

Contents

| | | |
|----------|---|-----------|
| 1 | Introduction | 21 |
| 2 | Formal Morphology of Czech | 25 |
| 2.1 | Formal Morphology | 25 |
| 2.1.1 | Basic Notions and Notation | 25 |
| 2.1.2 | Full Morphology | 26 |
| 2.1.3 | Lemmatization | 27 |
| 2.1.4 | Tagging | 28 |
| 2.1.5 | Spelling Checking | 29 |
| 2.2 | Introduction to The Czech Tag System | 31 |
| 2.3 | The Positional Tag System for Czech | 32 |
| 2.3.1 | Format and Columns | 32 |
| 2.3.2 | Description of the Values of the Categories | 34 |
| 2.3.3 | Co-occurrence Tables | 35 |
| 2.3.4 | Part of speech (POS) | 36 |
| 2.3.5 | Detailed part of speech (SUBPOS) | 43 |
| 2.3.6 | Gender (GENDER) | 66 |
| 2.3.7 | Number (NUMBER) | 69 |
| 2.3.8 | Case (CASE) | 71 |
| 2.3.9 | Possessor's gender (POSSGENDER) | 74 |
| 2.3.10 | Possessor's number (POSSNUMBER) | 76 |
| 2.3.11 | Person (PERSON) | 77 |
| 2.3.12 | Tense (TENSE) | 79 |
| 2.3.13 | Degrees of Comparison (GRADE) | 81 |
| 2.3.14 | Negation (NEGATION) | 82 |
| 2.3.15 | Voice (Active/Passive) (VOICE) | 83 |
| 2.3.16 | Reserve position 1 (RESERVE1) | 84 |

| | | |
|----------|---|------------|
| 2.3.17 | Reserve position 2 (RESERVE2) | 84 |
| 2.3.18 | Variant, register, style, colloquiality, etc. (VAR) | 85 |
| 2.3.19 | The Tag Correspondences | 88 |
| 2.4 | The Compact Tag System for Czech | 89 |
| 2.4.1 | Tag Format and “Variables” | 89 |
| 2.4.2 | Verbs | 91 |
| 2.4.3 | Nouns | 92 |
| 2.4.4 | Adjectives | 92 |
| 2.4.5 | Pronouns | 93 |
| 2.4.6 | Numerals | 95 |
| 2.4.7 | Adverbs | 96 |
| 2.4.8 | Prepositions | 96 |
| 2.4.9 | Conjunctions | 96 |
| 2.4.10 | Particles | 96 |
| 2.4.11 | Interjections | 97 |
| 2.4.12 | Other | 97 |
| 3 | The Paradigm System | 99 |
| 3.1 | The Paradigm Field | 101 |
| 3.2 | The Negation Field | 102 |
| 3.3 | The List of Endings | 102 |
| 3.3.1 | The Ending String | 103 |
| 3.3.2 | The Superlative Field | 103 |
| 3.3.3 | The List of Tags | 104 |
| 3.4 | Paradigm Names | 104 |
| 4 | The Morphological Dictionary | 111 |
| 4.1 | The Root Field | 114 |
| 4.2 | The Paradigm Field | 115 |
| 4.3 | The Lemma Field | 116 |
| 4.4 | The Tag Field | 117 |
| 4.5 | The Comment Field | 117 |
| 4.5.1 | The Derivation Info Field | 118 |
| 4.5.2 | The Comment Field | 118 |
| 4.6 | The Alternate Part of Speech Field | 119 |
| 4.7 | The Style Field | 120 |
| 4.8 | The Term Field | 121 |

| | | |
|----------|--|------------|
| 5 | Analysis and Generation of Word Forms | 123 |
| 5.1 | Direct Analysis and Generation | 124 |
| 5.2 | The Data | 127 |
| 5.2.1 | The Ending Record | 129 |
| 5.2.2 | The Root Record | 130 |
| 5.3 | The Analysis Algorithm | 132 |
| 5.3.1 | Data Structures | 133 |
| 5.3.2 | Algorithm A1 (the main “wrapper” algorithm) | 134 |
| 5.3.3 | Algorithm A2 (capitalization) | 136 |
| 5.3.4 | Algorithm A3 (prefixing) | 138 |
| 5.3.5 | Algorithm A4 (token analysis proper) | 140 |
| 5.4 | The Generation Algorithm | 143 |
| 5.4.1 | Data Structures | 145 |
| 5.4.2 | Algorithm G1 (tag template precedence) | 147 |
| 5.4.3 | Algorithm G2 (tag template processing) | 149 |
| 5.4.4 | Algorithm G3 (word form production) | 151 |
| 5.5 | Other Algorithms | 153 |
| 6 | Morphological Disambiguation (Tagging) | 155 |
| 6.1 | Tagging – a step aside? | 155 |
| 6.2 | Orthogonality of Morphological Categories | 156 |
| 6.2.1 | The Morphological Analyzer Used in the Tagging Experiments | 157 |
| 6.3 | The Training Data | 158 |
| 6.4 | The Model | 160 |
| 6.5 | Training | 164 |
| 6.5.1 | Feature Weights | 164 |
| 6.5.2 | Feature Selection | 164 |
| 6.6 | Results | 167 |
| 6.7 | Tagging Other Languages Using Scarce Resources | 171 |
| 6.7.1 | Full Morphological Tagging | 171 |
| 6.7.2 | The Languages Used and The Training Data | 172 |
| 6.7.3 | The Methodology | 173 |
| 6.7.4 | The Results | 176 |
| 6.7.5 | The Differences Among Languages | 182 |
| 6.7.6 | Comparison to Previous Results | 182 |
| 6.7.7 | Dictionary vs. Training Data | 183 |
| 6.7.8 | Future Work | 184 |
| 6.7.9 | Special Acknowledgements | 184 |

| | | |
|----------|--|------------|
| 6.8 | Conclusion and Further Research | 185 |
| 6.9 | Lemmatization and Word Sense Disambiguation | 186 |
| 7 | Resources & References | 189 |
| A | Czech Morphological Data | 197 |
| A.1 | Positional Tags – Quick Reference | 198 |
| A.1.1 | Category 1: POS | 198 |
| A.1.2 | Category 2: SUBPOS | 198 |
| A.1.3 | Category 3: GENDER | 202 |
| A.1.4 | Category 4: NUMBER | 202 |
| A.1.5 | Category 5: CASE | 202 |
| A.1.6 | Category 6: POSSGENDER | 203 |
| A.1.7 | Category 7: POSSNUMBER | 203 |
| A.1.8 | Category 8: PERSON | 203 |
| A.1.9 | Category 9: TENSE | 203 |
| A.1.10 | Category 10: GRADE | 203 |
| A.1.11 | Category 11: NEGATION | 204 |
| A.1.12 | Category 12: VOICE | 204 |
| A.1.13 | Category 13: RESERVE1 | 204 |
| A.1.14 | Category 14: RESERVE2 | 204 |
| A.1.15 | Category 15: VAR | 204 |
| A.2 | The Endings | 205 |
| A.2.1 | Table Format | 205 |
| A.2.2 | Summary of Signs, Abbreviations, and Headings in the Ending Table | 208 |