

アルゴリズムとデータ構造III 5回目:11月12日

構文解析 CKY法, 動的計画法

授業資料 <http://ir.cs.yamanashi.ac.jp/~ysuzuki/algorithm3/index.html>

授業の予定(中間試験まで)

| | | |
|---|-------|------------------------------------|
| 1 | 10/01 | スタック(後置記法で書かれた式の計算) |
| 2 | 10/15 | 文脈自由文法, 構文解析, CYK法 |
| 3 | 10/22 | 構文解析 CYK法 |
| 4 | 10/29 | 構文解析 CYK法 |
| 5 | 11/12 | 構文解析 CYK法, 動的計画法 |
| 6 | 11/ | 構文解析(チャート法), グラフ(ダイクストラ法, DPマッチング) |
| 7 | 11/ | グラフ(DPマッチング, A*アルゴリズム) |
| 8 | 11/19 | グラフ(A*アルゴリズム), 前半のまとめ |
| 9 | 11/26 | 中間試験 |

10/08, 11/05の代わりに補講日は後日相談

授業の予定(中間試験以降)

| | | |
|----|-------|---|
| 10 | 12/03 | 全文検索アルゴリズム(simple search, KMP) |
| 11 | 12/10 | 全文検索アルゴリズム(BM, Aho-Corasick) |
| 12 | 12/17 | 全文検索アルゴリズム(Aho-Corasick), データ圧縮 |
| 13 | 01/07 | 暗号(黄金虫, 踊る人形) 符号化(モールス信号, Zipfの法則, ハフマン符号)テキスト圧縮 |
| 14 | 01/14 | テキスト圧縮(zip), 音声圧縮(ADPCM, MP3, CELP), 画像圧縮(JPEG) |
| 15 | 01/21 | 期末試験 |

本日のメニュー

- 構文解析
 - CYK法(続き)
- 動的計画法
 - (ダイクストラ法)

練習問題1

- CYK法を使って“I eat pizza with Nana”の構文解析結果を作成しなさい。

| | |
|--------------|---------------|
| | (1) S → N V |
| | (2) S → S PP |
| A → BC | (3) S → V N |
| | (4) V → V N |
| | (5) PP → P N |
| | (6) N → N PP |
| | (7) N → I |
| | (8) N → Nana |
| A → a (辞書規則) | (9) N → pizza |
| | (10) V → eat |
| | (11) P → with |

CYK法で構文解析

I eat pizza with Nana.

| | | | | | |
|----------|-------|---------|-----------|----------|----------|
| | 1. I | 2. eat | 3. pizza | 4. with | 5. Nana |
| 1. I | N → I | | | | |
| 2. eat | | V → eat | | | |
| 3. pizza | | | N → pizza | | |
| 4. with | | | | P → with | |
| 5. Nana | | | | | N → Nana |

| | |
|--------------|-------------|
| (1) S → N V | • N → I |
| (2) S → S PP | • N → Nana |
| (3) S → V N | • N → pizza |
| (4) V → V N | • V → eat |
| (5) PP → P N | • P → with |
| (6) N → N PP | |

CYK法で構文解析

I eat pizza with Nana.

| | 1. I | 2. eat | 3. pizza | 4. with | 5. Nana |
|----------|-------|---------|--------------------|----------|----------|
| 1. I | N → I | S → N V | | | |
| 2. eat | | V → eat | S → V N V → V N | | |
| 3. pizza | | | N → pizza | | |
| 4. with | | | | P → with | PP → P N |
| 5. Nana | | | | | N → Nana |

(1) S → N V
(2) S → S PP
(3) S → V N
(4) V → V N
(5) PP → P N
(6) N → N PP

• N → I
• N → Nana
• N → pizza
• V → eat
• P → with

CYK法で構文解析

I eat pizza with Nana.

| | 1. I | 2. eat | 3. pizza | 4. with | 5. Nana |
|----------|-------|---------|--------------------|----------|----------|
| 1. I | N → I | S → N V | S → N V | | |
| 2. eat | | V → eat | S → V N V → V N | | |
| 3. pizza | | | N → pizza | | N → N PP |
| 4. with | | | | P → with | PP → P N |
| 5. Nana | | | | | N → Nana |

(1) S → N V
(2) S → S PP
(3) S → V N
(4) V → V N
(5) PP → P N
(6) N → N PP

• N → I
• N → Nana
• N → pizza
• V → eat
• P → with

CYK法で構文解析

I eat pizza with Nana.

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|----------|-------|---------|--------------------|----------|--------------------------------|
| 1. I | N → I | S → N V | S → N V | | |
| 2. eat | | V → eat | S → V N V → V N | | S → S PP S → V N V → V N |
| 3. pizza | | | N → pizza | | N → N PP |
| 4. with | | | | P → with | PP → P N |
| 5. Nana | | | | | N → Nana |

(1) S → N V
(2) S → S PP
(3) S → V N
(4) V → V N
(5) PP → P N
(6) N → N PP

• N → I
• N → Nana
• N → pizza
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CYK法で構文解析

I eat pizza with Nana.

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|----------|-------|---------|--------------------|----------|--------------------------------|
| 1. I | N → I | S → N V | S → N V | | S → N V S → S PP |
| 2. eat | | V → eat | S → V N V → V N | | S → S PP S → V N V → V N |
| 3. pizza | | | N → pizza | | N → N PP |
| 4. with | | | | P → with | PP → P N |
| 5. Nana | | | | | N → Nana |

(1) S → N V
(2) S → S PP
(3) S → V N
(4) V → V N
(5) PP → P N
(6) N → N PP

• N → I
• N → Nana
• N → pizza
• V → eat
• P → with

CYK法で構文解析 S → N V の構文木

I eat pizza with Nana.

| | 1. I | 2. eat | 3. pizza | 4. with | 5. Nana |
|----------|-------|---------|-----------|----------|----------|
| 1. I | N → I | | | | S → N V |
| 2. eat | | V → eat | | | V → V N |
| 3. pizza | | | N → pizza | | N → N PP |
| 4. with | | | | P → with | PP → P N |
| 5. Nana | | | | | N → Nana |

(1) S → N V
(2) S → S PP
(3) S → V N
(4) V → V N
(5) PP → P N
(6) N → N PP

• N → I
• N → Nana
• N → pizza
• V → eat
• P → with

CYK法で構文解析 S → S PP の構文木

I eat pizza with Nana.

| | 1. I | 2. eat | 3. pizza | 4. with | 5. Nana |
|----------|-------|---------|-----------|----------|----------|
| 1. I | N → I | | | | S → S PP |
| 2. eat | | V → eat | | | V → V N |
| 3. pizza | | | N → pizza | | N → N PP |
| 4. with | | | | P → with | PP → P N |
| 5. Nana | | | | | N → Nana |

(1) S → N V
(2) S → S PP
(3) S → V N
(4) V → V N
(5) PP → P N
(6) N → N PP

• N → I
• N → Nana
• N → pizza
• V → eat
• P → with

