

German morphology - assessment

Lothar Lemnitzer, Petra Steiner

15. Dezember 1994

Inhaltsverzeichnis

1	Purpose	3
2	Nominal inflection	3
2.1	Concatenation	4
2.1.1	inflectional endings	4
2.1.2	Stem changes by "Umlautung"	6
2.1.3	stem alternation or suppletive stems	6
2.1.4	defective paradigms	7
2.1.5	Features for nominal inflection	7
3	Inflection of verbs	8
3.1	The regular pattern	8
3.1.1	the regular inflectional paradigm	9
3.2	Irregular patterns	10
3.2.1	Stem changes - Ablaut	11
3.2.2	Irregular past tense and past perfect	11
3.2.3	other changes of the inflectional endings and the stem	12
3.2.4	Change of inflectional endings	13
4	Inflection of adjectives	13
4.1	The regular pattern	13
4.2	graduation	15
4.3	schwa-deletion	15
4.4	stem changes	15
4.5	Nouns derived from adjectives	16
5	Inflection of few minor classes	16
5.1	adverbs	16
5.2	attributively used pronouns	16
5.2.1	personal pronouns	17

5.3	interrogative pronouns	17
5.4	demonstrative pronoun	17
5.5	indefinite article and possessive pronouns and indefinite pro- nouns	17
6	Literature	18

WP53: Morphology Rules, Assessment Report

Dear Susan, dear members of WP5,
please find enclosed our overview about the problems of German morphology. There are a lot more features in German inflection than in any other language of our project. It is a realistical estimation that writing the morphology rules will be feasible within about 8 months (nouns: 2, verbs: 3, adjectives and rest: 2). mmorph is suitable to do this in a very efficient and clear way, especially when the possibility of grammatical conditions with consequences in spelling will be considered in the next modification of the morphology tools.

1 Purpose

This is a description of the phenomena of, mainly, inflectional morphology of German nouns, verbs, adjectives and a few minor classes.

In addition, some effort is taken to state some of the principles which guide the changes which a base form undergoes in inflection.

This report shall help to define the task of capturing the attributes of German inflection in the rule - like framework adopted in the MULTTEXT project.

Note: German special characters have to be mentioned very often in this report. In order to keep this report readable and printable in a non-German environment, I will use the following references to escape the character display problem

- a-umlaut, o-umlaut, u-umlaut, A-umlaut, O-umlaut, U-umlaut
- eszett for the old ligature character also referred to as ðharp sin the literature
- the voiceless ϵ will be referred to as schwa

2 Nominal inflection

The following changes which the base form undergoes in the process of inflection have to be taken into account:

1. concatenation of an inflectional endings
2. change of the main vowel of the stem (“Stammumlaut”) and “ß”-alternation
3. stem changes of loan words which cannot be treated within the framework of German inflection but have to be stated separately
4. defective or incomplete paradigms

2.1 Concatenation

We distinguish the singular and the plural **number** and within each the four **cases** nominative, genitive, dative and accusative.

This leads to the following paradigm table:

	singular	plural
nominative	ns	np
genitive	gs	gp
dative	ds	dp
accusative	as	ap

The codes in the cells of this table will be used to refer to the respective paradigm places.

2.1.1 inflectional endings

The most frequently used inflectional endings are

- -, the zero ending
- *es*, nearly exclusively for *gs*
- *e*
- *s*, popular for foreign, in particular English loan words
- *er*, for some plural forms
- *en*, mainly for the plural
- *n*,

If *er* or *e* form a plural ending, an *n* is concatenated to form the *dp*. Depending of the phonological shape of the stem’s ending, the *e*

- is obligatory. This is the case if

- the consonant following the *e* is *s* and the stem ends with an alveolar-predorsal dental phoneme (/s/ or /z/) e.g.: der Reiz, des Reizes, die Reize, or the stem
- the consonant following the *e* is *n* and the stem does not end in a vowel or one of the consonants *l* or *n*; e.g.: der Mast - die Masten; das Rad - die Räder,
- is optional. This is the case if
 - the consonant following the *e* is *s* and the stem does not end in either /s/ or /z/ or /l/ or /r/; e.g.: der Rat-des Rat(e)s
- is blocked. This is the case
 - the consonant following the *e* is *s* or *n*, and the stem ends in /l/ or /r/; e.g.: das Rudel-des Rudels, die Mutter-die Mütter

There are however ending paradigms which do not fit this schema for some subsets subgroups of the German noun vocabulary:

- With *Bau* and all composita ending with *-bau*, a *t* is inserted between the stem and the inflectional ending in the plural; der Bau-die Bauten
- With a few loan words, an *i* is inserted between the stem and the ending in the plural; e.g. Privileg - Privilegien. The *i* is a residual of the "original" inflectional class.
- with another, even larger group of loanwords, all inflected forms without the nominative singular receive an *s* as inflectional ending. This holds in particular for English loan words, Park, Disco, Freak
- With "feminised" nouns ending in "in", an *n* is inserted between the stem and the inflectional ending in the plural (Lehrerin-die Lehrerinnen; but compare: Adenosin-Adenosine)

Where the inflectional ending for the genitive singular contains an *e*, the dative singular might also, but optionally, take an *e* as inflectional ending. This results in two alternative dative singular forms - e.g. dem Wald und dem Walde; the latter is stylistically marked as formal or even poetic, but it does occur in newspaper texts.

Furthermore, there is a group of nouns derived from adjectives, which still behave inflectionally like the underlying adjective. Their inflectional behavior is therefore described in the adjective section. Let us just state here that this pattern of derivation is highly productive.

2.1.2 Stem changes by "Umlautung"

Nouns which are able to do so may undergo a change of the stem's main vowel in the plural.

This may occur with

- nouns with *a*, *o* or *u* as main vowel
- nouns with the stem diphthong *au*, which then changes to <aumlaut>u

There is no rule or morphophonological regularity by which the Umlautung of the main vowel can be predicted. Compare:

- Glocke - Glocken with Topf - Töpfe
- Klasse - Klassen with Ast - Äste
- Mutter - Muttern with Mutter - Mütter

Therefore this stem change has to be stated in the lexicon. A feature [+/-umlaut] suffices. From this information it is always clear which vowel of the stem is subject to change.

With noun stems ending in an eszett, this grapheme is changed to double-s, if the vowel preceding the eszett is short.

Otherwise the stem ending remains unchanged: compare Fluß-Flüsse with Fuß-Füße

2.1.3 stem alternation or suppletive stems

In a couple of cases loanwords from ancient Greek and Latin or from contemporary foreign languages do not fit the German inflectional patterns at all.

Either the stem changes in a way which is not covered in the previous section (e.g. Index-Indizes, Targui-Tuareg) or there are inflectional endings which do not fit the scheme outlined above (Skonto-Skonti, Lew-Lewa, Bolshewik-Bolshewiki).

To cover the second case one could deliberate about opening new inflection classes, in particular with "productive" processes of borrowing from contemporary languages (as in the -o/-i change found in Italian words).

However, we decided not to do so, following the strategy of keeping the class system small and manageable. We intend to treat all these cases lexically by adding the plural stem as "alternate stem", which takes no inflectional ending.

2.1.4 defective paradigms

For a couple of nouns no singular (z.B. die Kosten) or no plural (z.B. Gerede) is applicable. We mark the resp. forms of the paradigm as not applicable, in contrast to paradigmatic forms which are possible, but where no ending is added to the base form.

2.1.5 Features for nominal inflection

Taking all this into account, we arrive at the following feature structure for a noun entry:

```
GRAPH-FORM: graph_form
POS: noun
(morphological features of nouns)
GENDER: m | f | n | n.a. | mf | mfn
ENDING_CLASS: number
UMLAUT: Yes / No
ALT_STEM: graph_form
\newline
ENDING_CLASSES
  CLASS\#: number
  N_SG: graph_form | n.a.
  G_SG: graph_form | n.a.
  D_SG: graph_form | n.a.
  A_SG: graph_form | n.a.
  N_PL: graph_form | n.a.
  G_PL: graph_form | n.a.
  D_PL: graph_form | n.a.
  A_PL: graph_form | n.a.
\newline
(n.a. = not applicable)
```

As input for the morphological analysis tool, we clearly need to formalize the interaction between features of the stem ending phoneme and the form of the inflectional ending, in particular the insertion or deletion of the schwa.

At present we see no possibility to handle stem vowel change of even stem alternation within a rule based approach.

These features have to be stated in the lexicon.

3 Inflection of verbs

3.1 The regular pattern

We distinguish three personal perspectives- first second and third - in two numbers - singular and plural. This leads to six paradigmatic forms for each temporal level.

This leads to the following paradigm table:

	singular	plural
1. person	1s	1p
2. person	2s	2p
3. person	3s	3p

The codes in the cells of this table will be used to refer to the respective paradigm places.

Concerning the tenses, we distinguish the present and the past tense, for both the indicative and the subjunctive mood, and the indicative mood of the future tense.

	Indicative	Subjunctive
present tense	PrI	PrS
past tense	PaI	PaS

Concerning aspect, we have to add the perfect, in both present and past tense.

	Indicative	Subjunctive	Perfect
present tense	PrI	PrS	PrP
past tense	PaI	PaS	PaP

There is a tendency in the contemporary use of German:

- to replace the past tense by the present perfect
- to replace the future tense by the present tense, marking the future tense adverbially
- to replace the synthetic forms of the subjunctive by analytic forms, constructed by the subjunctive form of "werden" and the infinitive form of the main verb

Some of the "correct" subjunctive forms, in particular those of the irregular verbs, sound strange even to the native speaker, mainly because they are used very infrequently. Unfortunately, there is even little support from corpora, because those forms are very rare even in journalese.

Nevertheless one has to be prepared to handle these forms. The capability to detect, analyse and generate them has to be provided.

Some of the temporal paradigms are constructed by combining the respective inflected form of the auxiliary (”sein”, ”haben” or ”werden”) with one of the infinitive forms of the main verbs. This holds for the perfective paradigms and the future tense. We are not concerned with these paradigms here but only with the synthetic forms of the verbal paradigm.

Additionally, we need to handle three infinitive forms:

- the present infinitive, which is used as the entry head of verbal lexical units (e.g. ”machen”)
- the past participle (”gemacht”)
- the gerund form (”zu machen”)

3.1.1 the regular inflectional paradigm

The personal endings of the verbal classes form a rather regular pattern:

The present indicative

	singular	plural
1. person	-e	-en
2. person	-st	-t
3. person	-e	-en

Exception(s):

- With stems ending in one of the phonemes /s/ or /z/, the second person singular ending is different: the *s* of the ending is deleted

Indicative present regular paradigm - examples

	singular	plural
1. person	mache/reize	machen/reizen
2. person	machst/reizt	macht/reizt
3. person	macht/reizt	machen/reizen

The present subjunctive

	singular	plural
1. person	-e	-en
2. person	-est	-et
3. person	-e	-en

The past indicative and subjunctive

In the past tense, a *t* is inserted between the stem and the personal ending. This leads to the following regular paradigm(s):

	singular	plural
1. person	-t-e	-t-en
2. person	-t-est	-t-et
3. person	-t-e	-t-en

Note:

- The *t*-insertion the insertion of an *ë* for the second person singular and plural in order to prevent the collision of two *t* or the hard transition from *t* to *s*.
- as in the subjunctive of the present, the first and third person singular endings are identical
- indicative and subjunctive mood are identical in the past tense

Infinite forms and imperative

The infinitive present is identical with the canonical form of a verb entry, e.g. *machen*

The present participle is formed by adding an *-end* to the verbal stem: *mach-end*

The past participle is formed by prefixing *ge-* to the stem and appending the past-marking *t*: *ge-mach-t*

The imperative singular is identical with the 1s of the present indicative: *mache*

The imperative plural is identical with the 2p of the present indicative: *macht*

3.2 Irregular patterns

Around 200 basic verbs in German form irregular inflectional patterns. The irregular verbs can be described as differing in some respects from the regular pattern:

- the main vowel of the stem changes one or several times (Ablaut)
- the past and past participle are formed irregularly

- stem changes other than the Ablaut take place
- some of the inflectional endings are different or missing

Irregular verbs are different from the regular ones in one or more of these features, which will be described separately now. Stem changes - Ablaut

3.2.1 Stem changes - Ablaut

For around 200 verbs which form the core of the verbal system which are inherited from elder states of the Germanic languages, an extensive stem vowel change takes place which is called *Äblaut* in German linguistics.

Though these verbs form a closed set of verbal base forms, which has not been extended for a long period. it is not possible to fully cover the phenomenon in the lexicon, since these verbal base forms still take part in derivational processes.

A morphological analyser has to strip these derivational elements and input the base form to the rule system which handles the Ablaut-phenomena.

The vowel change applies to:

- 2s and 3s present indicative (helfen → hilfst, hilft)
- 1the whole past tense indicative paradigm (helfen → half)
- the whole past tense subjunctive paradigm (helfen → hülfe)
- the past participle (helfen - geholfen)

The vowel change is by no means predictable and thus has to be handled lexically, e.g. by the addition of alternate stems to the base stem.

For some verbs both the regular and the irregular paradigma are in use, in some cases coupled with a change in meaning (backen - backte/buk, without change in meaning; hängen - hängte/hing, hauen - haute/hieb with a different meanings)

3.2.2 Irregular past tense and past perfect

Some, but not all regular verbs do not take the *t* als past tense marker of the inflectional ending. Compare *machen-ich mach-t-e* to *werden-ich wurd-e*.

From that it follows that the form of the past tense ending is not functionally dependent on the Ablaut, nor the other way round (compare *bringen - ich brach-t-e* to the examples above).

In the irregular pattern then:

- the past tense is formed without the *t*
- as a consequence, it is not necessary to have an *e* inserted between the stem and the 2s and 2p endings
- the past perfect is formed by adding a *ge-* prefix and *-en* as suffix (helfen - ge-holf-en)

3.2.3 other changes of the inflectional endings and the stem

Schwa-deletion takes place

- for a few, but not all base forms ending with *d*; e.g. *wenden-wandte*, *senden-sandte*, but *versanden-versandete*.
- if the stem ends in *el* or *er*, for all inflected form which end with an *e* (versichern - versichre; verdunkeln - verdunkle)

A schwa is inserted

- between the stem and the past tense ending, if the stem ends in /m/ or /n/ phoneme and the preceding phoneme is neither a vowel nor an /h/, an /l/ nor an /r/; e.g. *rechnen-> rechn-e-t-en*, but *ahnen-> ahn-t-en*

eszett-ss-alternation

if a /s/ or a /z/ is the last phoneme of the verb, and the preceding one is a long vowel, then

- if the inflectional ending starts with a vowel, the phoneme is represented as double-s (e.g. *wiss-en*)
- if the inflectional ending starts with a consonant, or there is no ending at all, the phoneme is represented as eszett (e.g. *wußte*, *gewußt*)

cononant doubling

Consonants are sometimes doubled to indicate that the preceding vowel is a short one, e.g. *kommen->kam*

Further stem changes

Verbs ending with a schwa followed by a /l/ or /r/ loose

- the schwa of the stem for all inflectional forms ending with a schwa (i.e. 1s present indicative, 1s and 3s present subjunctive)
- the schwa of the ending for the 1p and 3p of the present indicative and subjunctive and the infinitive present and the present participle (*kichern->ich kichre*, *er kichre*; *wir/sie kichern*, *kichernd*)

In some cases the *ng* is changed to *ch* in the past and past perfect, but not in all cases (*denken*->*dach-t-e*, *bringen*->*brach-t-e*, but *bedingen*->*bedingte*)

Other stem changes do not lend themselves easily to any generalization. Therefore we propose to treat these changes lexically, by adding alternate stem information to the respective paradigms

3.2.4 Change of inflectional endings

Most of the changes which apply to inflectional endings are due to the phonetic form of the stem ending, as

- schwa-insertion with stems ending in /s/ or /z/ and the ending beginning with an /s/
- schwa-insertion with stems ending in /d/ or /t/ and the inflectional ending beginning with /s/ or /t/ (*reden*->*red-est*)

Besides this, there is a general loss of the inflectional ending for 1s and 3s if the past tense is formed irregularly (*sitzen*->*ich saß, er saß*).

4 Inflection of adjectives

4.1 The regular pattern

The adjective, which in its attributive use in noun phrases agrees with the following noun in gender, number and case is consequently specified for these three features. Furthermore we distinguish three declension classes which are functional dependent of the position of the attributive adjective in the noun phrase.

Therefore, we distinguish the following paradigms:

”weak” declension - adjective follows the definite article

	masculine	neuter	feminine
nominative sing	groß-e	groß-e	groß-e
genitive sing	groß-en	groß-en	groß-en
dative sing	groß-en	groß-en	groß-en
accusative sing	groß-en	groß-e	groß-e
nominative plur	groß-en	groß-en	groß-en
genitive plur	groß-en	groß-en	groß-en
dative plur	groß-en	groß-en	groß-en
accusative plur	groß-en	groß-en	groß-en

”strong” declension - adjective follows the zero article

	masculine	neuter	feminine
nominative sing	groß-er	groß-es	groß-e
genitive sing	groß-en	groß-en	groß-er
dative sing	groß-em	groß-em	groß-er
accusative sing	groß-en	groß-es	groß-e
nominative plur	groß-e	groß-e	groß-e
genitive plur	groß-er	groß-er	groß-er
dative plur	groß-en	groß-en	groß-en
accusative plur	groß-e	groß-e	groß-e

”mixed” declension - adjective follows a personal pronoun

	masculine	neuter	feminine
nominative sing	groß-er	groß-es	groß-e
genitive sing	groß-en	groß-en	groß-en
dative sing	groß-en	groß-en	groß-en
accusative sing	groß-en	groß-es	groß-e
nominative plur	groß-en	groß-en	groß-en
genitive plur	groß-en	groß-en	groß-en
dative plur	groß-en	groß-en	groß-en
accusative plur	groß-en	groß-en	groß-en

Seen from the point of view of the inflectional ending, one can state that all inflected forms are result of appending one of the following endings to the stem:

-e, -em, -en, er, -es

Adjectives are never inflected when used predicatively or adverbial or as apposition following the nominal head.

Die Tomate ist groß

Er trumpfte groß auf

Die Gefahr, groß und unmittelbar,

The following changes which the base form undergoes in the process of inflection have to be taken into account: 1 Type of inflection 2 Schwa-deletion and eszett-ss-alternation 3 graduation of adjectives

4.2 graduation

Most adjective base forms can be graduated to form the comparative and the superlative. This effect can be reached by:

- word formation: a comparative or superlative marking formative is inserted between the stem and the inflectional ending
- particles: the particle *mehr* marks the comparative (eine ihn mehr befriedigende Tätigkeit), *am meisten* marks the superlative (das am meisten besuchte Museum).
- compounding: some compounds fulfill the role of the superlative adjectives (e.g. *nagelneu*, *blutjung*)

Of these possibilities, only the first which affects the adjective stem directly is of relevance here:

- an *-er-* formative is inserted between stem and inflectional ending to mark the comparative
- an *-st* formative is inserted between stem and inflectional ending to mark the superlative

The same morphophonological rules hold for the *-st-* insertion as they do for the *-st* ending of verbs. These are therefore not repeated.

4.3 schwa-deletion

For adjectives ending with *-abel* *-ibel*, *-el* and for some ending with *-er* or *-en*, mainly foreign words, the schwa is deleted: e.g. *dunkel*->*dunkle*, *sensibel*->*sensible*, *integer*->*integre*, *teuer*->*teure*; but: *eisern*->*eiserne*

4.4 stem changes

For some adjectives with an unlautable vowel, the stem changes in this respect for the comparative and the superlative forms (e.g. *alt*->*älter*, *ältester*;

jung->jünger,jüngste)

A stem ending eszett may change to double-s to indicate that the vowel is a short one (e.g. naß->nasser,nässer)

A few adjectives take suppletive stems for the comparative and the superlative mode (gut-besser-beste). This phenomenon has to be treated lexically. A borderline case is the stem change for the adjective *hoch* (höher, höchste). For this case being the only one of its kind, we suggest to treat it lexically, too.

4.5 Nouns derived from adjectives

Nouns which are derived from adjectives by a rather productive process of conversion also inherit the full inflectional paradigm of these adjectives.

That is to say that constraints on the form paradigm of the adjective are also valid for the derived noun. Additionally, for a large group of nouns only the masculine and the feminine form are possible (in particular for agentive nouns, e.g. der/die Angestellte). These restrictions have to be stated lexically.

5 Inflection of few minor classes

5.1 adverbs

A few adverbs undergo the process of graduation. The same rules hold as for the adjectives. As adverbs they are not further specified for gender, number and case

5.2 attributively used pronouns

Some pronouns can be used attributively,i.e. as determining the nominal had. This accounts for the subgroups of the possessive pronouns, the indefinite pronouns and the interrogative pronouns. In addition, the personal pronouns are inflectable

5.2.1 personal pronouns

The inflectional forms of the personal pronoun, which mark the respective cases, should be treated lexically als suppletive forms of these pronouns e.g. *ich – meiner – mich – mir*

5.3 interrogative pronouns

The inflectional forms of the interrogative pronouns *was* and *wer* should be treated as suppletive forms.

The interrogative pronoun *welcher* takes the strong inflectional paradigm of the adjectives

5.4 demonstrative pronoun

The demonstrative pronoun is inflected according to the strong inflectional paradigm of the adjectives, with a few exception.

	masculine	neuter	feminine
nominative sing	dies-er	dies-es	dies-e
genitive sing	dies-en	dies-en	dies-er
dative sing	dies-em	dies-em	dies-er
accusative sing	dies-en	dies-es	dies-e
nominative plur	dies-e	dies-e	dies-e
genitive plur	dies-er	dies-er	dies-er
dative plur	dies-en	dies-en	dies-en
accusative plur	dies-e	dies-e	dies-e

The demonstrative pronouns *derjenige* and *derselbe* behave somewhat different:

- The article part of them changes according to the resp. gender
- The ending paradigms deviate slightly from the paradigm cited above.

5.5 indefinite article and possessive pronouns and indefinite pronouns

These three groups can be treated uniformly, as they all form the following paradigm

	masculine	neuter	feminine
nominative sing	mein-	mein-	mein-e
genitive sing	mein-es	mein-es	mein-er
dative sing	mein-em	mein-em	mein-er
accusative sing	mein-en	mein-	mein-e
nominative plur	mein-e	mein-e	mein-e
genitive plur	mein-er	mein-er	mein-er
dative plur	mein-en	mein-en	mein-en
accusative plur	mein-e	mein-e	mein-e

Note that the plural forms are not applicable to the indefinite article and to indefinite pronouns which refer to individuals only (e.g. irgendein)

6 Literature

Gerhard Helbig, Joachim Buscha; Deutsche Grammatik für den Ausländerunterricht. Leipzig 1987 (10. Auflage)

Drosdowski et al.: Duden Grammatik. Mannheim et al. 1984 (4. Auflage)

Robering, Klaus: Unifikation und Merkmalsvererbung in der deutschen Substantivflexion. In: ZfS 8(1989)1, S. 89-132

G. Marcus et al.: German Inflection: The Exception that Proves the Rule. Arbeiten des Sonderforschungsbereichs 282 - Theorie des Lexikons Nr. 40

Charles V.J. Russ: Die Pluralbildung im Deutschen. In: Henne/Oksaar (TITEL) (= ZGL 1989) S. 58-67

Siewert / Kloeke: Deutsche Phonologie und Morphologie. Merkmale und Markiertheit. Leiden 1981, S. 211-216

Akio Ogawa: Überlegungen zum syntaktischen Status einiger Verbpräfixe. In: Wirkendes Wort 38(1998) S. 439-456

Susan Olsen: Das Substantivierte Adjektiv im Deutschen und Englischen: Attribuierung vs. syntaktische Substantivierung"

Günther Görz, Dietrich Paulus: A finite state approach to German Verb

Morphology. In Proc. COLING 88, S. 212-215

Köpcke, K.-M.: Schemas in German Plural Formation. In: *Lingua* 74: 303-335

Wiese, R.: Schwa and the structure of words in German. In: *Linguistics* 24(1986) S. 695-724

Wiese, R.: Phonologie und Morphologie des Umlauts im Deutschen. *ZfS* 6(1987), S. 227-248