

3. Using event structures to model symmetric and asymmetric verb meanings in Croatian aspectual pairs

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Croatian aspectual verb pairs allow to express «the different ways of viewing the internal temporal constituency of a situation» (Comrie 1976: 3) by choosing between two morphologically related lexical variants: a perfective and an imperfective one (Babić 2002: 516–531; Barić *et al.* 1995; Browne 1993: 331–332; Kordić 1997: 41; Matovac 2022: 225–231; Silić & Pranjković 2007). However, not all verb meanings displayed by one variant are always available to the other – not even in the most derivationally prototypical of pairs. Pairs lacking one or more meanings that are present in the sense inventory of their aspectual counterpart are called *asymmetrical aspectual pairs* (Polančec 2022: 127–129) and their asymmetry is believed to be caused by constraints posed by the *Aktionsart* of the meanings involved (Kolaković 2018: 95; Polančec 2020: 160). Based on a small selection of corpus-extracted (*hrWaC* corpus, Ljubešić & Klubička 2014) and made-up examples, a comparison will be carried out between the meaning inventories of a selection of symmetric and asymmetric verb pairs available in the CroaTPAS resource (Marini & Ježek 2019; Marini 2022a). Their *Aktionsarten* will be modelled using a customized version of the formalism of event structures (Pustejovsky 1991) to shed more light on the interaction between lexical and grammatical aspect in Croatian.

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1. Introduction

The first scholar drawing a clear line between the often-misconstrued concepts of aspect and *Aktionsart* was Sigmund Agrell (1908), who stated that while aspect is what differentiates the imperfective from the perfective form in Slavic verb pairs, *Aktionsart* expresses how the events denoted by verbs unfold. Different *Aktionsarten* (or simply event types) have since then been identified and considered either as a lexical property of verbs (Dowty

1979; Vendler 1957) or a compositional one resulting from the interaction with their syntactic context (Verkuyl 1972).

In this paper, the focus will be on verb polysemy and on the fact that different verb meanings can be associated with different event types (Rappaport Hovav & Levin 1998). More precisely, a comparison will be carried out between the meaning inventories of a selection of Croatian aspectual verb pairs available in CroaTPAS (Marini & Ježek 2019; Marini 2022a), a bilingual Croatian/English pattern dictionary tailor-made to portray verbal polysemy and based on the *hrWaC* corpus (Ljubešić & Klubička 2014). The different *Aktionsarten* expressed by the verb meanings involved are going to be modelled using the formalism of event structures proposed by Pustejovsky (1991), in order to identify recurring traits in the internal structure of the modelled events to justify why a verb may lack a meaning which is available in its aspectual counterpart, as well as to model proper aspectual pairs.

2. A short history of aspect

The verb and its categories have always drawn the interests of scholars since ancient times. The first ones to distinguish between the three main verbal tenses (past, present, and future) were Aristotle and Plato, soon followed by the Stoics who added *aorist* and *imperfect*. Marcus Terentius Varro (116 – 27 BC) is commonly considered to be the first to identify the category of aspect (Binnick 1991: 34), which will however be properly characterized only many centuries afterwards.

The first appearance of the term *vid* (Rus. *vidy*, from the Greek *eidos*, Eng. *aspect*) was made in the Russian grammars of the 15th and 16th century, where it was used as a synonym of “verbal type” (Gojmerac 1980: 9). The first time the term *vid* was translated with the term *aspect* was in the French translation of Greč’s Russian Grammar of 1827 by Karl Philipp Reiff. After that, the term entered several Western European languages throughout the 19th century and started to intertwine with the notion of *Aktionsart*, which was originally chosen as the German translation of *vid*, but soon began to be used to refer to both the perfective vs. imperfective distinction, as well as «the manner in which the event expressed by the verb unfolds»¹⁹ – a definition provided by Brugmann (1904: 492–493).

¹⁹ «Aktionsart ist, im Gegensatz zur Zeitstufe, die Art und Weise, wie die Handlung des Verbums vor sich geht.»

It was not until the pivotal contribution *Aspektänderung und Aktionsartbildung beim polnischen Zeitworte* (1908) by the Swedish Slavist Sigurd Agrell that a clear line was drawn between the concept of *Aktionsart* and aspect in their current understanding:

«I do not use the label *Aktionsart* to refer to the two main Slavic verb categories, namely the unterminative and the terminative forms (the Imperfective and the Perfective) – those I call *aspects*. With the expression *Aktionsart*, I refer to the until now mostly unobserved – and even less classified – *meaning functions of affixed verbs* [...], that better express how the action is carried out, the way its development unfolds.»²⁰ (Agrell 1908: 78)

Although further distinctions should be drawn between *Aktionsarten* and the semantic functions of Slavic prefixes,²¹ the importance of this work cannot be stressed enough. According to Gojmerac (1980: 18), Agrell is the first to define aspect as the category allowing for different ways of looking at the events expressed by verbs, which is absolutely in line with later definitions such as Comrie's (1976), who famously defines aspect as the «different ways of viewing the internal temporal constituency of a situation» (Comrie 1976: 3). Comrie also adds that aspect is the category encoding the difference between *he was reading* and *he read* (which English grammars insist on referring to as different tenses), and that «perfectivity indicates the view of a situation as a single whole, without distinction of the various separate phases that make [it] up; while the imperfective pays essential attention to the internal structure of the situation» (Comrie 1976: 16). Moreover, Comrie criticizes the idea that the basic function of the perfective should be that of representing events as momentary or punctual. On the contrary, he points out that – rather than reducing an event to a single point – «a more helpful metaphor would perhaps be to say that the perfective reduces a situation to a *blob*» (Comrie 1976: 18). Indeed, being a three-dimensional object with potential internal complexity and clearly

²⁰ «Unter *Aktionsart* verstehe ich [...] nicht die beiden Hauptkategorien des slavischen Zeitwortes, die unvollendete und die vollendete Handlungsform (das Imperfektivum und das Perfektivum) – diese nenne ich *Aspekte*. Mit dem Ausdruck *Aktionsart* bezeichne ich bisher fast gar nicht beachtete – geschweige denn klassifizierte – *Bedeutungsfunktionen der Verbalkomposita* [...], die genauer ausdrücken, wie die Handlung vollbracht wird, die Art und Weise ihrer Ausführung markieren».

²¹ For more on this, see Gorbov (2020).

circumscribed limits makes a blob a better representation of the perfective view of a situation than a point.

Following Koschmieder's works in the 1930s, the two concepts of aspect and *Aktionsart* started not only to develop independently from one another, but also to become more and more associated with grammaticalization (the former) and lexicalisation (the latter), to the point that they sometimes go by the name of *grammatical aspect* and *lexical aspect*:

«Aspect is a fully grammaticized, obligatory, systematic category of languages, operating with general oppositions such as that of perfective and non-perfective, while *Aktionsarten* are purely lexical categories, nongrammatical, optional, and unsystematic.» (Binnick 1991: 170)

Aspectual class, aspectual character, situation type, situation aspect, action, verb class, lexical aspect, inherent aspect, and eventuality type are among the many labels *Aktionsarten* can be referred to (Polančec 2020: 41). In the rest of this contribution, *Aktionsart* will be the term used to refer to the phenomenon.

3. *Aktionsarten*

The first traces of a discussion surrounding *Aktionsarten* (Dowty 1979) can be found in Aristotle, who in *Metaphysics*, book 9, section 1048b distinguished between *kineseis* 'movements' and *energiai* 'actualities' to contrast actions that necessarily involve an end or result (such as that of *building*) with others which are complete in themselves (such as *being happy*).

The Oxford philosopher Gilbert Ryle (1949) later came back to Aristotle's classes and coined the term *achievement* for resultative verbs (such as *winning*, *unearthing* or *finding*) to be distinguished from irresultative activities (such as *listening* or *hunting*) that usually require a longer period of time to unfold. But it was Zeno Vendler, who put forth, in his paper *Verbs and Times* (1957), the traditional classification of verbs in four different lexical classes he calls *time schemata*, namely:

- Activity terms – *run, push a cart*
- Accomplishment terms – *run a mile, draw a circle*
- Achievement terms – *recognize, spot*
- State terms – *know, believe*

The three features Vendler bases his classification on are the following: (a) dynamicity (the presence of change), (b) duration, and (c) telicity (the presence of a goal or *télos*) (see Table 1).

Table 1. Vendler's (1957) verb classes

Verb classes	Dynamicity	Duration	Telicity	Examples
States	–	+	–	<i>know</i>
Activities	+	+	–	<i>run</i>
Accomplishments	+	+	+	<i>fix</i>
Achievements	+	–	+	<i>spot</i>

State terms, such as *know* in (1a), are not considered dynamic since they contain no elements of change. They can be seen as homogeneous situations characterized by a given duration but lacking a specific goal. Activity terms, such as *run* in (1b), on the other hand, express dynamic events lasting a certain amount of time, which still do not point at any *télos*. Accomplishment terms, such as *fix* in (1c), express events which have a duration, are dynamic and are characterized by a gradual progression towards a precise goal which must be reached for the event to have occurred. Finally, achievement terms, such as *spot* in (1d), express events without any duration culminating in an instant.

- (1) a. I **know** the truth.
 b. Claire **runs** in the park.
 c. I **fixed** the thermostat.
 d. I **spotted** Mary in the crowd.

This last class contains several verbs (such as *cough*, *flash*, or *blink*) that are able to express not only single achievements, as in (2a), but also iterated instantaneous events, as in (2b). Verbs such as these are called semelfactives (from Latin *semel* 'once') or *points* (Moens & Steedman 1988; Smith 1991) and provide a prime example of *aspectual coercion*. As defined by Moens & Steedman (1988: 17), aspectual coercions consist in the «change in the aspectual type of a proposition under the influence of modifiers like tenses, temporal adverbs and auxiliaries». In (2b) for instance, it would be the combination of a punctual verb like *cough* with a durative modifier such as *for five minutes* to induce an aspectual mismatch and trigger an iterative interpretation. On the other hand, in a sentence like (2c), it is the use of the progressive that coerces once again a semelfactive into an iterative process.

- (2) a. *Blake coughed once to say yes.*
 b. *Charlotte coughed for five minutes.*
 c. *Sally is coughing.*

4. Representing events

Aktionsarten have been represented in many ways over the years. Here we wish to provide a short overview starting with the feature decomposition representation put forth by Van Valin & LaPolla (1997: 93), which is based on the three binary features [\pm static], [\pm telic], [\pm punctual] (s. Table 2).

Table 2. Feature decomposition of Vendler's verb classes
(Van Valin & LaPolla 1997: 93, with modifications)

Verb class	Feature decomposition representations
State	[+static], [-telic], [-punctual]
Activity	[-static], [-telic], [-punctual]
Accomplishment	[-static], [+telic], [-punctual]
Achievement	[-static], [+telic], [+punctual]

Another way to represent events is that of decomposing them into semantic primitives (Dowty 1979; Rappaport Hovav & Levin 1998; Van Valin & LaPolla 1997). In line with Dowty (1979), Van Valin & LaPolla (1997: 102) call their decomposed lexical representations of sentences *logical structures*, which are made up of different elements: verbal constants (e.g. *do*), modifiers (BECOME, INGR) and variables. In Table 3, we can find four English examples chosen to be representative of the four Vendler classes and their respective logical structures.

Table 3. Logical structures representing Vendler's verb classes
(Van Valin & LaPolla 1997: 102, with modifications)

Verb class	Example	Logical Structure
State	<i>Sarah is beautiful.</i>	be' (Sarah, [beautiful'])
Activity	<i>Mark is singing.</i>	do' (Mark, [sing' (Mark)])
Accomplishment	<i>Ava baked a cake.</i>	BECOME baked' (Ava, cake)
Achievement	<i>The window broke.</i>	INGR broken' (window)

Achievements require the presence of the modifier INGR, which stands for *ingressive* and encodes instantaneous changes. Accomplishments, on the other hand, need the modifier BECOME, which encodes change over some temporal span.

Similarly, Rappaport Hovav & Levin (1998: 107) call their decomposed representations of verbs *lexical semantic templates* or *event structure templates*. In their framework, predicate decomposition involves two major types of components: primitive predicates making up for the structural aspect of verb meaning and constants to take care of the idiosyncratic elements. Table 4 provides their four basic templates, one for each of Vendler's verb classes.

Table 4. Event structure templates of Vendler's classes
(Rappaport Hovav & Levin 1998: 108, with modifications)

Verb class	Event structure template
<i>State</i>	[x <STATE>]
<i>Activity</i>	[x ACT _{<MANNER>}]
<i>Accomplishment</i>	[[x ACT _{<MANNER>}] CAUSE [BECOME [y <STATE>]]]
<i>Achievement</i>	[BECOME [y <STATE>]]]

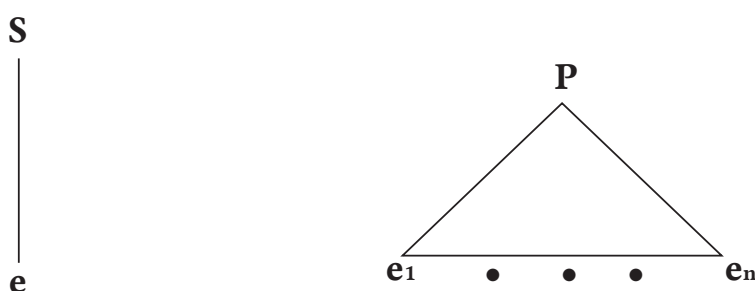
Next to feature decomposition and semantic primitives, however, several scholars decided to model Vendler's *Aktionsart* classes using graphical formalisms which focused on the internal configuration of the events being described: it is the case of Moens & Steedman's *event nucleus* (1988) and Pustejovsky's *event structure* (1991). As in the aforementioned models, also these formalisms rely on the idea that events can be broken down into smaller phases or subevents.

According to Moens & Steedman (1988), the event nucleus is constructed from a preparatory phase, a culminating event, and a consequent phase. Activities only refer to the preparatory phase, states only to the consequent phase, achievements to the culminating event and to the consequent phase and finally accomplishments to all three parts of the event nucleus.

First introduced by Pustejovsky (1991), event structures represent a well-attested formalism aimed at modelling the *Aktionsart* encoded in predicates by decomposing the events (e) they denote into smaller subevents. Following Vendler's classification, Pustejovsky divides events into *states* (S), *processes* (P), and *transitions* (T), further subdivided into *achievements*, and *accomplishments*.

From a structural point of view, *states* are the only event type consisting of a single event – static, atelic, and lasting – while *processes* (also called *activities*) consist of a dynamic series of identical and temporally ordered subevents (Figure 1).

Figure 1. Event structures for *states* (S) and *processes* (P)
(Pustejovsky 1991: 40, with modifications)



There are language-specific tests that help identify the *Aktionsart* encoded in predicates. For instance, in Croatian, *states* are tested using the question *Što se događa?* ‘What is happening?’, which should elicit a negative answer (Polančec 2015: 79). On the other hand, *activities* can be tested using adverbials such as *za jedan sat* ‘in an hour’, which they do not allow, because – being atelic – they do not have an inherent completion point (Polančec 2015: 82).

In light of this, the highlighted predicates in sentences (3a) and (3b), taken from Polančec and already tested for their *Aktionsart* (2015: 81–82), can be modelled using the event structures in Figure 1. The event of *hoping* from sentence (3a) can be modelled as a *state*, while that of *dealing with a festival* from (3b) can be modelled as a *process*. Indeed, they are both atelic and lasting, but the first one is not dynamic, i.e. it cannot be conceptualized as a series of different subevents like the second.

- (3) a. *Nadamo se pozitivnoj odluci Vijeća.*
 ‘We hope for a positive decision from the Council.’
 b. *Festivalima se bave samo kulturnjaci.*
 ‘Only culture specialists deal with festivals.’

On the other hand, *transitions* require an opposition of two subsequent events (Figure 2). According to Pustejovsky (1991: 42), when it is a *process* (P)

bringing about the change, we are dealing with an *accomplishment*, whereas *achievements* make no explicit reference to the activity being performed and involve only two subsequent states (S_1 and S_2).

Figure 2. Event structures for the two types of transitions: *accomplishments* and *achievements* (Pustejovsky 1991: 40, with modifications)



In terms of tests that help distinguish between them in Croatian, Polančec (2015: 82–83) states that both *accomplishments* and *achievements* pass the test of telicity, but while accomplishments accept adverbials with a longer time span such as *za jedan sat* ‘in an hour’, achievements require shorter ones, like *u minutu* ‘in a minute’.

This is the case of sentences (4a) and (4b) – also taken from Polančec (2015: 82–83). The event denoted by the verb *naučiti* in (4a) can be modelled as an *accomplishment* since, in order to acquire knowledge, a certain amount of time must be devoted to learning the subject matter. On the other hand, the event expressed in sentence (4b) is an abrupt change of state, which can be modelled as an *achievement* as portrayed by the event structure on the right in Figure 2.

- (4) a. **Naučio je sve u jedan sat.**
 ‘He learnt everything in an hour.’
 b. **A sad će me ovaj led baciti nekoliko godina unatrag.**
 ‘But now this ice will set me back several years.’

Moreover, Polančec (2015: 82–83) points out that, most of the verbs that pass the accomplishment test are perfective verbs belonging to aspectual pairs whose imperfective counterparts pass the durativity test with adverbials like *jedan sat* ‘for an hour’. More will be said on the role of aspectual pairs and their relationship with *Aktionsart* in the following section.

5. Croatian aspectual verb pairs

Let us now specifically focus on the Croatian verb system. Indeed, the Croatian language – like all Slavic languages – adds an element of complexity to the modelling of *Aktionsarten* if we try to account for the role played by verbal aspect (s. section 2).

Quoting Gojmerac (1980: 21), «according to Agrell [(1908)], verbal aspect is a perspective on the event, which becomes grammaticalized in Slavic languages and represents an actual grammatical category of the verb. Two are the possible ways of looking at events, each of them corresponding to one of the members of an aspectual opposition.»²²

With these words, Gojmerac (1980) helps bringing together Comrie's definition of aspect and the reality of Slavic languages, including Croatian, where perfective and imperfective actions are lexicalized in two different forms, also called *aspectual pairs* (Babić 2002: 516–531; Barić *et al.* 1995; Browne 1993: 331–332; Kordić 1997: 41; Matovac 2022: 225–231; Silić & Pranjković 2007: 288).

For instance, let us look at the following examples taken from Silić & Pranjković (2007: 288):

- (5) a. *Susjed je prodavao kuću.*
 'The neighbour was selling the house.'
 b. *Susjed je prodao kuću.*
 'The neighbour sold the house.'

As clearly explained by the authors, the imperfective variant *prodavati* (imperfective, 'to sell') is used in sentences like (5a) to focus on an action in which only the process is emphasized, while in sentences like (5b) featuring the perfective variant *prodati* (perfective, 'to sell'), the focus is on a completed action, on the result of a process, on an action which is not characterized by processuality.

In other words, Croatian aspectual pairs allow speakers to express «the different ways of viewing the internal temporal constituency of a situation» (Comrie 1976: 3) by choosing between different (but morphologically related) lexical variants.

²² «Za Koschmieder je, kao i za Agrella, glagolski vid pogled na radnju, koji se u slavenskim jezicima gramatikalizirao i predstavlja objektivnu gramatičku kategoriju glagola. Moguća su dva načina gledanja, a svakom odgovara jedan član vidske opozicije.»

5.1. Asymmetric aspectual verb pairs

According to Croatian literature, the members of an aspectual verb pair are usually related to each other either via prefixation, suffixation, or suppletivity (Isaćenko 1968; Silić 1978). For what concerns prefixation, prefixes are always thought to add a new meaning component to that of the base verb (Isaćenko 1968: 363), whereas aspectual pairs related via other derivational strategies should show identical lexical meanings (Łazorczyk 2010: 105; Silić 1978: 46).

However, this is not always the case, as pointed out by both Cvikić & Jelaska (2007: 198) and Kolaković (2020: 122), who bring to our attention the pair *odgovarati/odgovoriti* ‘answer’. These two verbs share their most cognitively salient sense of ‘providing an answer’, but despite their not being derived from one another via prefixation, they do not share the meaning from sentence (6) ‘to suit one’s needs’, which is only characteristic of the imperfective variant *odgovarati*.

- (6) *Termin mi ne odgovara.*
‘The appointment does not suit me.’

Polančec (2018) spots this phenomenon in several verb pairs, including *odgovarati/odgovoriti*. He focuses specifically on what he calls *osamostaljeni izvedeni nesvršeni glagoli* ‘orphan secondary imperfectives’ – i.e. «verbs that have the morphological structure of a derived imperfective verb, but lack their perfective partner in one or all of their meanings» (Polančec 2018: 114)²³ – and provides a new label to refer to their pairs, namely *asimetrični vidski parovi* ‘asymmetrical aspectual pairs’.

But why do these asymmetries take place? It is already accepted that multiple verb meanings can be associated to multiple event types (Breu 1994; Rappaport Hovav & Levin 1998), but could it be that it is in fact the *Aktionsart* encoded in these “asymmetric verb meanings” – i.e. meanings that do not appear in the sense inventory of a verb’s aspectual counterpart – that do not allow for a different viewing of their internal temporal constituency? In other words, could it be that their *Aktionsart* poses a constraint and cannot be preserved using a different aspectual variant without the verb losing its original meaning? This speculation seems to be in line with Kolaković (2018:

²³ «[Glagoli] koji imaju morfološku strukturu izvedenog nesvršenog glagola, ali nemaju svršeni parnjak bilo u jednom od svojih značenja ili pak u svim svojim značenjima.»

95), who believes that «the possibility of realising an aspectual opposition, namely an aspectual partner, depends also on the lexico-actional functions [of the verb meaning]»²⁴ and with Polančec (2020: 160), who points out that:

«The main reason for the importance of grammatical aspect in aspect languages lies in the fact that [...] grammatical aspect is an obligatory, paradigmatic category. This entails that, in many contexts where a verb occurs, grammatical aspect marking is present, and actionality is bound to be perceived via aspect morphology».

To provide more evidence on the intertwined relationship of *Aktionsart* and verbal aspect, an attempt will be made in this contribution at adapting the formalism of event structures (s. section 4) to fit the needs of Croatian aspectual verb pairs. Selected examples featuring both symmetric and asymmetric Croatian verb senses will therefore be analysed and their *Aktionsart* modelled using the selected formalism.

By modelling asymmetrical senses, we hope to find recurring traits in their *Aktionsarten* to justify why a verb may lack a meaning which is available in its aspectual counterpart. On the other hand, symmetrical senses will be modelled to provide a clearer graphical portrayal of the relationship between imperfective and perfective variants.

6. Methodology

Before modelling the *Aktionsarten* of symmetrical and asymmetrical Croatian verb meanings using the formalism of event structures, said meanings had to be identified and sentences portraying them had to be retrieved and evaluated. The following procedure was followed:

- (1) a selection of asymmetrical Croatian aspectual verb pairs was identified within the pattern inventory of the CroaTPAS resource (Marini & Ježek 2019; Marini 2022a) (section 6.1);
- (2) corpus examples portraying both the asymmetrical and symmetrical meanings of the selected verb pairs were extracted from the *hrWaC*

²⁴ «O leksičko-akcionalnim funkcijama ovisi i mogućnost ostvarivanja aspektne opreke, odnosno aspektnoga partnera.»

corpus (Ljubešić & Klubička 2014) and validated by native speakers (section 6.2);

- (3) made-up examples featuring the asymmetrical meanings in the syntactic context of their non-retrieved aspectual counterparts were created and evaluated by native speakers to confirm the agrammaticality of the non-retrieved options (section 6.3).²⁵

6.1. CroaTPAS asymmetrical verb pairs

CroaTPAS²⁶ – i.e. *Croatian Typed Predicate Argument Structures* (Marini & Ježek 2019; Marini 2022a) – is a digital Croatian/English bilingual dictionary containing a collection of corpus-derived Croatian verb valency structures, whose argument slots have been manually annotated with a hierarchy of Semantic Type labels. Like its Italian sister project T-PAS (Ježek *et al.* 2014), CroaTPAS is primarily conceived to frame verb polysemy, since each semantically typed verb argument structure (also called *pattern*) in its inventory corresponds to a different verb sense. The resource currently contains 180 Croatian verbs for a total of 795 different verb senses.

CroaTPAS's annotation methodology is a customized version of Corpus Pattern Analysis (CPA, Hanks 2013), a lexicographic methodology relying on the idea that meaning should be mapped onto its prototypical contexts of use. CPA requires the following four steps:

- (1) 250 corpus concordance lines are randomly sampled for each verb from a reference corpus, in this case, the Croatian Web as Corpus (Ljubešić & Klubička 2014) available on the *Sketch Engine* (Kilgarriff *et al.* 2014);
- (2) the different verb senses are identified by the lexicographer looking at the concordance lines;
- (3) pattern strings are created in a pattern editing environment connected to the online corpus;
- (4) numbers are assigned to the corpus lines exemplifying each pattern, so that they can be retrieved as corpus evidence.

²⁵ Four native speakers between 19 and 32 years of age were involved in the evaluation, 1 man and 3 women, all of them with university degrees in Croatian studies or foreign languages.

²⁶ Available at: <https://croatpas.baisa.cz/>.

The result of this procedure are verb entries such as the one for the imperfective verb *piti* ‘to drink’ portrayed in Figure 3. In this case, six different senses were retrieved in the 250 randomly selected concordance lines, which correspond to the six patterns below. Each pattern string contains the third person singular of the verb under scrutiny together with its arguments, which are represented only by their Semantic Types, conventionally between square brackets. Semantic Types can be found between round brackets when they qualify as “default arguments”, i.e., arguments that can be linguistically omitted while still being necessary for a correct interpretation of the sentence meaning (Ježek 2018: 59). Lexical items contributing to idiomatic verb patterns can be found in curly brackets.

Figure 3. CroaTPAS patterns for the imperfective verb *piti* ‘to drink’

piti

aspect: **imperfective**, related verb: **popiti**

1	[Animate] _{NOMINATIVE} pije ([Liquid] _{ACCUSATIVE}) [Animate] drinks [Liquid]
2	[Human] _{NOMINATIVE} pije ([Drug] _{ACCUSATIVE}) [Human] swallows, ingests [Drug]
3	[Human] _{NOMINATIVE} pije [Human] drinks [Alcoholik Drink]
4	[Human = <i>Football Player</i>] _{NOMINATIVE} pije {gol ili golove} [Human = Football Player] fails to prevent a goal
5	[Human] _{NOMINATIVE} pije [Human] _{DATIVE} {krv} (na {slamku}) [Human] is a nuisance to other [Human]
6	[Vehicle] _{NOMINATIVE} pije [Fuel] _{ACCUSATIVE} [Vehicle] consumes [Fuel]

As we can see, each verb entry is linked to a related verb, in this case the verb *popiti*, which is the perfective aspectual variant of *piti*. This makes

it easy to assess whether both variants possess the same meaning inventory or whether some verb meanings are asymmetrical and pertain to only one of the two.

CroaTPAS contains 17 asymmetrical verb pairings – i.e. pairs of related entries that don't share all their attested meanings. However, not all asymmetrical verb pairings in CroaTPAS are asymmetrical aspectual verb pairs, as shown in Table 5.

Table 5. Asymmetrical verb pairings in CroaTPAS

N.	CroaTPAS verb pairings	Italian equivalent and English translation
1	<i>brojiti/izbrojiti</i>	<i>contare</i> 'to count'
2	<i>dirati/dirnuti</i>	<i>toccare</i> 'to touch'
3	<i>glasati/izglasati</i>	<i>votare</i> 'to vote'
4	<i>gostiti/ugostiti</i>	<i>ospitare</i> 'to host'
5	<i>jesti/pojesti</i>	<i>mangiare</i> 'to eat'
6	<i>odgovarati/odgovoriti</i>	<i>corrispondere</i> 'to correspond'
7	<i>raditi/uraditi</i>	<i>funzionare</i> 'to work'
8	<i>silaziti/sići</i>	<i>scendere</i> 'to descend'
9	<i>štovati/poštovati</i>	<i>rispettare</i> 'to respect'
10	<i>tumačiti/protumačiti</i>	<i>interpretare</i> 'to interpret'
11	<i>tužiti/optužiti</i>	<i>accusare</i> 'to accuse'
12	<i>uputiti/upućivati</i>	<i>avviare</i> 'to start'
13	<i>učiti/naučiti</i>	<i>imparare</i> 'to learn'
14	<i>voditi/provoditi</i>	<i>guidare</i> 'to lead'
15	<i>vući/izvući</i>	<i>trarre</i> 'to draw'
16	<i>zamisliti/zamišljati</i>	<i>immaginare</i> 'to imagine'
17	<i>zvati/pozvati</i>	<i>chiamare</i> 'to call'

This is due to the fact that the choice of Croatian verb pairings to be included in CroaTPAS was made following an Italian-driven procedure, namely selecting the Croatian translational equivalents of a sample of Italian verbs from the fundamental vocabulary of the Italian language – a group of 2,000 words covering about 90% of all Italian written and spoken text (Chiari & De Mauro 2014: 113) – taking them from the Italian/Croatian bilingual dictionary by Špikić (2017), which often offered multiple translation options.

Therefore, some of these pairings (e.g. *vući/izvući*) have been selected to evaluate the semantic impact of prefixes on base verbs rather than based on aspectual opposition.

6.2. GDEX corpus example extraction

Given that, in this study, our interest is restricted only to Croatian asymmetrical aspectual verb pairs not derivationally related by prefixations (s. section 5.1), the only CroaTPAS verb pairings that will be analysed are those in Table 6, whose English translations have been adapted to better fit their main attested meaning in Croatian.

Table 6. Asymmetrical non-prefixed aspectual verb pairs in CroaTPAS

N.	CroaTPAS aspectual verb pairs	English translation
1	<i>dirati/dirnuti</i>	‘to touch’
2	<i>odgovarati/odgovoriti</i>	‘to answer’
3	<i>silaziti/sići</i>	‘to descend’
4	<i>uputiti/upućivati</i>	‘to send’
5	<i>zamisliti/zamišljati</i>	‘to imagine’

In order to be able to carry out our analysis, corpus examples portraying both the asymmetrical and symmetrical meanings of these verb pairs were extracted from the *hrWaC* corpus (Ljubešić & Klubička 2014) and validated by native speakers.

Indeed, even though CroaTPAS as a whole has already been evaluated and is able to represent the polysemy of the Croatian verbs it contains (Marini 2022b), since its pattern inventory relies on the manual annotation carried out by a single annotator on a corpus containing a finite number of examples, Croatian informants have been called upon to confirm the asymmetry of the verb pairs from Table 6 and the grammaticality of the corpus examples extracted to represent them.

As a matter of fact, to provide examples of both the symmetric and asymmetric meanings of the verbs from Table 6, only corpus examples scoring at least 0.8 on the GDEX algorithm (Kilgarriff *et al.* 2008) were extracted from the *hrWaC* corpus (Ljubešić & Klubička 2014). GDEX (*Good Dictionary EXamples*) is an algorithm able to identify corpus examples that are well-fitted for lexicographic and teaching purposes. It is embedded in

the *Sketch Engine* platform and automatically assigns corpus sentences a score from 0 to 1 based on their level of lexical and syntactic complexity.

Table 7 provides an overview of all the validated GDEX examples providing information about their aspectual value (column 2), GDEX score (column 4), and whether they are symmetric (S) or asymmetric (A) (column 5).

Table 7. Selection of GDEX examples extracted from the *hrWaC* corpus

Meaning	Aspect	Example	GDEX	S/A
<i>dirati_1</i>	<i>imperf.</i>	<i>Ne diraj me, ne diram te.</i> 'Don't touch me, and I won't be touching you.'	0.871	S
<i>dirnuti_1</i>	<i>perf.</i>	<i>Koliko ste puta loptu dirnuli u tih dvadesetak minuta na travnjaku?</i> 'How many times have you touched the ball in those twenty minutes on the field?'	0.894	S
<i>dirati_se_5</i>	<i>imperf.</i>	<i>Diraju se bez ikakvog rizika od trudnoće.</i> 'They masturbate without any risk of pregnancy.'	0.846	A
<i>odgovarati_1</i>	<i>imperf.</i>	<i>Ne želim tebi ovdje ništa sugerirati, samo ti odgovaram na pitanje.</i> 'I do not want to suggest anything here, I am just answering the question.'	0.924	S
<i>odgovoriti_1</i>	<i>perf.</i>	<i>Mene si citirao, pa ću ti i odgovoriti.</i> 'You mentioned me, so I am also going to give you an answer.'	0.925	S
<i>odgovarati_2</i>	<i>imperf.</i>	<i>Firma ne odgovara za neuspjele rezervacije.</i> 'The company does not answer for unsuccessful bookings.'	0.838	A
<i>odgovarati_3</i>	<i>imperf.</i>	<i>Ako ti to ne odgovara - ne odgovara ti ni posao u bankarskom sektoru.</i> 'If this does not suit you – then also a bank job will not suit you.'	0.925	A
<i>odgovarati_4</i>	<i>imperf.</i>	<i>Niti jedan od naših postojećih dizajna ne odgovara Vašim željama?</i> 'Not even one of our existing designs corresponds to your wishes?'	0.925	A
<i>odgovarati_5</i>	<i>imperf.</i>	<i>Glavni tajnik za svoj rad odgovara Predsjedniku.</i> 'The Secretary General answers to the President for his work.'	0.825	A
<i>odgovarati_6</i>	<i>imperf.</i>	<i>Sutra pišem biologiju i odgovaram filozofiju.</i> 'Tomorrow, I have to sit a biology exam and to be orally tested in philosophy.'	0.837	A

<i>silaziti_1</i>	<i>imperf.</i>	Silazim s busa iz Botinca. 'I am getting off of the bus from Botinec.'	0.830	S
<i>sići_1</i>	<i>perf.</i>	Obojica su sišla s traktora i počeli se tući. 'The two got off the tractor and started to hit each other.'	0.905	S
<i>silaziti_6</i>	<i>imperf.</i>	Smiješak joj ne silazi s lijepog lica. 'The smile does not get off of her face.'	0.893	A
<i>upućivati_1</i>	<i>imperf.</i>	Poseban poziv upućujemo bivšim članovima zbora. 'We send a special invitation to former choir members.'	0.95	S
<i>uputiti_1</i>	<i>perf.</i>	Organizator će svim klubovima uputiti pismo zahvale. 'The organizer will send thank you letters to all clubs.'	0.95	S
<i>upućivati_4</i>	<i>imperf.</i>	Taj naziv upućuje na japodsku tradiciju. 'That term refers to a Iapodian tradition'	0.902	A
<i>zamišljati_1</i>	<i>imperf.</i>	Naravno da ponekad u mašti zamišljam one grube situacije. 'Of course, sometimes in my mind I imagine awful situations.'	0.9	S
<i>zamisliti_1</i>	<i>perf.</i>	Zamislite svijet gdje moraš raditi samo što ti kažu. 'Imagine a world in which you have to do only what you are told.'	0.95	S
<i>zamisliti_se_2</i>	<i>perf.</i>	Čovjek se zamisli nad svakom sitnicom koja mu padne na pamet. 'The guy becomes pensive because of every little thing that comes to his mind'	0.95	A

As we can see, symmetric meanings available in both the perfective and imperfective variant of a given aspectual pair bear the same meaning number (*zamisliti_1* vs. *zamišljati_1*), which are also their pattern numbers in the CroaTPAS resource. The examples from Table 7 will be dealt with in section 7.

6.3. Made-up examples

On the other hand, when no corpus examples portraying a given verb sense were found, we had to make sure that that sense was indeed asymmetric, and that the absence of its aspectual counterpart was not due to insufficient corpus evidence.

Therefore, made-up examples featuring syntactic contexts that would normally trigger the use of the non-retrieved aspectual variants were created and evaluated by three native speakers to confirm the agrammaticality of the non-retrieved options and the subsequent asymmetry of the featured variant. Table 8 contains all the made-up examples that were created to confirm the asymmetric meanings from Table 7.

Table 8. Made-up examples used to confirm the asymmetric meanings from Table 7.²⁷

N.	Example	Options	Syntactic cues
1	<i>Nakon što su se _____, vodili su ljubav.</i> 'After engaging in masturbation, they made love.'	dirali /dirnuli	<i>nakon što,</i> <i>perfective-oriented</i>
2	<i>Čim mi posao _____, izgubim interes.</i> 'As soon as a job suits me, I lose interest.'	odgovara /odgovori	<i>čim,</i> <i>perfective-oriented</i>
3	<i>Čim dizajn bude _____ Vašim željama, počet ćemo graditi zgradu.</i> 'As soon as the design corresponds to your wishes, we will start building.'	odgovarao /odgovorio	<i>čim,</i> <i>perfective-oriented</i>
4	<i>Prije nego što je Glavni tajnik za svoj rad _____ Predsjedniku, odgovarao je samo Upravnom odboru.</i> 'Before the Secretary General responded for his work to the President, he answered only to the Steering Committee.'	odgovarao /odgovorio	<i>prije nego što,</i> <i>perfective-oriented</i>
5	<i>Nakon što sam _____ filozofiju, išla sam kući.</i> 'After being orally tested in philosophy, I went back home'	odgovarala /odgovorila	<i>nakon što,</i> <i>perfective-oriented</i>
6	<i>Čim diktator bude _____ za svoje zločine, prihvatit ćemo Vaše uvjete.</i> 'As soon as the dictator answers for his crimes, we will accept your conditions.'	odgovarao /odgovorio	<i>čim,</i> <i>perfective-oriented</i>
7	<i>Čim joj osmijeh _____ s lica, rasplakat će se.</i> 'As soon as the smile leaves her face, she will start crying.'	siđe /silazi	<i>čim,</i> <i>perfective-oriented</i>

²⁷ The grammatical option is highlighted in bold.

8	<i>Prije nego što je ime na to _____, ne znamo što je značilo.</i> 'Before the meaning referred to that, we don't know what it meant.'	upućivalo /uputilo	<i>prije nego što,</i> <i>perfective-oriented</i>
9	<i>Danima se umjetnik _____.</i> 'The artist was pensive for days.'	zamislilo/zamišljao	<i>danima,</i> <i>imperfective-oriented</i>

As it can be seen in the Table 8, when the missing aspectual variant for a given meaning was the perfective one, a made-up example was created starting off with a subordinative conjunction that would usually require the use of a perfective verb afterwards, e.g. *čim* 'as soon as', *prije nego što* 'before', or *nakon što* 'after' (Čilaš Mikulić *et al* 2015: 59; Matovac 2022: 229). This is the case of example (2) from Table 8, which was created to ascertain the asymmetry of *odgovarati_3* 'to suit somebody' from Table 7.

Respondents were presented with a fill-in-the-blanks task where they had to choose between the perfective or imperfective variant of the given verb, in this case *odgovara* (imperfective) or *odgovori* (perfective). The option that the respondents agreed on is highlighted in bold. The fact that, in this case, the imperfective variant *odgovara* was still necessary even in a perfective-oriented scenario gives us evidence of the asymmetry of this specific meaning.

Please, take notice that under the influence of the subordinative conjunction *čim* 'as soon as', in sentences (3) and (6), the perfective auxiliary *bude* was used, but in both cases the choice of the lexical verb still falls on the imperfective variant *odgovarati* and not on *odgovoriti*.

When the possibly asymmetrical meaning was a perfective one, an imperfective-oriented syntactic environment was created using the adverb *danima* 'for days' (Čilaš Mikulić *et al* 2015: 59), as in the case of example (9) from Table 8, which was created to assess the asymmetry of the reflexive meaning *zamisliti_se_2* 'to become pensive' from Table 7. Considering the fact that neither of the possible answers is highlighted in bold, in this case the respondents found the use of both the perfective and imperfective variant agrammatical, which indeed does make the meaning *zamisliti_se_2* 'to become pensive' an asymmetric one. More will be said on this in section 7.2.

7. Analysis

In this section, we will analyse the interaction between *Aktionsart* and verbal aspect in Croatian aspectual verb pairs by modelling both the symmetric (section 7.1) and asymmetric verb senses (s. section 7.2) identified in Table 7 using the formalism of event structures (section 4).

We will show how event structures are able to graphically mirror the lexical link between the perfective and imperfective variant in aspectual pairs, while at the same time allowing for a view of perfectivity in line with Comrie's *blob* metaphor (1976: 18). Moreover, event structures will all be useful in the modelling of asymmetrical meanings, allowing us to visualize why a verb may lack a meaning which is available in its aspectual counterpart.

The CroaTPAS aspectual verb pairs that are going to be at the centre of this analysis are those from Table 6: *dirati/dirnuti* 'to touch', *odgovarati/odgovoriti* 'to answer', *silaziti/sići* 'to descend', *uputiti/upućivati* 'to send', and *zamisliti/zamišljati* 'to imagine'.

7.1. Modelling symmetric verb meanings

The following examples are taken from Table 7 and are all cases of symmetric meanings, i.e. meanings that can be expressed using both the perfective and imperfective variant of the same aspectual pair. For instance, examples (7a) and (7b) feature the meaning 'touching a physical entity', which can be expressed perfectly by the variant *dirnuti* and imperfectively by the variant *dirati*.

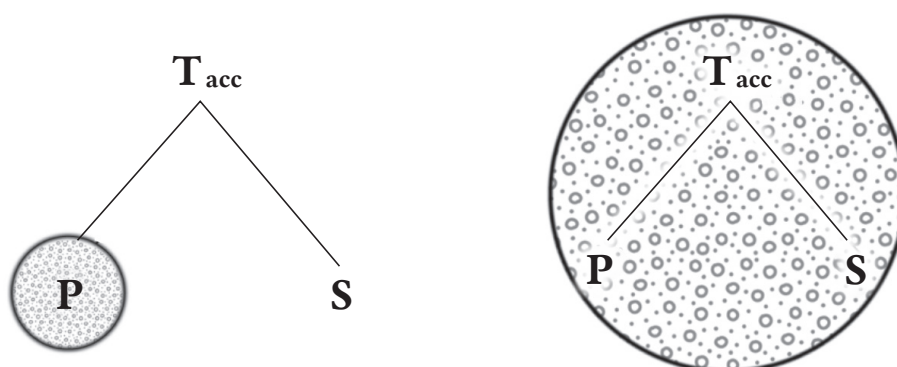
- (7) a. *Ne diraj me, ne **diram** te.*
 'Don't touch me, and I won't touch you.'
- b. *Koliko **ste** puta loptu **dirnuli** u tih dvadesetak minuta na travnjaku?*
 'How many times have you touched the ball in those twenty minutes on the field?'

In (7a), *diram* is actually a present tense used to express a future scope, which is why it was translated as 'I won't touch you'. The focus is not on the completed action, but rather on a future scenario when the action is being carried out, something along the lines of 'there will be no touching on my part'. On the other hand, even though in (7b) there is explicit mention of a number of times the ball has been touched, each touching event is seen

as completed, which is why the choice of aspectual variant falls on the perfective one.

In light of this, the best event structures to model the highlighted events in (7a) and (7b) are *transitions*, specifically *accomplishments* (T_{acc}), like the ones in Figure 4.

Figure 4. Accomplishment event structures modelling symmetric meanings in Croatian aspectual pairs



The imperfective *touching* event in sentence (7a) can be seen as the *process* phase of a T_{acc} event structure (Figure 4, to the left), while the structure to the right allows us to consider the *transition* in its whole including the resulting *state* of the ball being touched, as in example (7b).

We believe that T_{acc} event structures are uniquely able to model symmetric verb senses, because the link between their branches mirrors the link between aspectual variants. As a matter of fact, when an imperfective verb is used, the focus is on the P branch, but the rest of the structure still exists – just like the possibility of using the same meaning perfectly. On the other hand, when the perfective variant is used, the focus is on the T_{acc} structure as a whole, but we can still catch a glimpse of the P phase within the overall event – just like we know that an imperfective variant still exists.

To further implement this idea, *patterned focus circles* were added to show which event phase to focus on depending on the example. We believe this graphical rendition to be particularly helpful to explain the perfective view of a situation, as well as in line with Comrie's (1976: 18) *blob* metaphor, since the internal complexity of the T_{acc} is maintained and not reduced to a single point.

The next aspectual pair that will be analysed is *odgovarati/odgovoriti*, whose most salient symmetric meaning is that of ‘providing an answer’, as testified by corpus examples (8a) and (8b):

- (8) a. *Ne želim tebi ovdje ništa sugerirati, samo ti **odgovaram** na pitanje.*
 ‘I do not want to suggest anything here, I am just answering the question.’
 b. *Mene si citirao, pa **ću** ti i **odgovoriti**.*
 ‘You mentioned me, so I am also going to give you an answer.’

In much the same way as in examples (7a) and (7b), were we to assign an *Aktionsart* to the event of ‘providing an answer’, the most fitting one would be that of an *accomplishment*, since we can identify a *process* phase (the answering) bringing about a change, which is the existence of an answer (a new entity) by the end of the *transition*. In example (8a), the use of the imperfective variant *odgovarati* allows us to peek into the structure of the event focusing only on the subevent characterized by processuality, whereas the use of the perfective variant *odgovoriti* in (8b) makes us look at the event as a whole and at its being accomplished – even if in the future. Please, take notice of the choice of verb tenses used in the English translations: a progressive form to render the imperfective view, and the actual lexical presence of an end state (*the answer*) to provide the same perspective given by the perfective variant.

Also in this case, the event structure that we can use to model the events in (8a) and (8b) is a T_{acc} event structure (Figure 4), since it provides the possibility of singling out and associating its different structural elements to the two aspectual variants of the verb pair, while mirroring the existing link between them.

The focus in (8a) is on the first branch (i.e. on the process phase) because the structure models the use of the imperfective variant *odgovarati* which allows us to view the event as in progress. However, the rest of the structure does not disappear. The event of ‘answering’ still entails a resulting state, which is just not our primary concern when choosing this specific variant. Conversely, in the structure to the right, the focus is on the transition as an undivided whole, as expressed in (8b) by the perfective variant *odgovoriti*.

The same goes for examples (9a–b), (10a–b), and (11a–b):

- (9) a. ***Silazim** s busa iz Botinca.*
 ‘I am getting off of the bus from Botinec.’
 b. *Obojica **su sišla** s traktora i počeli se tući.*
 ‘The two got off the tractor and started to hit each other.’

- (10) a. *Poseban poziv **upućujemo** bivšim članovima zbora.*
 ‘We are sending a special invitation to former choir members.’
 b. *Organizator će svim klubovima **uputiti** pismo zahvale.*
 ‘The organizer will send thank you letters to all clubs.’
- (11) a. *Naravno da ponekad u mašti **zamišljam** one grube situacije.*
 ‘Of course, sometimes in my mind I imagine awful situations.’
 b. ***Zamislite** svijet gdje moraš raditi samo što ti kažu.*
 ‘Imagine a world in which you have to do only what you are told.’

In (9a), (10a), and (11a), we are presented with imperfective views of the events of ‘getting off of a bus’, ‘sending an invitation’, and ‘imagining situations’. However, all of these meanings are actually symmetric, and can also be expressed using the perfective variants of their respective aspectual pair, as in (9b), (10b), and (11b).

All the events expressed by the imperfective variants can be associated with actions that are either portrayed as taking place at the moment of speaking, as in (9a) and (10a), or as habitual but still durative, as in (11a). Therefore, all these events can be seen, and subsequently modelled, as the *process* phases of a T_{acc} event structure (Figure 4, to the left).

On the other hand, all the events expressed by the perfective variants are presented as a whole – despite the change in verbal tenses: in (9b) we have a past tense (*su sišla*, ‘they got off’), in (10b) a future (*će uputiti*, ‘he will send’), and in (11b) an imperative (*zamislite*, ‘imagine’). In all these cases, the events are considered globally and can thus be modelled as T_{acc} event structures, where the focus circles surrounding the structures help visualising them as a blob.

Before turning to the asymmetric meanings from Table 7, let us consider the fact that all the symmetric meanings we found in our inventory could be modelled as the different phases of an *accomplishment* event structure (T_{acc}). This supports the data from Polančec (2015: 83), who states that most of the Croatian verbs that pass the *accomplishment* test are perfective verbs belonging to aspectual pairs whose imperfective counterparts pass the durativity test.

7.2. Modelling asymmetric verb meanings

In the following section, we will encounter only asymmetric verb meanings – i.e. meanings that are absent from the inventory of one of the aspectual variants making up a verb pair. To make sure they were indeed asymmetric, made-up examples with syntactic contexts that require the use of the non-

retrieved aspectual variant were created and validated by native speakers (s. Table 8).

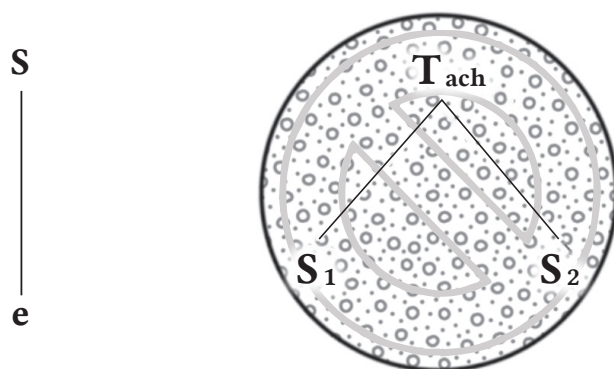
The *Aktionsart* of these validated asymmetrical meanings will now be modelled using the formalism of event structures to provide a graphical representation that may help us better understand their asymmetry.

The first meaning we will focus on belongs to the imperfective verb *odgovarati* and is amiss in its perfective counterpart *odgovoriti*. It is the meaning of ‘suiting somebody’ that we find in the corpus-extracted sentence (12a):

- (12) a. *Ako ti to ne odgovara – ne **odgovara** ti ni posao u bankarskom sektoru.*
 ‘If this does not suit you – then also a bank job will not [suit you].’
 b. **Čim mi nešto **odgovori**, izgubim interes.*
 ‘As soon as something suits me, I lose interest.’
 c. *Čim mi nešto **odgovara**, izgubim interes.*
 ‘As soon as something suits me, I lose interest.’

As shown in (12b), the perfective variant *odgovoriti* cannot be used to express this meaning despite the presence of the conjunction *čim* (‘as soon as’), which typically favours a perfective view on events. Our respondents opted for the use of the variant *odgovarati* both by itself (12c) and introduced by the phase verb *početi* (‘to start’) as in *Čim mi nešto **počne odgovarati**, izgubim interes* ‘As soon as something starts to suit me, I lose interest’. We found this last solution particularly interesting since it effectively solves the problem of being presented a perfective-oriented environment while being forced to use an imperfective form.²⁸

Figure 5. Event structures modelling asymmetric state meanings



²⁸ See Batinić Angster (*this volume*, Chapter 4, section 4.3.5) for a discussion of the temporal uniformity of infinitives embedded by phasal or aspectual verbs, among others.

In terms of *Aktionsart*, both the events from (12a) and (12c) can be categorised as *states*, since in both cases we deal with events that are homogeneous, atelic, and lasting (Kolaković 2018: 95). Indeed, in (12c) we can identify a beginning for this state that is caused by the choice of connector ('as soon as'), but this does not change the fact that the event of 'being suitable' expressed by *odgovarati* is just one single *state* and not a *transition* between *state*₁ and *state*₂, thus making it impossible to model this meaning using the event structure of an achievement (T_{ach}) like the one on the right of Figure 5.

In other words, the lack of telicity in the meaning makes it impossible for the variant *odgovoriti* to be used even in a perfective-oriented context such as that of (12b). We can therefore state that the *Aktionsart* of this meaning poses a constraint to the creation of a perfective view of the event, which makes the meaning asymmetric.

A similar situation is to be found in examples (13a–c), still relating to the pair *odgovarati/odgovoriti*. The asymmetric sense this time is that of 'corresponding to something', which can be expressed only with the imperfective variant *odgovarati*.

- (13) a. *Niti jedan od naših postojećih dizajna ne **odgovara** Vašim željama?*
 'Not even one of our existing designs corresponds to your wishes?'
 b. **Čim dizajn **bude odgovorio** Vašim željama, počet ćemo graditi zgradu.*
 'As soon as the design corresponds to your wishes, we will start building.'
 c. *Čim dizajn **bude odgovarao** Vašim željama, počet ćemo graditi zgradu.*
 'As soon as the design corresponds to your wishes, we will start building.'

Despite the use of the connector *čim* 'as soon as' trying to elicit the use of the perfective variant *odgovoriti* (13b), the meaning of 'corresponding to something' can only be expressed by *odgovarati*, (13c). Only the perfective auxiliary *bude* aligns with the conjunction, but not the verb on a lexical level. Also in this case, the *Aktionsart* of the involved verb meaning is that of *state*, since we are dealing with a homogeneous, atelic event characterized by a certain duration (Kolaković 2018: 95). Even though we can hope there will be a moment in which the design will start to meet the client's expectations and finally correspond to what he or she wants, the verb does not express a *transition*, but simply a *future state*.

Once again, the structures in Figure 5 can model the situation: the state of ‘corresponding to one’s wishes’ cannot be reduced to the starting state (S_1) of an achievement event structure (T_{ach}) to be viewed globally using a perfective variant because there is no telic element in the meaning to begin with. Also in this case, to put it in Kolaković’s words, it is the actional properties of the verb meaning that are preventing the realisation of the aspectual partner *odgovoriti* (Kolaković 2018: 95).

The same goes for examples (14a–c), (15a–c), as well as (16a–c). The latter triple features the aspectual pair *upućivati/uputiti*, where the meaning of ‘referring to’ results typical only of the imperfective variant *upućivati* and goes amiss in the perfective one *uputiti* because of the constraints posed by the fact that the meaning expresses an atelic *state*. To support this, we can use Polančec’s test and ask the question *Što se događa?* ‘What is happening?’ (2015: 79), which does elicit a negative answer, since nothing is happening if something is simply ‘referring to a tradition’ (16a).

- (14) a. *Glavni tajnik za svoj rad **odgovara** Predsjedniku.*
 ‘The Secretary General answers to the President for his work.’
 b. **Prije nego što **je** Glavni tajnik za svoj rad **odgovorio** Predsjedniku, odgovarao je samo Upravnom odboru.*
 ‘Before the Secretary General answered to the President for his work, he answered only to the Steering Committee.’
 c. *Prije nego što **je** Glavni tajnik za svoj rad **odgovarao** Predsjedniku, odgovarao je samo Upravnom odboru.*
 ‘Before the Secretary General answered to the President for his work, he answered only to the Steering Committee.’
- (15) a. *Firma ne **odgovara** za neuspjele rezervacije.*
 ‘The company does not answer for unsuccessful bookings.’
 b. **Čim diktator **bude odgovorio** za svoje zločine, prihvatit ćemo Vaše uvjete.*
 ‘As soon as the dictator answers for his crimes, we will accept your conditions.’
 c. *Čim diktator **bude odgovarao** za svoje zločine, prihvatit ćemo Vaše uvjete.*
 ‘As soon as the dictator answers for his crimes, we will accept your conditions.’

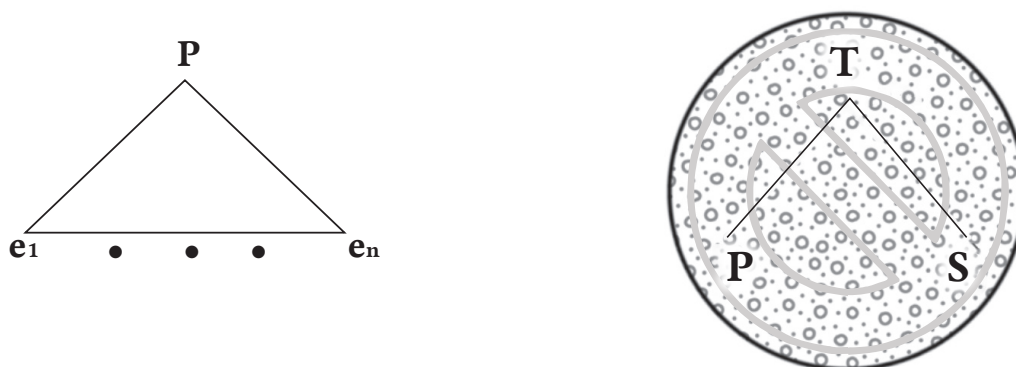
- (16) a. *Taj naziv **upućuje** na japodsku tradiciju.*
 ‘That term refers to a tradition of Japode.’
 b. **Prije nego što **je** ime na to **uputilo**, ne znamo što je značilo.*
 ‘Before the meaning referred to that, we don’t know what it meant.’
 c. *Prije nego što **je** ime na to **upućivalo**, ne znamo što je značilo.*
 ‘Before the meaning referred to that, we don’t know what it meant.’
 On the other hand, something quite different happens in examples (17a–c):
- (17) a. *Sutra pišem biologiju i **odgovaram** filozofiju.*
 ‘Tomorrow, I have to sit a biology exam and to be orally tested in philosophy.’
 b. **Nakon što **sam odgovorila** filozofiju, išla sam kući.*
 ‘After being orally tested in philosophy, I went back home.’
 c. *Nakon što **sam odgovarala** filozofiju, išla sam kući.*
 ‘After being orally tested in philosophy, I went back home.’

In (17b), the meaning that goes amiss in the perfective variant *odgovoriti* is that of ‘being orally tested, undergoing an oral test’, which is present in the sense inventory of the imperfective variant *odgovarati*. What justifies this asymmetry is the fact that a perfective view on the event would somehow undermine the main actional feature of the meaning itself, which is that of processuality. ‘Being tested’ is an event which has a certain duration and dynamicity (not all its moments are the same), but it lacks a goal, it is not a telic event because the person who is being tested has no control over the end of the activity. Indeed, we can even test whether this meaning qualifies as a *process* (or *activity*) using a durativity test:

- (18) a. *Odgovarala sam filozofiju **sat vremena**.*
 ‘I have been orally tested in philosophy for an hour.’

Considering all this, we find ourselves in a different predicament than in the previous examples. This time the actional constraint which does not allow for the use of the perfective variant *odgovoriti* is not the *state* character of the event, but its being a *process* which cannot be reduced to the first phase of an *accomplishment* (as portrayed by the agrammatical event structure to the right of Figure 6).

Figure 6. Event structures modelling asymmetric process meanings



The same goes for the meaning exemplified in (19a) and (19c), namely that of ‘engaging in masturbation’. Also in this case, we find ourselves facing an asymmetric meaning (a reflexive one this time), which cannot be expressed by the perfective variant *dirnuti se*, but only by the imperfective one *dirati se*.

- (19) a. ***Diraju se bez ikakvog rizika od trudnoće.***
 ‘They masturbate without any risk of pregnancy.’
 b. ***Nakon što su se dirnuli, vodili su ljubav.***
 ‘After having touched each other, they made love.’
 c. ***Nakon što su se dirali, vodili su ljubav.***
 ‘After engaging in masturbation, they made love.’

As a matter of fact, if we used *dirnuti se* as in (19b), the sentence would not be ungrammatical, but the sexual meaning would be lost and the new sentence would read something like ‘After having touched each other (with their hands), they made love’. This is because this latter meaning of the pair *dirati/dirnuti* is a symmetrical one whose internal structure can be modelled like an accomplishment. Conversely, the meaning in (19c) cannot be expressed with the perfective variant *dirnuti*, because – even though it does express a completed action – it needs to underline the durativity of said activity.

In terms of event structures, this translates to saying that the best structure to model (19c) is the same as (19a), i.e. that of an autonomous *process* which cannot be traced back to the first phase of an *accomplishment* event like the one to the right of Figure 6.

Let us now turn to the asymmetric reflexive meaning *zamisliti se* ‘becoming pensive’, which lacks an imperfective counterpart. This prompted

us to create an imperfective-oriented context using the adverb *danima* ‘for days’, to try to elicit the use of an imperfective form (Čilaš Mikulić *et al* 2015: 59), as can be seen in sentences (20b–c).

- (20) a. *Čovjek se zamisli nad svakom sitnicom koja mu padne na pamet.*
 ‘The guy becomes pensive over every little thing that comes to his mind.’
- b. **Danima se umjetnik zamišljao.*
 ‘The artist was pensive for days.’
- c. **Danima se umjetnik zamislio.*
 ‘The artist was pensive for days.’
- d. *Danima je umjetnik bio zamišljen.*
 ‘The artist was pensive for days.’

‘Becoming pensive’ is a classic example of a verb expressing a change of state (an *achievement* in Vendler’s (1957) terminology), i.e. an event involving two subsequent states (S_1 and S_2): the first being a non-pensive state of mind and the second a pensive one (Figure 7, to the left).

Figure 7. Event structures modelling asymmetric achievement meanings



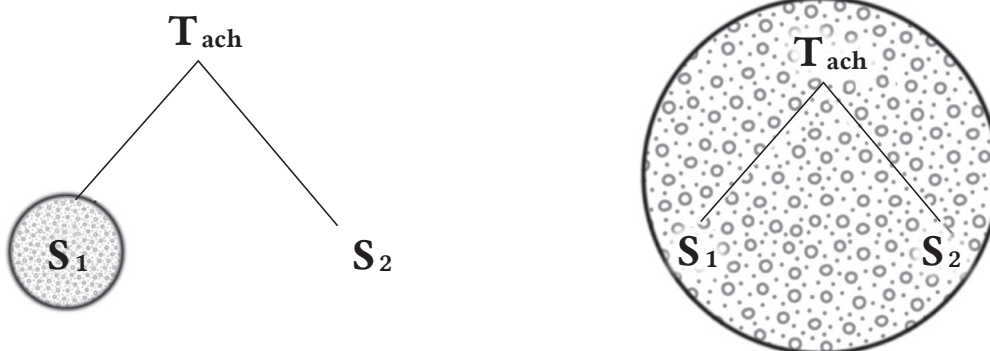
According to our respondents, neither the imperfective variant *zamišljati (se)* nor the perfective one *zamisliti (se)* can express the beginning state (S_1) nor the end state (S_2), as can be seen from (20b–c). However, other verbal expressions can be used, such as *biti zamišljen* ‘being pensive’, as can be seen from example (20d) *Danima je umjetnik bio zamišljen* ‘The artist was pensive for days.’ The event structure to the right of Figure 7 tries to model this situation, portraying the impossibility to peer into the different phases of the transition using the same verbal expression used to refer to the transition itself.

Finally, the last meaning that we are going to consider is the one from sentence (21a), namely the idiomatic meaning *smiješak nekome ne silazi s lica* ‘somebody cannot get a smile off of their face’. In this case, respondents did not find this meaning to be asymmetric, since it was enough to leave out the negation from the perfective-oriented scenario to allow the meaning to be used perfectly with the variant *sići*, as can be seen from (21c).

- (21) a. *Smiješak joj ne silazi s lijepog lica.*
 ‘The smile does not get off of her face.’
 b. **Čim joj osmijeh silazi s lica, rasplakat će se.*
 ‘As soon as the smile leaves her face, she will start crying.’
 c. *Čim joj osmijeh siđe s lica, rasplakat će se.*
 ‘As soon as the smile leaves her face, she will start crying.’

In terms of *Aktionsarten*, the meaning in (21a) can be modelled as a state, because nothing is happening if a smile does not get off of somebody’s face. On the other hand, example (21c) expresses a transition, a change of state, from an S_1 (smile is there) to an S_2 (smile has left). The two meanings can therefore be modelled as the beginning state of an achievement (Figure 8, to the left) and as the achievement itself, considered in its entirety, as highlighted by the focus circle around the event structure on the right of Figure 8.

Figure 8. Event structures modelling asymmetric achievement meanings



What can be considered asymmetric is the idiomaticity of the imperfective meaning in (21a), since it is considerably more commonly used than the perfective one from (21c), as testified by corpus data.

8. Conclusions

The aim of this contribution was to shed light on the intricate relationship between aspect and *Aktionsart* in Croatian aspectual verb pairs, first by providing a comprehensive historical overview of these concepts (s. section 2 and 3), and secondly by modelling the *Aktionsart* of a selection of Croatian verb meanings using a customized version of the formalism of event structures (section 4).

Special attention was devoted to aspectual pairs lacking one or more meanings that are present in the sense inventory of their aspectual counterpart. These are called *asymmetrical aspectual pairs* (Polančec 2022: 127–29) and their asymmetry is believed to be caused by constraints posed by the *Aktionsart* of the meanings involved (Kolaković 2018: 95; Polančec 2020: 160).

The following methodology was followed: (1) asymmetrical Croatian aspectual pairs from the CroaTPAS resource (Marini & Ježek 2019; Marini 2022a) were identified (section 6.1); (2) corpus examples portraying both the asymmetrical and symmetrical meanings were extracted from the *hrWaC* corpus (Ljubešić & Klubička 2014) (section 6.2); (3) made-up examples featuring the asymmetrical meanings in the syntactic context of their non-retrieved aspectual partners were created and evaluated by native speakers to confirm the asymmetry (section 6.3).

Both the corpus-extracted (Table 7) and made-up examples (Table 8) were analysed and modelled using event structures, which we believe have proven particularly effective on several levels. As far as the symmetrical meanings go, event structures were able to provide a graphical portrayal of the relationship between perfective and imperfective variants (section 7.1), while at the same time allowing for a view of perfectivity in line with Comrie's (1976: 18) *blob* metaphor. Moreover, event structures have also proven useful in the modelling of asymmetrical meanings (section 7.2), allowing us to visualize the actional reasons behind the asymmetries. According to our results, all *Aktionsarten* (*states*, *processes*, and *transitions*) seem to have the potential to pose certain constraints on the aspectual viewing of the events they encode and to prevent verbs from displaying meanings that are available to their aspectual counterparts.

Appendix

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Abbreviations

ACT	activity
e	event
INGR	ingressive
P	process
S	state
T	transition
T _{acc}	accomplishment
T _{ach}	achievement

References

- Agrell, S. (1908). *Aspektänderung Und Aktionsartbildung Beim Polnischen Zeitworte*. Lund: Håkan Ohlssons Buchdruckerei.
- Babić, S. (2002). *Tvorba riječi u hrvatskome književnome jeziku*. Zagreb: Hrvatska akademija znanosti i umjetnosti/Globus nakladni zavod.
- Barić, E., Lončarić, M., Malić, D., Pavešić, S., Peti, M., Zečević, V. & Znika, M. (1995). *Hrvatska gramatika*. Zagreb: Školska knjiga.
- Binnick, R. I. (1991). *Time and the Verb: A Guide to Tense and Aspect*. New York/Oxford: Oxford University Press.
- Browne, W. (1993). Serbo-Croat. In: Comrie, B. & Corbett G. G. (eds) *The Slavonic Languages*, 306–387. London: Routledge.
- Brugmann, K. (1904). *Kurze Vergleichende Grammatik Der Indogermanischen Sprachen*. Strassbourg: Trübner.
- Chiari, I. & De Mauro, T. (2014). The New Basic Vocabulary of Italian as a Linguistic Resource. In: Basili, R. & Lenci, A. (eds) *Proceedings of the 1st Italian Conference on Computational Linguistics*, 113–116. Pisa: Pisa University Press.
- Čilaš Mikulić, M., Gulešić Machata, M. & Udier, S. (2015). *Razgovarajte s nama! Udžbenik hrvatskoga kao drugoga i stranoga jezika za stupanj B2*. Zagreb: FF Press.
- Comrie, B. (1976). *Aspect: An Introduction to the Study of Verbal Aspect and Related Problems*. Cambridge: Cambridge University Press.
- Cvikić, L. & Jelaska, Z. (2007). Složenost ovladavanja glagolskim vidom u inojezičnome hrvatskome. *Lahor: časopis za hrvatski kao materinski, drugi i strani jezik*, 2(4), 190–216.

- Dowty, D. R. (1979). *Word Meaning and Montague Grammar: The Semantics of Verbs and Times in Generative Semantics and in Montague's PTQ*. Dordrecht: D. Reidel Publishing Company.
- Gojmerac, M. (1980). *Glagolski vid u hrvatskome ili srpskom i njemačkom jeziku*. PhD thesis, University of Zagreb.
- Gorbov, A. (2020). Aktionsart. *Encyclopedia of Slavic Languages and Linguistics Online*.
- Hanks, P. (2013). *Lexical Analysis: Norms and Exploitations*. Cambridge (MA): MIT Press.
- Isačenko, A. V. (1968). *Die Russische Sprache Der Gegenwart. Formenlehre*. Niemeyer: Halle.
- Ježek, E. (2018). Partecipanti impliciti nella struttura argomentale dei verbi. In: Dallabrida, S. & Cordin, P. (eds.) *La grammatica delle valenze. Spunti teorici, strumenti e applicazioni*, 55–71. Firenze: Franco Cesati.
- Ježek, E., Bernardo, M., Feltracco, A., Bianchini, A. & Popescu O. (2014). T-PAS: A Resource of Corpus-Derived Typed Predicate-Argument Structures for Linguistic Analysis and Semantic Processing. In: *Proceedings of the Ninth International Conference on Language Resources and Evaluation (LREC'14)*, 890–895.
- Kilgarriff, A., Vitek, B., Bušta, J., Jakubíček, M., Kovář, V., Michelfeit, J., Rychlý, P. & Suchomel, V. (2014). The Sketch Engine: Ten Years On. *Lexicography*, 1, 7–36.
- Kilgarriff, A., Husák, M., McAdam, K., Rundell, M. & Rychlý, P. (2008). GDEX: Automatically Finding Good Dictionary Examples in a Corpus. In: *Proceedings of the XIII EURALEX International Congress*, 425–432.
- Kolaković, Z. (2018). *Dvoaspektni glagoli – Razlike između (p)opisa u priručnicima i stanja u korpusu s posebnim osvrtom na uporabu izvornih govornika*. PhD thesis, University of Zagreb/University of Regensburg.
- Kolaković, Z. (2020). Par – Nepar – Aspektni Par*. *Jezikoslovlje*, 21(2), 103–147.
- Kordić, S. (1997). *Serbo-Croatian*. München: Lincom Europa.
- Łazarczyk, A. A. (2010). *Decomposing Slavic Aspect: The Role of Aspectual Morphology in Polish and Other Slavic Languages*. PhD thesis, University of Southern California.
- Ljubešić, N. & Klubička, F. (2014). {bs, hr, sr} WaC – Web Corpora of Bosnian, Croatian and Serbian. In: *Proceedings of the 9th Web as Corpus Workshop (WaC-9)*, 29–35.
- Marini, C. (2022a). CroaTPAS: uspoređivanje značenja vidskih parnjaka s namjerom istraživanja odnosa između vida, akcionsarta i glagolske polisemije u hrvatskom. *Croatica: časopis za hrvatski jezik, književnost i kulturu*, 46(66), 67–80.
- Marini, C. (2022b). CroaTPAS: A Survey-Based Evaluation. In: *Proceedings of the 18th Joint ACL - ISO Workshop on Interoperable Semantic Annotation within LREC2022*, 76–80.
- Marini, C. & Ježek, E. (2019). CROATPAS: A Resource of Corpus-Derived Typed Predicate Argument Structures for Croatian. In: Bernardi, R., Navigli, R. & Semeraro, G. (eds) *Proceedings of the 6th Italian Conference on Computational Linguistics (CLiC-It)*.
- Matovac, D. (2022). *Basic Croatian Grammar: For Croatian Language Learners*. Zagreb: Hrvatska sveučilišna naklada.
- Moens, M. & Steedman, M. (1988). Temporal Ontology and Temporal Reference. *Computational Linguistics*, 14(2), 15–28.
- Polančec, J. (2015). Što nam Aktionsart glagola može reći o njegovu vidu. In: Udier, S. & Cergol Kovačević, K. (eds) *Višejezičnost kao predmet multidisciplinarnih istraživanja: zbornik radova s međunarodnoga znanstvenog skupa Hrvatskog društva za primijenjenu lingvistiku održanoga od 25. do 27. travnja 2014. godine u Zagrebu*, 75–88. Zagreb: Srednja Europa/Hrvatsko društvo za primijenjenu lingvistiku (HDPL).

- Polančec, J. (2018). Osamostaljeni izvedeni nesvršeni glagoli u hrvatskom jeziku. *Suvremena lingvistika*, 44(85), 113–138.
- Polančec, J. (2020). *A Typology of Aspect-Actionality Interactions*. PhD thesis, University of Zadar.
- Polančec, J. (2022). Vidski neupareni glagoli u hrvatskom jeziku. *Croatica: Časopis za hrvatski jezik, književnost i kulturu*, 46(66), 105–133.
- Pustejovsky, J. (1991). The Syntax of Event Structure. *Cognition*, 41, 47–81.
- Rappaport Hovav, M. & Levin, B. (1998). Building Verb Meanings. In: Butt, M. & Geuder, W. (1998). *The Projection of Arguments: Lexical and Compositional Factors*, 97–134. Stanford: CSLI Publications.
- Ryle, G. (1949). *The Concept of Mind*. London: Hutchinson's University Library.
- Silić, J. (1978). An Approach to the Study of Aspectuality in the Croatian Literary Language. In: Filipović, R. (ed) *Contrastive Analysis of English and Serbo-Croatian*, 42–70. Zagreb: Zavod za lingvistiku.
- Silić, J. & Pranjković, I. (2007). *Gramatika hrvatskoga jezika: za gimnazije i visoka učilišta*. 2nd ed. Zagreb: Školska knjiga.
- Smith, C. (1991). *The Parameter of Aspect*. Dordrecht: Springer.
- Špikić, A. (2017). *Croato Compatto: Dizionario Croato/Italiano e Italiano/Croato*. Bologna: Zanichelli.
- Van Valin, R. D. & LaPolla, R. J. (1997). *Syntax: Structure, Meaning, and Function*. Cambridge: Cambridge University Press.
- Vendler, Z. (1957). Verbs and Times. *The Philosophical Review*, 66(2), 143–160.
- Verkuyl, H. J. (1972). *On the Compositional Nature of the Aspects*. Dordrecht: D. Reidel Publishing Company.