

A Typology of Assimilations

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The paper is focused on a systematic classification of assimilatory processes found in connected speech. It gives a complex typology of assimilations based on 17 different analytical perspectives yielding almost 60 different assimilation types. In addition to offering a detailed catalogue of assimilation processes occurring in connected speech, the typology may also be used as a tool for analyzing and comparing in a systematic way any connected-speech phenomenon of any language.

Keywords: typology, assimilation, coarticulation, feature spreading, coproduction

1. Introduction

This paper is concerned with the categorization of different kinds of assimilation occurring in natural connected speech. It reviews currently available data on assimilation types in phonetic literature, and, at the same time, describes several specific types of assimilation not discussed anywhere else. Although there exist a number of different classifications of assimilations by various authors (Bronstein 1960: 207–217; Hála 1962: 362–374; Abercrombie 1967: 133–139; Jones 1972: 217–229; Král' and Sabol 1989: 150–152; Palek 1989: 97–100; Gimson and Cruttenden 1994: 254–260; Palková 1994: 143–147; Laver 1994, 376–384; *inter alia*), these are usually presented as simplified accounts of miscellaneous assimilatory processes serving mostly practical (teaching) purposes. Such accounts are valuable in that they give us a glimpse into the complexities of natural speech processes, but they cannot be considered to be exhaustive. The aim of this paper is to offer a more complex picture of assimilations as we understand them today.

The central problem occurring in most typologies of assimilations proposed so far is that they are based on a mixture of analytical perspectives. That is, in the process of assimilation analysis, different and often incompatible perspectives are not distinguished and separated sufficiently, which leads to inconsistencies in typological classifications. However, as indicated before, such accounts are not intended to serve as exhaustive descriptions of assimilation, so this practical simplification is natural. The typology worked out in this paper aims to be more precise and more specific, and it is based on a number of diverse, but separately considered, analytical perspectives.

2. Definition of assimilation

Before we proceed to the description of the individual types of assimilation, it is necessary to determine what assimilation is and how it can be defined. The term assimilation usually refers to contextual variability of speech sounds, which is said to be caused by the influence of one sound upon another. It is often defined as a process of replacing one sound (or changing some properties of a sound) under the influence of another sound which occurs near to it. It has also been characterized as an adjustment of speech sounds to their environment (cf. Malmberg 1963: 60; Abercrombie 1967: 133–134; Jones 1972: 217–218; Král' and Sabol 1989: 150; Farnetani 1999: 376; Roca and Johnson 1999: 34; Odden 2005: 57; *inter alia*). In

addition to this term, a host of other (related) terms have appeared over the last 50 years or so, with similar or partially different meanings. Such terms include, for instance, *similitude*, *coarticulation*, *feature spreading*, *coproduction*, *gestural coordination* (*intergestural phasing*), etc. (Menzerath and Lacerda 1933; Öhman 1966, 1967; Carney and Moll 1971; Jones 1972; Benguerel and Cowan 1974; Gay 1977; Browman and Goldstein 1990, 1992; Bell-Berti and Krakow 1991; Löfqvist 1992; Ohala 1993; Fowler and Saltzman 1993, *inter alia*). Many of these terms are used interchangeably, but most of them are problematic in terms of their compatibility.

Perhaps the most controversial issue is the debate about the distinction between assimilation and coarticulation (Chomsky and Halle 1968; Daniloff and Hammarberg 1973; Hammarberg 1976, 1982; Fowler 1980; Whalen 1990; Bell-Berti and Krakow 1991; Browman and Goldstein 1992; Kohler 1992; Wood 1996; Byrd 2003; *inter alia*). This issue is also related to the debate about the difference between phonetics and phonology and the existence or non-existence of an interface between the two (Ladefoged 1988; Ohala 1990b; Keating 1996; Flemming 2001). The crux of the problem is whether a particular connected-speech phenomenon is planned before the actual physical articulation or whether it occurs only during articulation as a biomechanical result of human physiology. Those processes that are thought to be planned before articulation are often referred to as assimilations, while the ones said to occur as a result of physical properties of articulators are usually called coarticulations. The two theoretical positions mentioned above are based on the employment of different hypothetical mechanisms. Assimilations are generally based on the assumption that there is a *look-ahead mechanism* which causes all segments unspecified for a particular feature to have that feature spread from some later (or earlier) segment. This procedure has been termed *feature spreading* and it is considered to be a phonological phenomenon (cf. Kozhevnikov and Chistovich 1965; Henke 1966; Daniloff and Hammarberg 1973; Benguerel and Cowan 1974; Goldsmith 1976; Hammarberg 1976, 1982; Nolan 1982, Clements 1985). On the other hand, coarticulations are often seen as coproduction, which means that sounds (elements) or individual articulatory gestures are coproduced naturally, and no look-ahead mechanism is necessary. Put differently, the changes in the properties of sounds in connected speech are due to low-level, non-phonological, biomechanical interaction of articulators (cf. Fowler 1980; Bell-Berti and Harris 1982; Browman and Goldstein 1989, 1990, 1992, 2000; Bell-Berti and Krakow 1991; Byrd 1992, 1996, 2003; Beckman et al. 1992; Fowler and Saltzman 1993; Byrd and Saltzman 2002; Goldstein and Fowler 2003). In addition to these theoretical positions, there have also been attempts to combine the two models and try to bridge the gap between them (cf. Flemming 2001). In this paper, we will make no difference between assimilation and coarticulation, in line with many other linguists (Daniloff and Hammarberg 1973; Hammarberg 1976, 1982; Clark and Yallop 1995: 88; Ellis and Hardcastle 2002: 377), and adopt the feature spreading model (or, alternatively, the gesture spreading model) as a general all-purpose model. Note that we understand features or gestures as parameters which can be spread categorically or non-categorically (see also section 3.10). This does not mean that we deny the possible existence of a difference between planned and biomechanical processes in connected speech. Nevertheless, most processes described so far in literature as coarticulations seem to be planned and conventional (Whalen 1990; Wood, 1996; Pavlík, forthcoming), which is the characteristic feature of assimilations. At the same time, a particular assimilation may be categorical in one language but gradual in another, i.e. the same phenomenon is treated differently in different languages (the problem lies in the very definition of the term categorical).

In the course of the succeeding sections, we will operate with the following definition of assimilation: Assimilation/coarticulation is the process of spreading (copying) a feature or gesture of a segment, whether categorically or non-categorically, to another segment or segments in natural connected speech.

The notion of assimilation presupposes the existence of at least two segments (phonemes/allophones), which, by influencing each other, change their phonetic properties. We may distinguish between the segment which is being assimilated – the **assimilee**, the segment which assimilates another segment (transfers some features to it) – the **assimilator**, and the segment resulting from the assimilation, i.e. the assimilee after the assimilation, which we will name, for want of a better term, the **assimilant**. For example, in the phrase *ten cups* [t^hɛŋ'k^hɛps], the segment [k] is the assimilator, the segment [n] is the assimilee, whereas the segment [ŋ] is the assimilant. However, it should be pointed out that this is necessarily a simplification of reality, because numerous studies (Öhman 1966; MacNeilage and DeClerk 1968; Gay 1977; *inter alia*) have shown that, in general, most neighbouring segments influence each other reciprocally. In other words, segments usually contain information about the preceding and the following segments, and they themselves influence the neighbouring segments – there is temporal overlap of segments and gestures (Ali et al. 1971: 540; Remington 1977: 1279; Repp 1981: 1463; Browman and Goldstein 1990, 1992; Recasens et al. 1993; Byrd and Tan 1996, *inter alia*). From a theoretical point of view, however, we can set up these categories and treat them as abstract constructs. At the same time, many of the assimilatory classifications proposed below are constructs functioning on different abstraction levels, and their usefulness and descriptive value depends on how they are approached in terms of their application. With this caveat in mind, we will specify the analytical perspectives used for the classification of assimilations. They are the following:

1. The type of the speech sound involved in assimilation
2. The -emic/-etic distinction
3. The time of origin
4. The type of systemic relation
5. The position on the syntagmatic axis
6. The degree of opacity
7. The degree of stability/fixity
8. The direction of the influence of one segment, feature, or gesture on another
9. The degree of the similarity of the assimilant to the assimilator
10. The degree to which the assimilating articulatory gestures or features are transferred to the assimilee.
11. The point at which the assimilation originates in the communication chain
12. The extent of the assimilator's influence on the syntagmatic axis
13. The distance between the assimilator and the assimilee
14. The active articulatory organ involved in speech production
15. The place of articulation
16. The manner of articulation
17. Voicing

Needless to say, the list of the analytical perspectives proposed here cannot be considered to be exhaustive, but it attempts to offer a more complex picture of assimilations than the one we can find in current phonetic and phonological literature. It should also be

noted that every particular assimilation process (and its result) can be characterized from the point of view of all these perspectives simultaneously. Examples of such complex assimilation analysis can be found in section 4.

3. Types of assimilation

In this section we give a detailed account of various types of assimilation from seventeen different analytical perspectives. All examples, unless stated otherwise, come from standard British English. For the sake of simplicity and brevity, only a small number of examples are given for every assimilation type. These examples should be considered as *possible* realizations of particular words or phrases. For example, the assimilation of [n] to [m] in the phrase *on board* serves to illustrate a particular assimilation type; it does not mean that it is the only possible realization of that phrase.

3.1 *The type of the speech sound involved in assimilation*

Depending on the type of the sounds undergoing assimilation, we may distinguish, perhaps trivially, between vocalic and consonantal assimilations (cf. Odden 2005: 228, 234). **Vocalic** (vowel) **assimilations** occur when an assimilator (whether a vowel or a consonant) exerts influence on a vocalic element. For instance, vowels followed by nasal sounds tend to be nasalized (Malécot 1960; Ushijima and Hirose 1974; Fowler and Saltzman 1993, *inter alia*). **Consonantal assimilations** are those in which the assimilee is a consonantal element, e.g. [n] may change into [ŋ] under the influence of the following [k] or [g].

3.2 *The -emic/-etic distinction*

Traditionally, assimilations may be divided into phonemic and phonetic (allophonic) (cf. Jones 1972; Gimson and Cruttenden 1994). This division is based on the -emic/-etic distinction which is reflected in various forms in several linguistic theories (cf. Saussure 1959; Pike 1972; Chomsky 1975). **Phonemic assimilations** are those processes which result in the formation of a new phoneme. For example, the change of [n] to [ŋ] in the phrase *on course* may be considered to be a case of phonemic assimilation. However, such assimilations are always limited to a particular language (or language variety), because the same assimilation in another language may result in the formation of an allophone, e.g. [ŋ] in the Slovak language is just an allophone of /n/, and never functions as a phoneme. **Allophonic assimilations** are produced when the assimilant is not a separate phoneme in a particular language or lect, e.g. the advanced [k̟] in words like *key*, *cure*, etc. may be considered to be a case of allophonic assimilation.

3.3 *The time of origin*

From the point of view of time, assimilations have been divided into historical and present contextual. A **diachronic** (historical) **assimilation** is an assimilation which has taken place in the course of development of a language, i.e. a word which was once pronounced in a certain way is now pronounced in another way (Abercrombie 1967: 138; Jones 1972: 218). Such

assimilations cover mainly intra-lexemic cases. The emphasis is usually laid on the fact that they happened in the past. Examples of such assimilations are, for instance, *skamt* [skæmt] → *scant* [skænt], *picture* ['pɪktʃər] → ['pɪktʃə], etc. (Jones 1972: 218; Barber 2000: 44). **Synchronic** (contextual, juxtapositional) **assimilations** have been defined as assimilations that occur at present in connected speech when words are juxtaposed in a sentence, or in the formation of compounds. That is, a word acquires a pronunciation different from that which it has when said by itself (Abercrombie 1967: 133; Jones 1972: 218). For example, in the phrase *on course*, [n] assimilates (or may assimilate) to [ŋ]. Such a definition refers mainly to inter-lexemic assimilatory cases, and it rules out assimilations in simple and derived words. This is obviously counterfactual, because there are many cases of synchronic assimilations occurring in such contexts. For example, the word *comfort* may be pronounced with [m] or [ŋ], so there is a possible variation in terms of a 'canonical' form and an assimilated form.

As we can see, two different perspectives are usually mixed in making the distinction between diachronic and synchronic: the point of origin, and the place of occurrence of an assimilatory process within the syntagm (i.e. inter- or intra-lexemic assimilation). We will reserve the terms diachronic (historical) and synchronic (present contextual) for the temporal dimension of assimilation only.

3.4 *The type of systemic relation*

In terms of the type of relation of sound elements existing in the language-system, we will divide assimilations into syntagmatic and paradigmatic. **Syntagmatic assimilations** are those in which sounds interact on the syntagmatic axis, i.e. all commonly described assimilations in phonetic literature are syntagmatic. **Paradigmatic assimilations**, on the other hand, occur when sounds interact on a paradigmatic axis. For example, the Slovak word *ťažší* ['tʃɛʃi:] (*heavier*) is sometimes pronounced as ['tʃɛxʃi:]. We may assume that the change of [ʃ] to [x] is not caused by the neighbouring sounds, but is due to the influence of the Slovak word *ľahší* ['lʲɛxʃi:] (*lighter*), which forms its antonymous comparative-form counterpart within the paradigm. That is, the [x] in the word *ľahší* functions as an assimilator. A similar case is that of the Slovak word *menší* ['mɛnʃi:] (*smaller*), which may assimilate paradigmatically into ['mɛntʃi:] under the influence of the word *väčší* ['vɛtʃʃi:] (*bigger*), i.e. [ʃ] changes into [tʃ] under the influence of [tʃ]. It should be noted that the paradigmatically assimilated Slovak pronunciations ['tʃɛxʃi:] and ['mɛntʃi:] are non-standard. Traditionally, cases of paradigmatic assimilations are treated in literature as analogical processes. However, since these processes can be described in terms of our definition of assimilation, we include them here.

3.5 *The position on the syntagmatic axis*

Assimilations occurring on the syntagmatic axis may be divided into inter-lexemic and intra-lexemic. **Inter-lexemic** (inter-word) **assimilations** are those occurring between lexemes (and their word-forms), e.g. *ten cups* [tɛn'kʰɛps]. **Intra-lexemic** (intra-word) **assimilations** occur within lexemes, and they may be further divided into **intra-morphemic**, e.g. Slovak *banka* (*bank*) ['bɛŋkɛ] (in clear speech, some Slovaks may pronounce this word as ['bɛnkɛ],

although this is a case of hypercorrection), and **inter-morphemic**, e.g. *rammed* [ˈræmnd̩] (the alveolar gesture of /d/ is spread backwards to /m/ resulting in the alveolar-bilabial nasal – [m̩]), or *rainbow* [ˈreɪnbəʊ].

3.6 *The degree of opacity*

As far as the opacity of the assimilation motivation is concerned, assimilations may be divided into opaque and transparent. **Opaque** (non-transparent, unmotivated) **assimilations** are no longer traceable back to the original form, that is, we cannot tell what the original (preceding) pronunciation was. For example, without studying its etymology, we cannot tell that the word *ant* is an assimilated form of the word *amete*. In other words, there is only one (already assimilated) form of the word available (synchronically) to the language user. **Transparent** (motivated) **assimilations**, on the other hand, are those which can be traced back to the original (canonical) form, i.e. there are at least two pronunciations of a particular word (non-assimilated and assimilated) available to the language user, e.g. *comfort* [ˈkʰəm(p)fət] → [ˈkʰəm̩fət].

3.7 *The degree of stability/fixity*

Some assimilations may be stable, while others may be relatively variable. **Stable** (fixed) **assimilation** is a form which, in a particular lect, always occurs as an assimilated form. For example, the regular past-tense morpheme *-ed* is always pronounced as [t] when preceded by voiceless consonants. Similarly, [k] followed by high front sounds (as in the words *key*, *cure*, etc.) is always advanced – [k̟]. Such assimilations are stable, regardless of speech rate and style. They may of course differ in degree, but they are normally present – what is stable is the occurrence of assimilation. **Variable assimilation** is an assimilation which may or may not occur in a particular context, and it often depends on speech rate and various stylistic factors. Here are some examples: English: *input* [ˈɪnput] or [ˈɪmpʊt]; *football* [ˈfʊtˈbɔ:l] or [ˈfʊpˈbɔ:l]; Slovak: *test bol* (*the test was*) [ˈtest bɔl] or [ˈtezd bɔl], *ženský* (*female*, adj. sg. masc. gen.) [ˈʒɛnski:] or [ˈʒɛŋski:] (/n/ is formed by a constriction rather than a closure and it is not identical to the nasalized vowel [ɛ̃] (see Král' 1988: 75 – 76, Král' and Sabol 1989: 236 – 237)).

3.8 *The direction of the influence of one segment, feature, or gesture on another.*

Depending on the direction of the influence of the assimilator on the assimilee, we may distinguish between uni-directional and bi-directional assimilations.

(a) Uni-directional assimilations

Uni-directional assimilations presuppose the existence of one assimilator and one or more assimilees. They can be either progressive or regressive.

Progressive (carry-over/perseveratory/forward/left-to-right) **assimilation** occurs when in the sequence of segments AB segment A exerts influence on segment B. In other words, segment A is the assimilator while segment B is the assimilee: $A \Rightarrow B$ (Malmberg 1963: 61; Abercrombie 1967: 134; Daniloff and Hammarberg 1973: 242; Gay 1977: 184; Webb 1982: 310; Král' and Sabol 1989: 151, *inter alia*). According to MacNeilage and DeClerk (1968: 1228), most segments exhibit some degree of progressive assimilation (left-to-right coarticulation) from the preceding segment. Examples of progressive assimilation are the devoiced form of /z/ in the contracted forms in the sentences *What's (does) it look like?*, *Jack's (is) here* (cf. Jones 1972: 225), or labialized and palatalized consonants preceded by rounded and palatal segments respectively, e.g. *soon* [su:n^w], *seek* [si:k^j], etc. (cf. Guenther 1995). The degree of progressive assimilation may, of course, vary considerably (cf. Ladefoged 1983: 4; Gibbon, Hardcastle and Nicolaidis 1993: 275).

Regressive (anticipatory/backward/right-to-left) **assimilation** occurs when in the sequence of segments AB segment B exerts influence on segment A. In other words, segment B is the assimilator while segment A is the assimilee: $A \Leftarrow B$ (Malmberg 1963: 61; Abercrombie 1967: 134; Daniloff and Hammarberg 1973: 242; Gay 1977: 183; Webb 1982: 310; Král' and Sabol 1989: 151, *inter alia*). Regressive assimilations are very frequent and they are found in all languages. For example, consonants followed by a rounded segment tend to be labialized, e.g. *took* [t^{hw}uk] (Benguerel and Cowan 1974; Benguerel and Adelman 1976; Lubker and Gay 1982; Fowler and Saltzman 1993: 185–187); vowels followed by nasals tend to be nasalized, e.g. *ten* [t^hɛ̃n], although the degree of nasalization in different languages may differ (Malécot 1960; Král' 1966; Ali et al. 1971; Ushijima and Hirose 1974; Fowler and Saltzman 1993: 187–188).

(b) Bi-directional assimilations

This type of assimilation presupposes one or two assimilators and one or more assimilees. We will distinguish between three kinds of bi-directional assimilation: double, bilateral, and reciprocal.

Double (dual) **assimilation** occurs when in the sequence of segments ABC segments A and C both exert influence on segment B. In other words, segments A and C are assimilators while segment B is the assimilee: $A \Rightarrow B \Leftarrow C$ (cf. Malmberg 1963: 61; Král' and Sabol 1989: 151). In fact, this is a combination of progressive and regressive assimilation. For instance, double assimilation is found when a vowel is flanked by two nasals and it is nasalized as a result, e.g. *moon* [mũ:n]. Another example of this type of assimilation is the labialization of a consonant when flanked by rounded segments, e.g. /s/ in *too soon* [t^hu:'s^wu:n].

Bilateral (radiating) **assimilation** occurs when in the sequence of segments ABC segment B exerts influence (it radiates its feature(s) laterally) on both segments A and C. In other words, segment B is the assimilator while segments A and C are assimilees: $A \Leftarrow B \Rightarrow C$. For example, labialization caused by rounded vowels, especially /u/-like vowels, usually spreads in both directions and the neighbouring segments tend to be labialized, e.g. *moon* [m^wu:n^w]. The labialization of the segment preceding the rounded vowel is usually stronger

than the labialization of the segment following such a vowel. This could be expressed by adding superscript numbers (indicating the degree of labialization) to the symbol of labialization, e.g. [m^{w3}u:n^{w1}]. So far, such symbols can be used only impressionistically.

Reciprocal (mutual) assimilation occurs when in the sequence of segments AB segment B exerts influence on segment A, and, at the same time, segment A exerts influence on segment B. In other words, both segments A and B are simultaneously assimilators and assimilees: $A \Leftrightarrow B$ (cf. Vachek 1973: 65–67; Tiffany and Carrell 1977: 136; Král' and Sabol 1989: 151; Gimson and Cruttenden 1994: 260; Laver 1994: 384). Within this type of assimilation, we may distinguish two sub-types: non-coalescent and coalescent.

(a) **Non-coalescent (autonomous) reciprocal assimilation** occurs when two sounds influence each other reciprocally, and the result is such that both sounds receive some feature(s) reciprocally, but they nevertheless remain relatively autonomous. This can be expressed by the formula: $A \Leftrightarrow B \rightarrow A^B B^A$, i.e. when sounds A and B interact, they are still recognizable as separate (autonomous) sounds after receiving some features reciprocally. For example, the assimilation found in the word *more* [m^wɔ:] may be considered to be reciprocal and non-coalescent – [m] receives labiality from [ɔ:], and [ɔ:] receives nasality from [m].

(b) **Coalescent reciprocal assimilation** is a process in which two segments merge into one, and a qualitatively new sound (assimilant) is formed. Coalescent assimilation may be of two types. In the first type ($A \Leftrightarrow B \rightarrow A/B$), the new sound may be formed half-way between the original segments, providing they share the same articulator, e.g. *horseshoe* [s] \Leftrightarrow [ʃ] \rightarrow [ʃ] (cf. Nolan, Holst and Kühnert 1996). The second type ($A \Leftrightarrow B \rightarrow X$) occurs when a relatively different sound is formed, e.g. *get you* [t] \Leftrightarrow [j] \rightarrow [tʃ].

3.9 The degree of the similarity of the assimilant to the assimilator

In terms of the degree to which the assimilant resembles the assimilator we may distinguish between complete assimilation and partial assimilation (cf. Abercrombie 1967: 137; Webb 1982: 310; Král' and Sabol 1989: 151).

Complete (total) assimilation occurs when the assimilee adjusts to the assimilator so that they both have the same type and number of features (gestures). In other words, the resulting assimilant becomes identical to the assimilator. This can be expressed by the formula $AB \rightarrow AA$ or $AB \rightarrow BB$. For instance, in the phrase *on Monday*, the consonant /n/ assimilates (or may assimilate) to the consonant /m/ in the place of articulation, and thus becomes identical to its assimilator – [ɒm¹mɒnd(e)ɪ].

Partial (incomplete) assimilation occurs when the assimilee adjusts partially to the assimilator and shares with it some features (gestures). In other words, the resulting assimilant and the assimilator are not identical. This can be expressed by the formula $AB \rightarrow A^B B$ or $AB \rightarrow AB^A$. When, in the above phrase *on Monday*, we change the second word into *board*, the [n] will assimilate to the following [b] in exactly the same way as to [m], but it will not share all the features with [b] – [ɒm¹bɔ:d]. The assimilation of [n] into [m] under the influence of [b] is therefore only partial.

3.10 *The degree to which the assimilating articulatory gestures or features are transferred to the assimilee.*

According to Articulatory Phonology, individual lexical units consist of gestures, which are combined to form a gestural score (Browman and Goldstein 1989, 1990, 1992, 2000; Byrd 1992, 1996, 2003; Fowler and Saltzman 1993; Byrd and Saltzman 2002; Goldstein and Fowler 2003). Although Articulatory Phonology does not work with segments, we can see traditional segments as particular (dynamic) gestural configurations determined by the span of the segment. What happens during assimilation is that some gestures overlap, and one of the gestures may be decreased in its magnitude and sometimes it may have a zero magnitude. Viewed from this perspective, the resulting assimilation can be either categorical or gradient (cf. Ellis and Hardcastle 1999, 2002; Nicolaidis 2001).

Categorical assimilation occurs when a particular articulatory gesture of the assimilee changes categorically (fully) to another gesture. In feature-spreading models, this means the spreading of a feature and the delinking of the original node (Goldsmith 1976; Clements 1985; Roca and Johnson 1999: 101–102). For example, [n] assimilated to [ŋ] in the phrase *in case* is a case of categorical assimilation. Similarly, in the word *dogs*, the glottal gesture of [ɔ̃] is spread categorically to the following inflectional morpheme *-s*, which therefore changes into [z̃], i.e. [dɔ̃z̃].

Gradient (gradual, non-categorical) assimilation occurs when a particular articulatory gesture (feature) of the assimilee does not change categorically (fully) to another gesture (feature) (Byrd 1992; Zsiga 1994; Byrd and Tan 1996; Ellis and Hardcastle 2002). In other words, although a gesture of segment A is spread to segment B, the magnitude of the gesture of segment B changes. For example, the alveolar and velar gestures of the segments [n] and [k] in the phrase *in case* may overlap and be produced simultaneously. This would result in the production of a [n̠k] segment. In feature spreading models we could express this situation by feature spreading and keeping the original node linked. However, the case is even more complicated, because the first (alveolar) gesture may be reduced in its magnitude to various degrees, and neither traditional phonology nor feature spreading models have a way of representing this situation. Articulatory Phonology accounts for this by the postulation of gestures as articulatory units and by introducing the concept of *gestural magnitude*. Segmentally, we could transcribe such gestural combination as [n̠k] where [n̠] indicates an alveolar gesture with reduced magnitude.

3.11 *The point at which the assimilation originates in the communication chain*

It is a well known fact that there does not exist a one-to-one correspondence (mapping) between articulatory, acoustic, and auditory phenomena. This has been documented for a number of cases in a number of phonetic theories (Ohala 1986, 1988; Stevens 1989, 1998, 1999; Lindblom and Engstrand 1989). For this reason, it is useful to distinguish between articulatory, acoustic, and auditory assimilations.

Articulatory assimilation occurs when articulatory features or gestures of some segments change under the influence of articulatory features or gestures of other segments. That is to say, the assimilation is detectable articulatorily (physiologically) and it is traceable by techniques of articulatory phonetics (X-ray films, EPG, MRI, etc.).

Acoustic assimilation occurs when a segment changes acoustically under the influence of another segment. This type of assimilation is traceable by means of acoustic analysis of the signal (oscillography, spectrography, etc.).

Auditory assimilation is an assimilation that can be detected auditorily by means of auditory testing. Interestingly, there seem to be assimilations that occur only in perception, that is, some assimilations are articulatorily not present but they are nevertheless heard as assimilations (Ohala 1986, 1988, 1990a, 1993). On the other hand, some assimilations which are detectable articulatorily may not be detectable acoustically and auditorily. For example, when in the phrase *on board* a $[\widehat{nm}]$ segment is produced, the oral cavity is blocked at the point of the alveolar ridge by the alveolar closure gesture for [n], so there is present no cavity stretching from the alveolar ridge to the lips. This means that even though there is an alveolar-bilabial closure $[\widehat{nm}]$, it will have no acoustic influence on the final result, because the resonances for the bilabial place are not present (the alveolar closure precedes the bilabial closure in terms of the direction of the airflow). Therefore, the segment $[\widehat{nm}]$ may be considered to be a case of articulatory assimilation, but not a case of acoustic/auditory assimilation, because it will be detected as [n] (although visually it may indicate assimilation to [m]). The situation changes when the alveolar gesture for [n] is reduced in magnitude or missing completely. Then the listener will be able to detect the assimilation auditorily (the assimilation of [n] into [m]), because the oral cavity will be extended fully as far as the bilabial closure for [m].

3.12 *The extent of the assimilator's influence on the syntagmatic axis*

According to how far the influence of the assimilator is detectable on the syntagmatic axis we can talk about mono-segmental and poly-segmental assimilations.

Mono-segmental (single) assimilation occurs when there is only one segment being assimilated by the assimilator. For example, in the phrase *in case*, a particular assimilant, [k], assimilates only one segment – [n] into [ŋ].

Poly-segmental (multiple) assimilation occurs when two or more segments are being assimilated by the assimilator. A typical example of this type of assimilation is the regressive assimilation of voice/voicelessness. For instance, the consonant cluster [zdz] in the Slovak phrase *hviezd z prítmía* (*(of the) stars from twilight*) is assimilated to [sts] under the influence of the following voiceless consonant [p] (Schulzová 1974: 75).

3.13 *The distance between the assimilator and the assimilee*

Depending on whether or not there are intervening segments between the assimilee and the assimilator, we can distinguish between contiguous and non-contiguous assimilation (Malmberg 1963: 61–62; Král' and Sabol 1989: 151; Gussenhoven and Jacobs 1998: 187–194).

Contiguous (contact) assimilation occurs when there are no intervening segments between assimilee(s) and assimilator(s). All of the above examples of assimilations are of this type.

Non-contiguous (distant/long-distance) assimilation occurs when there are one or more intervening segments between assimilee(s) and assimilator(s). Synchronically, this can be demonstrated on VCV sequences, where there is mutual influence of the two vowels upon

each other, in spite of the presence of the intervening consonant (cf. Öhman 1966; Carney and Moll 1971; Gay 1977). A typical example of diachronic non-contiguous assimilation is vowel harmony. Vowel harmony refers to the way the pronunciation of one phoneme is influenced by (is in harmony with) another phoneme in the same word. Vowel harmony is found, for example, in Turkish and Hungarian, where vowels in roots and grammatical suffixes in individual words are either all back or front, or all rounded or unrounded (Robins 1964: 164; Burling 1992: 145–147):

Hungarian

ház-ak = house-s (all vowels are back)

év-ek = year-s (all vowels are front)

Turkish

baş-lar = head-s (all vowels are back)

ev-ler = house-s (all vowels are front)

3.14 *The active articulatory organ involved in speech production*

According to the participation of the active articulatory organs in assimilatory processes (i.e. the organs capable of active movement), we can set up the following types of assimilations: vocal-fold, velar, lingual (coronal, dorsal, and radical), labial, and mandibular (cf. Hála 1962; Král' and Sabol 1989; Farnetani 1999; Pavlík 2003).

Vocal-fold (laryngeal, glottal) **assimilation** occurs when the state and the activity of the vocal folds is transferred from the assimilator to the assimilee. This results in voicing or loss of voicing, e.g. the word-final sequence [st] in the Slovak word *test* (*test*) changes into [zd] in the phrase *test bol* ['tezd bɔl] (*the test was*) under the influence of [b].

Velar (soft-palate) **assimilation** occurs when the state and the activity of the velum (the degree of openness) is transferred from the assimilator to the assimilee. This results in nasalization or loss of nasalization, e.g. *moon* [mũ:n].

Lingual assimilation subsumes coronal, dorsal, and radical assimilations, and it refers to spreading of any lingual gesture.

Coronal (laminal and/or apical) **assimilation** occurs when the state and the activity of the tongue corona (crown) is transferred from the assimilator to the assimilee. The corona consists of the blade, the tip, and the underblade (cf. Gussenhoven and Jacobs 1998: 8–11; Ladefoged 1999: 596). For instance, the tongue corona for [n] is slightly retracted in the phrase *in Rome* under the influence of the postalveolar approximant [ɹ]. The segment [n] is thus assimilated coronally into [ɲ]. Within coronal assimilation we can further distinguish between apical assimilation – *apicalization*, and laminal assimilation – *laminalization*.

Dorsal assimilation occurs when the state and the activity of the tongue dorsum, i.e. the body of the tongue – the front and back of the tongue (cf. Hála and Sovák 1955: 117; Hála 1962: 66, 1975: 61–62; Malmberg 1963: 26; Král' and Sabol 1989: 130; Laver 1994: 120; Roca and Johnson 1999: 726) is transferred from the assimilator to the assimilee. In this type of assimilation the dorsum may be shifted horizontally and/or vertically under the influence of another segment, e.g. the dorsum position for the segment [k] in the word *key* is slightly advanced to [k̟] under the influence of [i:].

Radical assimilation occurs when the state and the activity of the tongue radix (root) is transferred from the assimilator to the assimilee. What usually happens is that the root of the tongue is drawn back towards the back wall of the pharynx, and this may impart a ‘dark’ quality to the assimilated segment (cf. Laver 1994: 326–327). This process is also called *pharyngealization*. For example, consonants preceding the English back vowel [ɑ:] will be slightly assimilated radically (the root is drawn to the back wall of the pharynx), because, in comparison with the neutral position of articulators, the English [ɑ:] is slightly pharyngealized. Therefore, in the English word *mark*, the consonant [m] will be slightly pharyngealized. This slight degree may be expressed by the superscript number 1 added to the symbol of pharyngealization: [m¹ɑ:k]. Pharyngealization may also be used to express phonological contrast in some languages, e.g. in Arabic, but this is not a case of synchronic assimilation.

Labial assimilation occurs when the state and the activity of the lip(s) is transferred from the assimilator to the assimilee. For example, [s] in the word *soon* is assimilated labially under the influence of the following rounded vowel, i.e. the neutral shape of the lips is changed into rounded (labialized) – [s^w].

Mandibular assimilation occurs when the state and the activity of the mandible (the lower jaw) is transferred from the assimilator to the assimilee. The mandible is usually coordinated with lingual and labial movements in that ‘...the tongue and jaw can interact in a compensatory manner in order to preserve a target articulation’ (Edwards 1985: 1944). For example, when the openness of the lower jaw increases for the production of an occlusive lingual consonant, the tongue must compensate for this by moving in the opposite direction (i.e. vertically upwards) so that an occlusion is achieved. This has been termed **motor equivalence**, and, in general, it may be defined as the ability to carry out a task using different motor means or as the capacity of a motor system to achieve the same end-product with considerable variation in the individual components that contribute to that output (cf. Jakobson and Halle 1975: 46; Hughes and Abbs 1976: 199; Fowler and Saltzman 1993: 177–178; Guenther and Barreca 1997: 383). Mandibular assimilation occurs when such compensation is not present. For example, [j] in the Slovak word *najat’* (to hire) may be pronounced with an increased aperture, because the jaw stays in a relatively open position during the sequence [ɛjɛ], and the tongue does not compensate for this open mandibular articulation.

3.15 *The place of articulation*

According to the place of articulation, the following types of assimilation can be distinguished: labial, bilabial, labiodental, dental, alveolar, postalveolar, retroflex, palatoalveolar, palatal, velar, uvular, pharyngeal, and glottal.

Labial assimilation occurs when lip-rounding and lip protrusion characteristics of the assimilator are transferred (categorically or non-categorically) to the assimilee. This process is usually referred to as *labialization* and it is expressed by the IPA symbol [ʷ] (cf. Abercrombie 1967: 62–63; Brosnahan and Malmberg 1970: 67; Král’ and Sabol 1989: 149; Laver 1994: 321–322). Several cases of consonant labialization have been adduced above. As far as vowels are concerned, the vowel [ə] in the word *away* may be labialized under the influence of the following [w] into [ə^w] or [ə̞].

Bilabial assimilation occurs when the bilabial closure (or approximation) of the assimilator is transferred (categorically or non-categorically) to the assimilee. This assimilation may also be called *bilabialization*, and it differs from labialization in that it does not refer to lip-rounding or lip protrusion, and there must always be a bilabial closure. There is no special diacritical symbol used for this assimilatory process, nor do we need to devise any. This is because all bilabialized sounds are, in fact, regular bilabial sounds which have their respective symbols in the IPA. For example, when the /n/ is followed by /p/, as in the phrase *in peace*, the bilabial closure gesture of [p] is initiated already during the production of the alveolar closure gesture for [n]. This results in the bilabialization of the [n] segment.

Labiodental assimilation occurs when the labiodental characteristics of the assimilator are transferred (categorically or non-categorically) to the assimilee. This process is usually referred to as *labiodentalization* and it may be expressed by the symbol [ʷ] (Laver 1994: 322–323), not currently present in the IPA diacritics set, or a separate IPA symbol [ɱ]. It occurs both progressively and regressively, e.g. *in vain* [ɪn^ʷvɛɪn], *love me* [ˈlʌv^ʷmⁱ(:)], etc.

Dental assimilation occurs when the dental characteristics of the assimilator are transferred (categorically or non-categorically) to the assimilee. This process may be referred to as *dentalization* and it is expressed in the IPA by the symbol [̪]. For instance, in the phrase *one thing*, the [n] is articulated dentally as [n̪], and this dentalization is categorical. Other cases may be gradient, e.g. the final part of the diphthong [aɪ] in the phrase *I think* may be assimilated dentally, but the tongue usually does not touch the teeth, i.e. the final part of the diphthong is slightly dentalized (the tongue tip approaches the back part of the upper teeth) – [aɪ̪].

Alveolar assimilation occurs when the alveolar characteristics of the assimilator are transferred (categorically or non-categorically) to the assimilee. This process may be referred to as *alveolarization* and it does not have any specific symbol in the IPA. It can, however, be expressed by means of using other symbols and diacritical marks currently available in the IPA, e.g. *sometimes* [mt] → [m̠t], *sick leave* [kl] → [k̠l̠] or [k̠l̠], etc.

Postalveolar assimilation occurs when the postalveolar characteristics of the assimilator are transferred (categorically or non-categorically) to the assimilee. This process may be referred to as *postalveolarization* and it does not have any specific symbol in the IPA. It can, however, be expressed by means of using other symbols and diacritical marks currently available in the IPA. For example, segments preceding British English [ɹ] (a postalveolar approximant) tend to be postalveolarized – *in Rome* [ɪn̠ˈrəʊm], *some rice* [səm̠ˈraɪs], etc.

Retroflex assimilation is likely to be found in American English in sounds preceding the retroflex rhotic approximant [ɹ̠]. In other words, the retroflex properties of the assimilator are spread to the assimilee. This assimilation may be termed *retroflexion* (although this term is generally used for the description of the movement of the tongue in the production of [ɹ̠]), and there is currently no diacritical mark reserved for it in the IPA. We will use the diacritic [̠] for this purpose here. For instance, the sound [p] will be (or may be) retroflexed when followed by [ɹ̠], e.g. *pearl* [p̠^hːɹ̠], providing the rhotic is pronounced as a retroflex sound and not a bunched sound, or something in between (Delattre and Freeman 1968; Westbury, Hashi and Lindstrom 1998), although perceptually the result may be similar.

Palatoalveolar assimilation occurs when the palatoalveolar characteristics of the assimilator are transferred (categorically or non-categorically) to the assimilee. This process may be referred to as *palatoalveolarization* and it does not have any specific symbol in the IPA. It may be expressed by means of various symbols and diacritical marks currently available in the IPA, e.g. the last segment of the first morpheme of each of the following words and phrases is palatoalveolarized – *horseshoe* [sʃ] → [ʃʃ], *question* [stʃ] → [ʃtʃ], *is she* [zʃ] → [ʒʃ], etc.

Palatal assimilation occurs when the palatal characteristics of the assimilator are transferred (categorically or non-categorically) to the assimilee. This process is referred to as *palatalization* and it is expressed in the IPA by the diacritical mark [j] (cf. Abercrombie 1967: 63; Brosnahan and Malmberg 1970: 67; Král' and Sabol 1989: 149; Laver 1994: 323–325), or by some other means available in the IPA, e.g. *Peter* [p^hi:t^ə], *like you* [lɑ:kju(:)], etc. Palatalization in English is usually only moderate compared to some other languages, e.g. Russian (cf. Derkach 1975; Bondarko 2005), although Russian ‘soft’ consonants are not a case of synchronic assimilation.

Velar assimilation occurs when the velar characteristics of the assimilator are transferred (categorically or non-categorically) to the assimilee. This process is referred to as *velarization* and it is expressed in the IPA by the diacritical mark [ʷ], although it can also be expressed by other means (cf. Abercrombie 1967: 63; Brosnahan and Malmberg 1970: 67; Král' and Sabol 1989: 149; Laver 1994: 325–326). Here are some examples: *on course* [nʷk] or [ŋk], *that car* [tʷk] or [tkk], etc. The degree of velarization may vary in various languages and contexts.

Pharyngeal assimilation occurs when the pharyngeal characteristics of the assimilator are transferred (categorically or non-categorically) to the assimilee. This process is referred to as *pharyngealization* and it is expressed in the IPA by the superscript [̠] (cf. Abercrombie 1967: 63; Brosnahan and Malmberg 1970: 68; Král' and Sabol 1989: 149; Laver 1994: 326–330). We described earlier a case of mild pharyngealization in English: *mark* [m[̠]ɑ:k].

Glottal assimilation can be found in cases where the state of the glottis of one segment is transferred to another segment. For instance, the widely open glottis of /p/ in the Slovak phrase *dážď padá* (*the rain is falling*) is spread to preceding voiced segments. The voiced consonants of the word *dážď* ([ʒ] and [j]) thus become voiceless: [d̥ɛ:ʃc ˈpød̥ɛ:].

3.16 *The manner of articulation*

Traditionally, speech sounds can be characterized according to the manner in which they are produced. It should be noted, however, that manner characteristics are a complicated issue in that we often find many differences in the definition and use of this term by various linguists (cf. Abercrombie 1967: 47–50; Jones 1972: 45–48; Gimson and Cruttenden 1994: 30–31; Laver 1994: 130, *inter alia*). In this paper, we will distinguish two types of assimilation according to the manner of articulation: aperture assimilation and airstream-direction assimilation.

3.16.1 *Aperture assimilation*

Aperture assimilation (assimilation of the degree of openness) occurs when aperture characteristics (the degree of openness) of the assimilator are transferred (categorically or non-categorically) to the assimilee. This assimilation may be divided into two types. We will name them incrementization and decrementization.

(a) **Incrementization**

This type of assimilation causes the size of the aperture of the assimilee to increase under the influence of the neighbouring segment – assimilator. For example, in the Slovak word *najat'* (*to hire*), the [j] segment is more open than during its canonical articulation, i.e. it assimilates under the influence of the open vowel [ɛ]. Another example of incrementization is a more open articulation of the Slovak occlusive [n] followed by the sibilants [s] or [z]. We can transcribe it as [ɲ]. Although in this case the aperture of [ɲ] is narrow enough to cause friction, no friction is audible because the airstream is directed through the nasal cavity (Král and Sabol 1989).

(b) **Decrementization**

This is a process during which the size of the aperture of the assimilee decreases under the influence of the assimilator. For example, in the phrase *thank you*, the aperture of [j] decreases under the influence of the preceding [k], and [j] assimilates to [ɟ] or [ç] (cf. Gimson and Cruttenden 1989: 256).

3.16.2 *Airstream-direction assimilation*

Airstream direction assimilation occurs when the airstream characteristics (the direction and manner in which the airstream passes through the vocal tract) of the assimilator are transferred to the assimilee. This mainly concerns plosive consonants, which can have their occlusion released in different ways according to the airstream characteristics of the following segment. We can distinguish between:

(a) **Oral plosion (oral release)**

The release phase of a plosive may be assimilated according to the manner of production of the following segment. When the following segment is an oral sound, the release of the plosive may be either full or incomplete.

Full oral plosion (full release) can be defined as the release stage of a plosive consonant through the oral cavity. Full plosion may further be divided into central and lateral (cf. Abercrombie 1967: 175; Jones 1972: 157; O'Connor 1973: 136; Ladefoged 1975: 48; Laver 1994: 149–150, 360–361). In **central plosion** the air is released centrally, e.g. in *key*, *pour*, etc., whereas in **lateral plosion** the air escapes over one or both sides of the tongue, e.g. when a plosive is followed by a lateral – *nettle*, *fickle*, etc. Lateral plosion can be expressed by the superscript [ʰ].

Incomplete oral plosion (incomplete release/no audible release) can be defined as a release stage of a plosive consonant with a simultaneous or nearly simultaneous plosive occlusion formed elsewhere in the oral cavity. In other words, when two plosive consonants overlap or follow each other closely, the offset phase of the first one overlaps with the onset phase of another, and the airstream release of the first plosive is incomplete (or not audible),

although acoustically it may still be present to various degrees (cf. Abercrombie 1967: 146–147; Jones 1972: 155–156; O’Connor 1973: 133–134; Byrd 1992; Laver 1994: 149, 359). Such incomplete plosion is usually expressed by means of the IPA symbol [̚].

(b) *Nasal plosion (nasal release)*

In the case of nasal plosion, the release phase of a plosive consonant is assimilated according to the airstream direction of the following nasal consonant, i.e. the release is made through the nasal cavity (cf. Abercrombie 1967: 142–143; Jones 1972: 156–157; O’Connor 1973: 134–135; Laver 1994: 149–150, 362). Nasal plosion usually occurs (or may occur) when a plosive is followed by a homorganic nasal consonant, although a homorganic nasal is not always a necessary condition. For example, in such words and phrases as *thicken* [k^hŋ], *happen* [p^mm], *good night* [dⁿn], etc., the release is (or may be) made nasally. The IPA uses only one symbol for nasal plosion – [̚ⁿ] – and it is not clear whether the symbol is meant to express an abstract notion of nasal plosion subsuming all types of nasal release, or whether the IPA simply lacks the other symbols (such as [̚^m], [̚^l], [̚^ŋ], etc.). This lack of specificity results in different interpretations, e.g. Laver (1994) uses the symbol [̚ⁿ] as a general symbol for all types of nasal plosion, whereas Ladefoged (personal communication) used to argue in favour of using separate and more specific symbols for the individual types of nasal plosion.

3.17 Voicing

Finally, assimilation is traditionally classified according to the participation or lack of participation of the vocal folds in the production of speech sounds. We can distinguish between two main types: voicing and devoicing (cf. Hála 1962: 362; Abercrombie 1967: 136; Král’ 1975, 1988).

Voicing (sonorization, assimilation of voice) occurs when the voicing (the vibration of the vocal folds) of the assimilator is transferred (categorically or non-categorically) to a voiceless assimilee. For example, the voiceless word-final consonant cluster [st] in the Slovak word *test* is assimilated into voiced [zd] when the word is followed by a voiced sound.

Devoicing (desonorization, assimilation of voicelessness) occurs when the feature of voicelessness (the lack of vibration of the vocal folds) of the assimilator is transferred (categorically or non-categorically) to a voiced assimilee. For example, the voiced consonant [b] in the Slovak word *chlieb* (*bread*) is assimilated into voiceless [p] when the word is followed by a pause or a voiceless consonant (Schulzová 1974; Král’ 1988; Král’ and Sabol 1989: 324–326), etc.

4. Examples of complex assimilation analysis

This section serves to provide examples of complex assimilation analysis. As we stated earlier, particular assimilations may be analyzed from all of the perspectives simultaneously. The individual analytical perspectives are numbered according to the list presented at the end of section 2. The five examples found in the table have already been introduced in earlier chapters and require no further comment.

		Examples				
		English	English	English	Slovak	Slovak
Analytical perspective	<i>in case</i>	<i>dogs</i>	<i>more</i>	<i>test bol</i>	<i>ženský</i>	
	[n] → [ŋ]	[s] → [z]	[m] → [m ^w], [ɔ:] → [ɔ̃:]	[st] → [zd]	[n] → [ŋ]	
1.	consonantal	consonantal	vocalic consonantal	consonantal	consonantal	
2.	phonemic	allophonic	allophonic	phonemic	allophonic	
3.	synchronic	synchronic	synchronic	synchronic	synchronic	
4.	syntagmatic	syntagmatic	syntagmatic	syntagmatic	syntagmatic	
5.	inter-lexemic	inter-morphemic	intra-morphemic	inter-lexemic	inter-morphemic	
6.	transparent	transparent	transparent	transparent	transparent	
7.	variable	stable	stable	variable	variable	
8.	regressive	progressive	reciprocal (non-coalescent)	regressive	regressive	
9.	partial	partial	partial	partial	partial	
10.	categorical	categorical	gradient	categorical	categorical	
11.	articulatory	articulatory	articulatory	articulatory	articulatory	
	acoustic auditory	acoustic auditory	acoustic auditory	acoustic auditory	acoustic auditory	
12.	monosegmental	monosegmental	polysegmental	polysegmental	monosegmental	
13.	contiguous	contiguous	contiguous	contiguous	contiguous	
14.	lingual (dorsal)	vocal-fold	labial + velar	vocal-fold	lingual (coronal)	
15.	velar	glottal	labial + velar	glottal	alveolar	
16.	no assimilation	decrementization of glottal aperture	no assim. of [m], incred. of velar opening of [ɔ:]	decrementization of glottal aperture	incrementization of alveolar aperture	
		voicing	no assimilation	voicing	no assimilation	

Table 1. *Examples of complex assimilation analysis*

Exemplifications in Table 1 are intended to show a picture of the range of analytical possibilities available to a phonetician analyzing changes of sounds in speech. At the same time, they draw the reader's attention to the fact that the complexity of sound changes cannot be fully understood unless several analytical perspectives are taken into account simultaneously. In other words, particular sound changes in connected speech are best described as bundles of different assimilation types. Naturally, the complexity of the analysis will depend on the theoretical position adopted by the linguist, the degree of abstraction of linguistic description, and the degree of accuracy and precision one wants to achieve when describing and cataloguing connected speech processes.

5. Conclusion

The paper attempts to give a relatively precise and coherent typology of assimilations. In addition to offering a detailed catalogue of assimilation processes occurring in connected speech, the typology may also be used as a tool for analyzing and comparing in a systematic way any connected-speech phenomenon of any language. The typology is based on seventeen different analytical perspectives which are dealt with separately in order to avoid mixing different points of view or levels of abstraction. The application of these perspectives in assimilation analysis will yield almost 60 different assimilation types. Table 2 provides a concise overview of different assimilation types within the respective analytical perspectives.

Analytical perspective	Assimilation types
The type of speech sound	vocalic, consonantal
The -emic/-etic distinction	phonemic, allophonic
The time of origin	diachronic, synchronic
The type of systemic relation	syntagmatic, paradigmatic
The position on the syntagmatic axis	inter-lexemic, intra-lexemic (intra-morphemic, inter-morphemic)
The degree of opacity	opaque, transparent
The degree of stability/fixity	stable, variable
The direction of the influence	progressive, regressive, double, bilateral, reciprocal (non-coalescent, coalescent)
The degree of the similarity of the assimilant to the assimilator	complete, partial
The degree to which articulatory gestures or feature(s) are transferred to the assimilee	categorical, gradient
The point at which the assimilation originates in the communication chain	articulatory, acoustic, auditory
The extent of the assimilator's influence on the syntagmatic axis	mono-segmental, poly-segmental
The distance between the assimilator and the assimilee	contiguous, non-contiguous
The active articulatory organ	laryngeal, velar, lingual (coronal, dorsal, radical), labial, mandibular
The place of articulation	labial, bilabial, labiodental, dental, alveolar, postalveolar, retroflex, palatoalveolar, palatal, velar, pharyngeal, glottal
The manner of articulation	Aperture assimilation: incrementization, decrementization Airstream-direction assimilation: oral plosion (full, central, incomplete), nasal plosion
Voicing	voicing, devoicing

Table 2. *An overview of analytical perspectives and assimilation types*

The typology presented in the above table covers all major assimilation types described so far in phonetics and phonology. In addition to this, it also catalogues some less known or unknown types of assimilation. Although the analytical perspectives applied in the categorization of assimilations give a relatively detailed picture of different assimilation types, the typology cannot be considered to be exhaustive. Nevertheless, it is intended to offer the most complete classification of assimilations in phonetics and phonology to date.

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