} P(t \mid d)$$

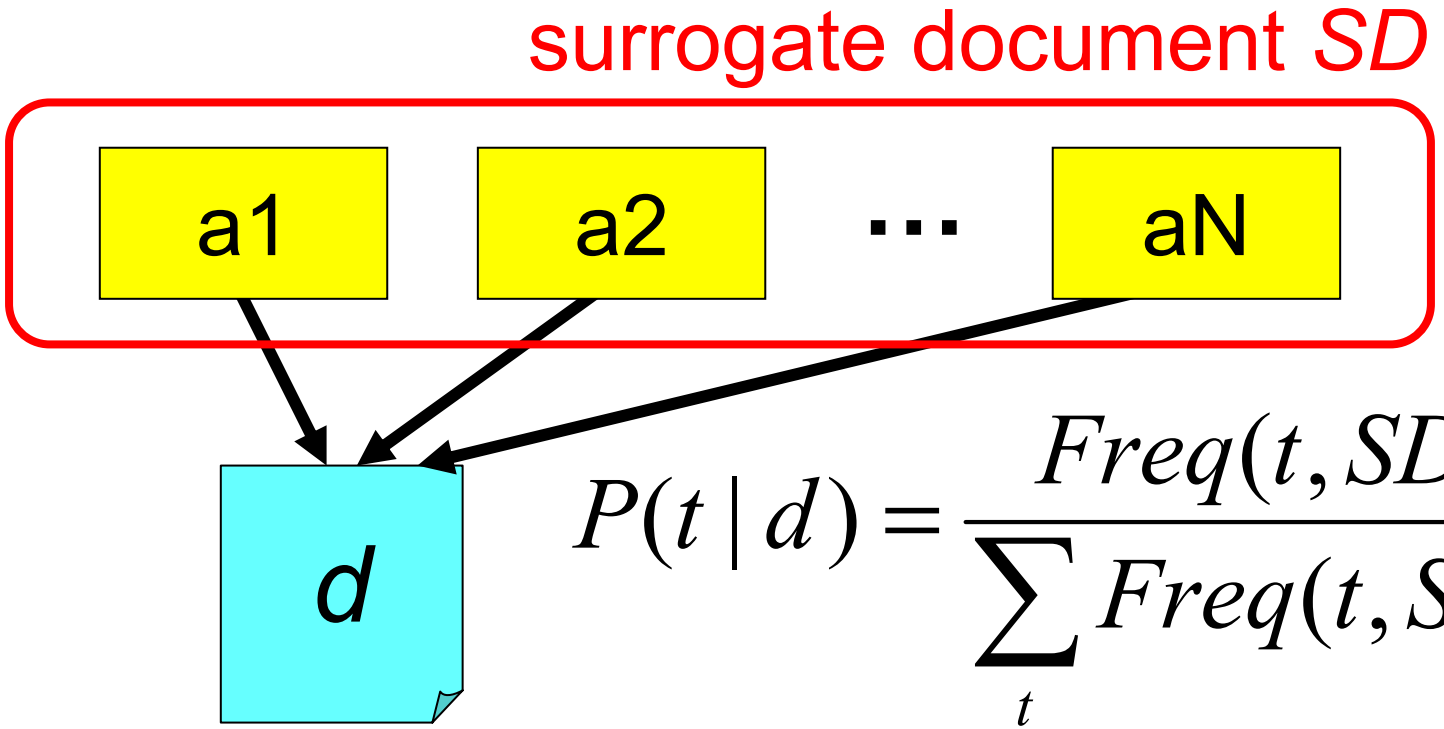
- We use $P(t)$ if term t is not modeled
- ChaSen is used to extract term t

- We compare the effectiveness of two alternative methods to model $P(t \mid d)$

First method: Document model

- Use all anchor texts linking to *d* as a single surrogate document for *d*

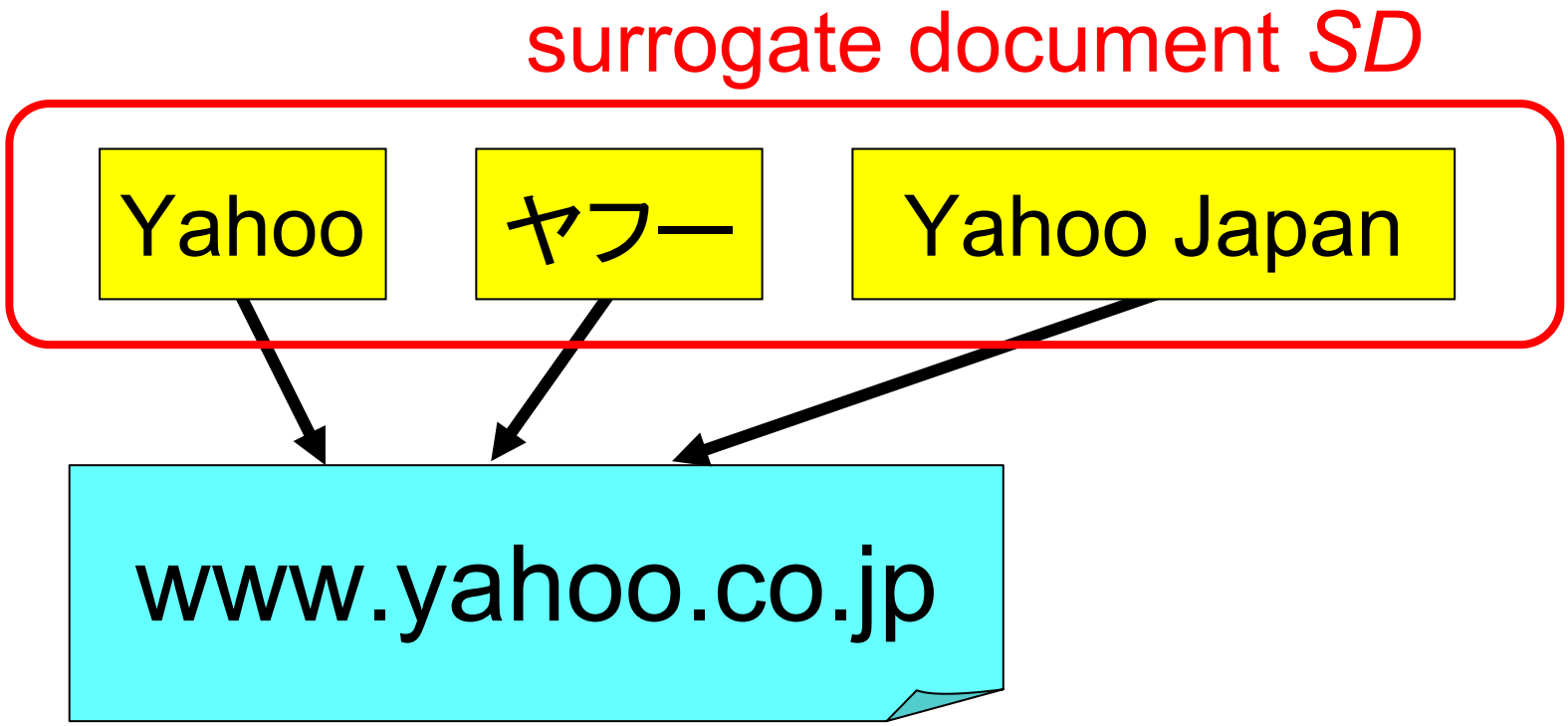
  [Westerveld et al., TREC 2001]



$$P(t \mid d) = \frac{Freq(t, SD)}{\sum_{t} Freq(t, SD)}$$

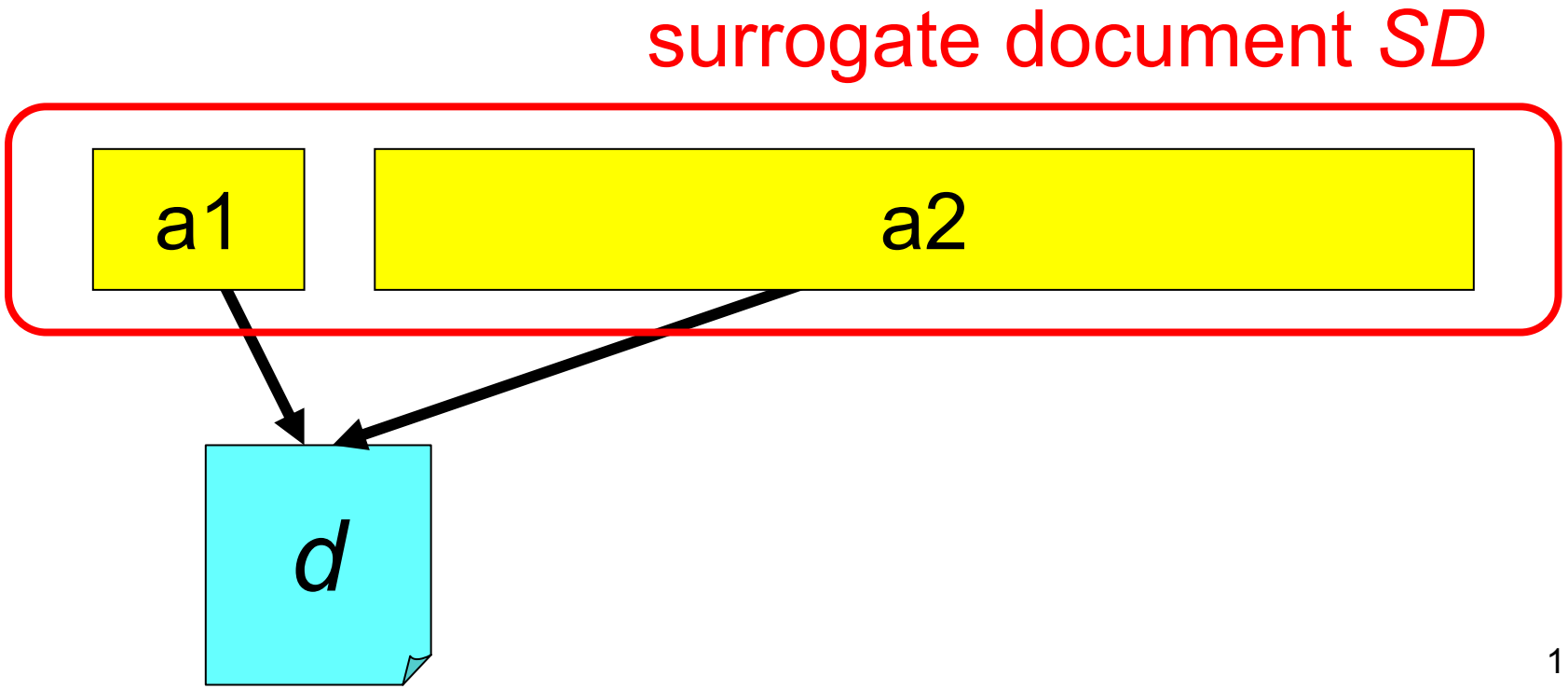
Problem of DM

- *P*(*t* | *d*) is same for ヤフー（*yafuu*） and “Japan”
- But, “Japan” is useless without “Yahoo”



Problem of DM (cont.)

- Document model is spammable
- Computation of $P(t \mid d)$ is affected by a2 significantly



Second method: Anchor model

- Use anchor texts linking to *d* independently to compute *P*(*t* | *d*)

$$P(t \mid d) = \sum_{a} P(t \mid a) \times P(a \mid d)$$

Probability of term *t* is normalized on an anchor-by-anchor basis

Query expansion in $P(t \mid d)$

- If term *t* is not modeled in our system, we use synonym term *s*

$$P(t \mid d) = P(t \mid s, d) \times P(s \mid d)$$

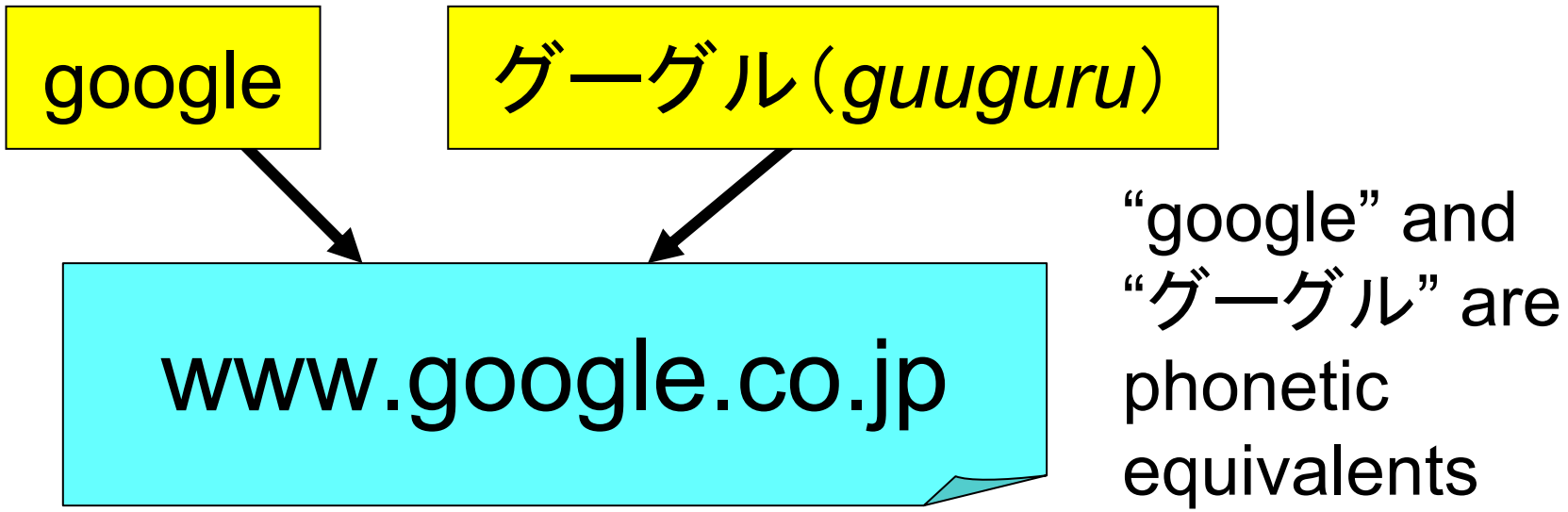
$$\approx P(t \mid s) \times P(s \mid d)$$

Probability that *s* is replaced with *t*

- We need synonym pairs to compute $P(t \mid s)$

Extracting synonym pairs

- Multiple anchor texts linking to the same document have same/similar meaning
- We extract phonetic equivalents (transliterations) from those anchor texts



Identifying phonetic equivalents

- Our transliteration method is used to determine whether two words are phonetic equivalents

  [Fujii and Ishikawa, CHUM 2001]

  google / グーグル（*guuguru*） → Yes

  google / エンジン（engine） → No

Example of query expansion

Topic ID	Source term	Expanded term
1041	UNESCO	ユネスコ
1097	エキサイト	excite
1131	ダンス	dance
	ディライト	delight
1138	トヨタ	Toyota
1172	ディレクトリ	directory

Evaluation result (TYPE=A)

	DCG-3-0	WRR-1-0
AM+Syn+C	2.522	0.605
AM+Syn	2.499	0.600
AM	2.464	0.596
DM+Syn	2.460	0.593
DM	2.431	0.590
C	0.381	0.080

Evaluation result (TYPE=AB)

	DCG-3-0	WRR-1-0
AM+Syn+C	2.203	0.529
AM+Syn	2.182	0.524
AM	2.152	0.521
DM+Syn	2.148	0.518
DM	2.124	0.516
C	0.333	0.070