Towards a Linguistically Motivated Ontology of Motion: Situation Based Synsets of Motion Verbs

Zygmunt Vetulani

Adam Mickiewicz University in Poznań
Faculty of Mathematics and Computer Science
ul. Umultowska 87, 61614 Poznań, Poland
vetulani@amu.edu.pl

Abstract

The paper aims at contributing to the problem of designing ontologies for spatio-temporal knowledge representation. We consider a linguistically oriented, situation-based methodology and we situate it with respect to the WordNet approach. We focus on the problem of how to design a system of ontological concepts related to various kinds of motion. We develop the concept of *situation based synsets.*

Introduction

In the paper we consider problems related to ontologies for spatio-temporal reasoning. By ontologies we mean, according to e.g. (Guarino 1997), "theories of various kind expressing the meaning of shared vocabularies, in the specific field of information retrieval and extraction as well as in the more general area of knowledge and language engineering". This use of the term *ontology* is compatible with the traditional meaning of this word, inherited from philosophy, as *ontologies* are used to characterise the way individuals exist. Ontologies may take the form of systems to classify entities and to attribute properties to classes of entities (rather than to particular ones) in order to enable reasoning on the basis of relations between these classes. Typical example is the hyponimy/hyperonimy relation (ISA) together with inheritance and default reasoning mechanisms. In this study we focus on the particular problem of how to design a system of ontological concepts related to various kinds of motion.

General research framework

Although the problem of designing a well motivated motion ontology is interesting in its own right, we attract the reader's attention to the fact that this research is a part of more general considerations within the framework of designing *ontological systems*. This issue was object of our recent publication (Vetulani 2003) concerning linguistically motivated ontological systems. We will briefly sketch the main ideas of this paper.

The concept of *ontological system* explores the opposition between *general* and *detailed*[1] *ontologies. General ontology* is a system of concepts and features which are domain independent, in opposition to the *detailed ontologies* which are domain oriented. The concept of general ontology is close e.g. to the notion of Top Concept Ontology of the EuroWordNet (Vossen 2003) or the UpperCYC Ontology (1997). By *ontological system* we mean a system composed of a general ontology and a collection of detailed ontologies which are compatible with the general one and which cover a number of domains. At the same time, the idea of the ontological system allows contradictions between particular detailed ontologies within one ontological system. The key component used to discriminate between a general ontology and the detailed ones, and which differentiates various detailed ontologies is the *system of categories and related features.*

In our paper (Vetulani 2003) we propose a method of selecting categories for the purpose of a general ontology based on linguistic considerations. Reasons we give in favour of linguistic motivations for ontology design are twofold. First, any given language is the primary tool for transmitting information about the world (real, imaginary, literary, potential,...) within the community speaking this language. For this reason the language reflects notional structure shared by the community of language users. This is because the language objects formed in the process of language evolution are first of all those which correspond to the main concepts used by the community.[2] Selecting linguistically motivated concepts means selecting the important ones. The second reason is connected with the

[1] Some authors use the appellation *special-purpose ontology* for *detailed ontologies.*

[2] Our point is that concepts are products of the society as a whole and not individuals. Most probably no human user of any natural language possesses all concepts of this language and controls, explicitly or not, the total of language resources (of this language).

way we proceed in order to select concepts: we select those, which are directly useful to express the semantic coherence criteria for sentence elements. This is a technological motivation justified by NLP needs.

For the reasons widely discussed in (Vetulani 2003), instead of proceeding to the (costly) corpus studies, we decided to apply a (much cheaper) *indirect* method consisting in reusing data mined from the Generative Syntactic Lexicon (GSL) of Polish Verbs (worked out during the period from 1967 to 1992 by the team of Kazimierz Polański (Polański 1992)). The main objective of this lexicon was to characterise the syntactic-semantic connectivity of Polish verbs. For this purpose over 10000 verbs forming the core of the Polish verbal system[3] were selected on the basis of a corpus of 50000 sentences representing literary, scientific and newspaper texts.

This lexicon is organised into entries. The main parts of an entry are:
(a) entry identifier (verb in infinitive)
(b) optional meaning description (informal), if necessary for meaning differentiation,
(c) formula (or formulae) (called by Polański *sentential scheme /schemat zdaniowy/*) showing the syntactic structure and syntactic requirements of the verb with respect to obligatory and facultative arguments,
(d) specification of semantic requirements of the verb with respect to the obligatory and facultative arguments,
(e) examples of use (natural language).
As a simple example, let us take the entry POLECIEĆ (meaning *to fly*). It has several meanings, one of them is represented by the lexicon entry given below.

(a) POLECIEĆ (English: FLY)[4]
(b) .....
(c) NP_N — NP_I+ (NP_{Abl})+ (NP_{Adl})
(d) $NP_N \rightarrow$ [+Hum]
$NP_I \rightarrow$ [flying object]
(e) Examples: ..., *z Warszawy do Francji polecę samolotem (I will fly from Warsaw to France by plane),...*

Round brackets are used for optional arguments (here for the Ablative position and the Adlative position)[5]. In the entry part (d), the (some) nominal arguments are associated with semantic features expressing semantic requirement of the verb with respect to arguments. In order to express semantic requirements, Polański uses first of all a short list of basic semantic features:

[+Abstr] – abstract	[Fl] – plant
[-Abstr] – concrete	[Inf] - information
[+Anim] – animate	[Instit] - institution
[-Anim] - non-animate	[Instr] - instrument
[+Hum] - human	[Liqu] - liquid
[-Hum] - non-human	[Mach] - machine
[Coll] – collective	[Mat] - material
[Elm] – element	[Pars] – part

> "Some items from this list may be combined. E.g. [-Abstr/-Anim] stands for the class of concrete, non-animate objects represented by nouns like *stone* or *glass*, whereas [+Hum/Pars] refers to the parts of the human body (*hand, head, leg*). The above set of features still appears insufficient[6] for expressing precisely enough the syntactic requirements. In our example, in the assignment "$NP_I \rightarrow$ [flying object]" the term *flying object* stands for the class of objects (category), whose names may occupy the NP_I position in a sentence with *polecieć* [fly] as the predicate verb. It is easy to see that the above 16 features are not enough to define categories like *flying object*. A quick look into the Lexicon shows that these features and a number of their combinations are enough to express semantic requirements for the major part of verbs, nevertheless, the necessity to use more detailed specifications is quite common. This was the reason for Polański to complete the short list of semantic features with ca 1600 notions expressed by common nouns (simple or compound). These nouns will be henceforth called *semantic descriptors.*" (Quotation from (Vetulani 2003), adapted to fit the example above.)

The semantic descriptors extracted from the lexicon constitute the basis of the general ontology for a linguistically motivated ontological system discussed in (Vetulani 2003).

It is important to notice that the semantic descriptors extracted within the ontology project described above refer either to

- "concrete entities perceivable by senses and located at any point in time in a three-dimentional space", e.g. *roślina (plant), zwierzę (animal),* and therefore belong to the category of 1stOrderEntities in the terminology of EuroWordNet (Vossen 2003), or to
- "unobservable propositions that exist independently of time and space", e.g. *myśl (thought), pamięć (memory)*,

[3] In the Polish grammatical tradition one uses to consider perfective and imperfective verbs as separate lexemes even if they share other relevant semantic and syntactic properties. If this is the case, then – in the GSL - both "variants" are described by common dictionary entry. This is why the GSL has ca 7500 entries covering more than 10300 verbs.

[4] The original entry is in Polish. We give here its English translation.

[5] The ablative noun phrase (here marked as NP_{Abl}) means the move **from** the entity to which refers this phrase, and the adlative noun phrase (here marked as NP_{Adl}) means the move **towards** such an identity.

[6] "We do not claim that the set of semantic features we propose is exhaustive and final. Besides features commonly accepted we considered necessary to introduce such distinction words as nouns designing plants, elements, information etc.", cf. (Polański 1992).

and therefore belong to the category of 3rdOrderEntities in the terminology of EuroWordNet (Vossen 2003).

The above approach fails to be complete. The gap consists in the absence of concepts typically represented by verbs. Further in this paper we present a method of selecting ontological concepts relative to motion which belong to the category of 2ndOrderEntities, i.e. "entities which cannot be grasped, heard, seen, felt as an independent physical thing", but "can be located in time and occur or take place rather than exist", e.g. *zdarzyć się (happen), spowodować (cause), poruszać się (move)*. The approach we apply to motion related verbs[7] results with the ontological concepts corresponding to *synsets* in the WordNet terminology.

Before discussing this issue, we first report briefly on the WordNet approach as reference framework.

A reference framework: WordNets

The Princeton WordNet and its multilingual successor EuroWordNet provide examples of linguistically motivated ontologies based on purely distributionist approach. These ontologies may be considered as lexical databases organised around a notion of a *synset*. Synsets are defined at the basis of the *synonymy*. Synonymy is defined by interchangeability in linguistic contexts which is an equivalence relation. Synsets are equivalence classes (abstraction classes) with respect to synonymy (for exhaustive discussion see (Vossen 2003), Chapter 2.2.3.1. Synonymy). They are considered as representing semantic concepts which form the backbone of an ontology. The ontology is completed by a number of relations between synsets as e.g. antonymy, hyponymy, hyperonymy, meronymy, holonymy, etc. All these relations have procedural definitions consisting in application of truth tests. E. g. for synonymy we have to check the following:
for nouns:
"if it is (a/an) X then it is also (a/an) Y" and
"if it is (a/an) Y then it is also (a/an) X"
(e.g. *fiddle* and *violin*),
for verbs:
"if sth/someone/it Xs then something/someone/it Ys" and
"if sth/someone/it Ys then something/someone/it Xs"
(e.g. *begin* and *start*), where X and Y are substituted by the nouns/verbs representing the tested synsets.

The EuroWordNet project proposes a Top Ontology consisting of 63 basic semantic distinctions to classify ca 1300 concepts. These concepts are grouped into 3 parts called 1stOrderEntities, 2ndOrderEntities and 3rdOrderEntities (cf. above).

[7] By *motion related verbs* we mean verbs which refer to situations with movement as essential factor, i.e., verbs referring to situations involving moving element(s) with well defined role(s).

Situation-based motion ontology

The main objective of this study was to demonstrate the feasibility of a spatio-temporal ontology defined on the basis of the idea of *synset-like* synonymy classes with synonymy defined semantically.

Self-limitation

Our main concern is motion ontology design. We focus on the problem of how to construct (select, design) the main concepts of such an ontology. We will build concepts from words (as in WordNet) via exploring the notion of *situation* and mining for semantic information in the Generative Syntactic Lexicon (see above).

By *motion involving situation* we will mean all kinds of situation involving location change (or *move*) of the physical thing or its part (such situations are categorised in EuroWordNet as *dynamic situations* or *events*). The move is thus a part of situation which may have also other, static components (i.e. components orthogonal to the motion aspects of the situation). Among motion involving events we observe:

- those where motion constitutes the main (obligatory) element (eg *passing by, avoiding an object,...*),
- those where motion is a result (*throw*, *shot,...*),
- those where motion is a necessary condition (*crash,...*),
- those where motion is a symptom or a means (*waving hand,...*)[8].

In this paper we limit ourselves to the first of the above categories.

Method

Just like in the WordNet project we attempt to build ontological concepts using words clustered into classes of synonyms. Contrary to the WordNet approach (where synonymy is based on the distributionist idea of interchangeability in contexts) **we define synonymy as an explicitly semantic concept** on the basis of the notion of *situation (represented by attributes and values)*. This approach permits to abstract from linguistic intuitions of normality/abnormality and to introduce synonymy as based on the properties of structures (representing *situations*).

The words considered are verbs of motion. We assume that verbs refer to situations as *interpretation worlds* (in a way similar to the way predicate symbols refer to relations in the sense of Tarski semantics for classical predicate calculus). This means that verbs *make statements* about situations. Contrary to the formal logic where there is no *a priori* association between predicates and relations, verbs refer to typical situations and this association is in principle

[8] Notice that *waving* means not only a "physical and cyclic move of the hand" but - first of all - a special communication gesture where the move constitute only the form.

shared by the community of language users (otherwise communication would not be possible). Our method consists in:
1) visiting *one by one* all motion verbs of a chosen natural language (in our case Polish),
2) describing typical reference situations for all these verbs in terms of attributes,
3) introducing similarity relation(s) for attribute structures (describing situations), as well as other relations useful to define further relations between concepts (as hyperonymy for example),
4) using the above mentioned similarity relation (or various similarity relations) as a basis for synonymy and, consistently, as a basis for the *synset* concept.

Synsets obtained in that way are called Situation Based Synsets (SBSynsets) and are intended to constitute a backbone of the proposed ontology.

Implementation of the method

Selection of motion verbs. Verbs were selected from the Generative Syntactic Lexicon (GSL). We limited the selection to those where some situation involving motion constitutes at least one among all possible meanings. A list of 660 verbs[9] has been selected as the result of "manual" direct inspection of all 7526 lexicon entries (in GSL). For perfective-imperfective pairs of verbs (frequent in Slavonic languages, cf. *lecieć-latać*) both are included.

Description of typical reference situations for the selected verbs as attribute structures. To start with, we considered a relatively short list of 8 attributes describing motion relevant aspects of situations typically associated with the selected verbs. The selection of appropriate attributes and decisions concerning attribute values are among the most delicate problems of the whole project. The idea was to propose attributes directly characterising *essential* aspects of motion with possibly precisely defined values and with clear criteria to set these values. The proposed set of attributes applicable is as follows.

Ontological nature of moving (moved) object (person, being, thing) (1)
: The values of this attribute are to be taken from an upper ontology (for consistency with our general framework we suggest to use the one presented in (Vetulani 2003), but other, like WordNet Top Ontology, Cyc Upper Ontology etc. may be used as well); when appropriate, a class of typical representatives may be indicated as well. Examples of values we have used: animal, human, liquid, object, vehicle; examples of *typical representatives*: (typical:bird), (typical:plane), (typical: round thing). In total we used 44 different, in most cases combined values.

Change of the moving actor/object position (2)
: This attribute defines opposition between two important kinds of situations involving motion. To define this opposition we assume that each moving thing is represented by a point, located in space (called *centre of gravity*). We distinguish between motion where the centre-of-gravity-position change is an essential factor (C(hanging) P(position)) and other (F(ixed) P(osition)). In both cases the moving thing may be individual or a class (some quantity) of individuals. (Examples of CP-type motion: dislocation of individuals or groups of them; examples of FP-type motions are: rotation for individuals, dispersing or gathering for groups of individuals.).

Autonomy of motion (3)
: Movement of an entity is *autonomous* if it is under control of this entity, i.e. the entity may influence the way the move is performed, in the other case the movement is said *non-autonomous*; values *No, Yes* (examples of autonomous movements: *run, jump*; example of non autonomous movements: *being thrown*)[10].

Quantitative nature of moving object (4)
: Moving things may be considered as: C – collective (where the move typically involves a countable set of well distinguished participants organised in a unit), I – individual (where typically the move involves one idividual), M - mass (move typically involving an undetermined, high number of individualas or certain amount of homogenous matter). These values may be combined. E.g. C,I means "collective or individual".

Typical environment (5)
: Typical environment: S(urface), W(ater), A(ir) (including space)[11], N(atural environment), I(ndustrial environment), H(human environment). The value All is applied when all kinds of environment are possible or when the nature of environment is irrelevant. These values may be combined, e.g., "S,W" means "surface or water", "S&I" means "surface and industrial environment".

Accepted intensity (speed) of movement (6)
: We observe that some verbs may not be applied in a natural way in the context of high (or low) speed, some other are neutral with respect to speed of the move. For example, to *rush* implies high speed, whereas to *drag* implies low speed (e.g. the idea *to rush slowly* is contradictory).We characterise directly the possibility to express extreme intensity of the motion using pairs of values from the set {A,N,R}, where are A stands for *acceptance,* R - for *refusal,* N - for *necessity*. E.g. NR means that *intensity is necessarily low* (high intensity is

[9] 610 verbs come directly from 401 different GSL entries, remaining 49 were added for symmetry and completeness reasons.

[10] Practical test for the value C: possible use of the collective argument with the verb in singular (we do NOT consider as 'collective' the move performed simultaneously or in parallel by several individuals but on the individual basis).

[11] In principle S, W, A cover all cases, although sometimes more precision seems be appropriate.

therefore *impossible*). The first element of the pair stands for the low intensity, the second one – for high. RA means that low intensity is refused and high – accepted. AA means lack of restriction for extreme intensities (in practice – lack of restrictions at all). We observe practical usefulness of values AA, AR, RA, NR and RN (NN is contradictory). We attribute values at the basis of possibility/impossibility to form constructions *verb+intensity expression.* Example of test for *low speed accepted*: possible use together with "*z ociąganiem (lazily)* (for English: compare *He goes as slowly as possible, He runs as slowly as possible* and **He races as slowly as possible*).

Begining and End of the move (7)

We mark cases where B(egining) or/and E(nd) are essential (explicit or implicit) parts of the move situation description. Otherwise we mark No. These two values B, E are not excluding each other ("BE" stands for "B and E"). The value "No" is applied when the beginning and the end of the move are not essential constituents of situation description.

Involvement of another actor(s) and its (their) role(s) (8)

We mark obligatory involvement of an actor and its role: I(nstrument), M(edium), O(obstacle=hostile piece of environment), L(ocation), E(nemy), V(ehicle), A(gent), P(artner), T(arget). Such actors may be omitted at the surface level. In total we used 21 combinations.

We have calculated the attribute values to a large degree on the basis of the GSL (Polański, 2003).

Introducing similarity relation(s) for attribute structures. The use of attributes to differentiate between situations permits a natural definition of *similarity*. We consider similar those situations for which attributes take the same values[12]. This notion of similarity depends of course on the choice of attributes. Withdrawal of one or more of them makes similarity classes larger. Conversely, addition of new attributes makes situations more specific. Withdrawal/addition of attributes is a way to tune the similarity relation to make it conform to the *common sense (intuitive)* similarity.

Definition of synonymy; semantically motivated *synsets.* The similarity relation defined above may be used to properly introduce *synonymy* relation for words (in particular verbs). We consider two verbs as being synonymous if situations to which they respectively refer are similar (in the sense introduced in the preceding section). Strictly speaking, we compare verbs considered each in one precise sense. The synonymy relation we introduce here directly corresponds to the similarity for attribute structures. Synonymy defined in that way is strongly dependent on similarity for situations defined above, i.e. on the choice of applied attributes. Our notion of synonymy is close in spirit to the NEAR_SYNONYM relation of EuroWordNet (Vossen 2003). When the set of attributes differentiates situations strongly enough then it turns into the EuroWordNet SYNONYM relation and therefore may be considered as clustering verbs into *synsets.* In that case, our approach may be considered as complementary to the WordNnet approach in the sense that it provides *situational semantics* to the words covered by synsets. (It is to remind the reader that (Euro)WordNet synsets were initially defined in a distributionist way as evoking *semantic invariability*, whereas our notion of *synsets* directly addresses a problem of semantic properties of situations.)

[12] Another, more flexible definition of similarity would require that attributes take *similar* values (instead *identical*). We did not explore this solution so far. On the other hand, as no condition has been imposed on attribute values the two approaches are in fact equivalent.

Some observations concerning collected Situation Based Synsets

The four steps described in the section concerning "the implementation of the method" result with a partition of the set of 658 verbs into 339 classes of (near)synonyms (with respect to the proposed set of attributes), i.e. into 339 situation based synsets (according to the definitions given above). Although synsets obtained at the basis of all 8 attributes are relatively small, in one case we have observed 10-element synset composed of {nieść, nosić, ponieść, poodwozić, przenieść, przenosić, przesłać, przesunąć, przesuwać, przesyłać} (with the meaning close to *bring sth*). Attribute values describing this synset form the following list (ordered according to the order of attribute descriptions; cf. the respective section above): [object, CP, No, I, S, AA, BE, A(gent)] . It seems interesting to notice that the number of synsets is strongly decreasing[13] with their size: there are 286 classes containing 1 or 2 elements, then 27, 13, 6, 3, 2, 1 for respectively 3, 4, 5, 6, 7and 10 elements per synset.

Of course the partition into synsets drastically changes when we eliminate some of the attributes. When taking out of consideration the attribute (1) describing the ontological nature of the moving (moved) object (in terms of appropriate ontological concepts) then the number of one or two elementary synsets decreases down to 156 and the total number of synsets - to 233. (Participation of small synsets goes down to ca 66%). For longer synsets, as before, their frequency decreases (24 of the three-word synsets, then respectively 15 and 14 for four- and five-element synsets). It comes out that the average size of synsets becomes close to three. This also means that the distinctive power of the considered attribute is significant. This method is now being applied to estimate and compare relevance of other attributes. (Preliminary observations show that their distinctive power vary considerably. For

[13] Except that the number of singletons is lower then the number of two-element classes. This is because of the relatively high number of perfective – imperfective pairs of near-synonyms.

example the attribute characterising the relevance of *centre-of-gravity* position (2) appears relatively insignificant with respect to the other considered attributes.)

Future development

This research is in progress. Our short term purpose is to link our proposal directly to the (Euro)WordNet. This requires revision of the set of attributes and respective values in order to make the SBSynset partition possibly close to the WordNet synset partition. Another research line currently investigated consists in the study of SBSynset based reasoning about motion (considering in particular information contained in the attributes). We plan to make the resulting motion ontology backbone available free for research purposes.

Appendix

We present here the list of 38 largest synsets defined at the basis of the attributes (2)-(8) covering 274 verbs. Synsets are clustered using curly brackets "{" and "}".

{powciągać, powiesić, zniżać, zniżyć, toczyć, pokiwać, kręcić, machać, machnąć, pomachać, przewracać, przewrócić, powywracać, zakręcić, zawijać, zawinąć}, {poschodzić, chylić się, pochylić się, zachwiać się, nachylać się, nachylić się, podnieść się, podnosić się, podźwignąć się, przechylać się, przechylić się, skłonić się, zatrząść się}, {dochodzić, dojść, powędrować, wchodzić, wejść, wjechać, wjeżdżać, podgalopować, podkłusować, dojechać, dojeżdżać, podjechać, podjeżdżać}, {podsadzać, podsadzić, podźwignąć, chylić, nachylać, nachylić, pochylić, przechylać, przechylić, skinąć, skłonić, zatrząść}, {chadzać, chodzić, powstać, powstawać, prostować się, siadać, siąść, stanąć, usiąść, zakręcić się, wstać, wstawać}, {dopełzać, dopełznąć, podpełzać, podpełznąć, podczołgać się, podleźć, powlec się, pozłazić, zaczołgać się, zaleźć, załazić}, {nieść, nosić, ponieść, poodwozić, przenieść, przenosić, przesłać, przesunąć, przesuwać, przesyłać}, {bujaćII, frunąćI, fruwaćI, wzbić się, wzbijać się, wzlatywać, wzlecieć, wznieść się, wznosić się}, {krążyć, kręcić się, bobrować, buszować, myszkować, nawracać, nawrócić, obracać się, obrócić się}, {donieść, donosić, dosunąć, dosuwać, powieźć, windować, zanieść, zanosić}, {odsunąć, odsuwać, powyciągać, powysuwać, powywlekać, powywozić, wytaczać, wytoczyć}, {przynieść, przynosić, przytaczać, przytoczyć, przywieźć, przywozić, wynieść, wynosić}, {bujaćI, huśtać, kolebać, kołysać, obracać, obrócić, poobracać}, {człapać, kroczyć, kuśtykać, pełzać, pełznąć, czołgać się, raczkować}, {zsunąć się, zsuwać się, zsiadać, zsiąść, zstąpić, zjechać, zjeżdżać}, {wieźć, wozić, holować, przewieźć, przewozić, prowadzić}, {podprowadzać, podprowadzić, podtaczać, podtoczyć, zwalać, zwalić }, {ślizgać się, ślizgnąć się, potoczyć się, toczyć się, upadaćI, upaśćI}, {iść, maszerować, przenieść się, przenosić się, jechaćII, jeździćII}, {mijać, minąć, omijać, ominąć, przedostać się, przedostawać się}, {docierać, oddalać się, podążać, podążyć, powracać, powrócić}, {odjechać, odjeżdżać, pojechać, pomaszerować, wmaszerować, wymaszerować}, {wspiąć sięI, wspinać sięI, pozjeżdżać, podkołować, wspiąć sięII, wspinać sięII}, {dobiec, dobiegać, podbiec, podbiegać, podbiegnąć, wbiegać}, {ciągnąć, doholować, doholowywać, dostawiać, dostawić}, {dowlec, powlec, wlec, zwlec, zwlekać}, {wynurzać, wypadać, wypaść, nadchodzićII, nadejśćII}, {osunąć się, osuwać się, poodjeżdżać, przesunąć się, przesuwać się}, {dosunąć się, dosuwać się, schodzić, wciągać się, wciągnąć się}, {drgać, drgnąć, drżeć, dygotać, dygotać się}, {padać, paść, powywracać się, przewracać się, przewrócić się}, {nadciągaćI, nadciągnąćI, oddalić się, wycofać się, wycofywać się}, {przybiec, przybiegać, przybiegnąć, zbiec, zbiegać}, {dążyć, dotrzeć, zmierzać, zawracaćI, zawrócićI}, {dowędrować, wdrapać się, wdrapywć się, zachodzić, zajść}, {dopłynąć, dopływać, popłynąć, wpłynąć, wpływać}, {pozlatywać, pozlatywać się, podlecieć, dociągaćII, dociągnąćII}, {podchodzić, podejść, wkraczać, wkroczyć, pozjeżdżać się}

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