

Modal existential wh-constructions as affordance descriptions*

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Abstract. This paper proposes a new semantic analysis of modal existential wh-constructions (MECs). The core idea is that MECs denote a special type of “eventive property” of entities, particularly the set of events that an entity affords/makes possible. Accordingly, MECs are called affordance descriptions. The analysis predicts the ambivalent nature of MECs, which behave as verbal projections syntactically but have nominal distribution and meaning. Further, a biconditional relation between an affordance of an entity and the entity’s availability is postulated and is claimed to have grammatical consequences, accounting for the limited distribution of MECs under predicates that express availability in one way or another. The limited modality expressed by MECs (only circumstantial possibility) is also argued to fall out from the proposal: the reason is that the notion of affordance implies possibility but not necessity. Finally, a minimal situation account of the modal behavior is proposed, under which the affordance is mapped to an existential quantifier over situations, using the availability predication as its restrictor and the affordance description (the MEC) as its nucleus.

Keywords: MECs, affordances, availability, events, situations, modality

1. Introduction

In Šimík (2011), I argued that modal existential wh-constructions (MECs) are expressions that map to (characteristic functions of) relations between entities and events (type $\langle e, \langle v, st \rangle \rangle$; e type of entities, v type of events, s type of possible worlds, t type of truth-values, st being a shorthand for $\langle s, t \rangle$). I tried to show that such an account is more descriptively adequate than the previously assumed analyses, which mapped MECs to properties of individuals (type $\langle e, st \rangle$; Caponigro, 2003) or to (sets of) propositions ((a set of) $\langle s, t \rangle$ -type expressions; Šimík, 2009).¹ What was missing, however, was an independent rationale for why an unorthodox object as a relation between entities and events should be the right denotation for a kind of wh-construction. From that more general perspective, the competing analyses were better off; both properties and (sets of) proposi-

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¹The account of Pancheva-Izvorski (2000) is ambivalent between the two.

tions have uncontested usages in the analysis of *wh*-constructions: properties are widely assumed to be the denotations relative clauses and (sets of) propositions are denotations of sentential expressions such as (embedded) declaratives and interrogatives. Moreover, properties and (sets of) propositions are generally assumed to be plausible representations of conceptualizations of (the properties of) real world objects, as well as abstract objects such as thoughts and belief states. But what about relations between entities and events? Leaving aside the more or less technical application of such a denotation to analyze *vPs* in event semantics (Kratzer, 1996), the use the denotation seems conceptually unmotivated.

In this paper, I attempt to provide such a motivation and hence also conceptual support to my analysis. I will argue that modal existential *wh*-constructions can be thought of as affordance descriptions and that affordances—modeled in semantics as a particular type of relation between entities and events—are very intuitive psychological objects, as already argued by Steedman (2002b).² By extension, it makes a lot of sense that affordances, having a clear psychological reality, are conceptualized linguistically, giving rise to the semantic denotation of an entity-event relation and to a syntactic object which it is a mapping of, namely the modal existential *wh*-construction.

The paper is structured as follows. In section 2 I introduce the phenomenon of modal existential *wh*-constructions as well as the concept and semantics of affordance. I show that treating modal existential *wh*-constructions as affordance descriptions makes some surprising and correct predictions. The rest of the paper is devoted to spelling out the details of the proposal. In section 3 I deal with the relation of modal existential *wh*-constructions and the predicate it is selected by. In line with previous observations, establishing that the predicates that embed the constructions involve the semantics of availability (Grosu, 2004; Šimík, 2011), I concentrate on the relation between availability and affordance and conclude that there is a biconditional relation between the two: an entity is available if and only if it has some affordance. This hypothesis gives rise to an analysis where the two are connected not only cognitively but also grammatically (syntactically and semantically), ultimately accounting for the distribution of modal existential *wh*-constructions. Finally, in section 4, I turn to a semantic decomposition of the notion of affordance, proposing that it can be thought of as a relation between two sets of situations (i.e., essentially, in terms of generalized modal quantification), one in which something is available and the other in which it has the affordance specified by the modal existential *wh*-construction, stating that there is at least one situation that belongs to both sets (corresponding to possibility modality). Section 5 concludes.

2. Modal existential *wh*-constructions as affordance descriptions

Since it is not an extremely well-studied phenomenon, I start by providing a basic description of modal existential *wh*-constructions and use the opportunity to introduce the main problems, including some solutions that have been proposed to tackle them. This will be done in section 2.1. After

²The notion of affordance was introduced by Gibson (1977) and since then has mainly been used in psychology. Steedman (2002a,b) is, to the best of my knowledge, the only one who explored the relevance of affordance to linguistics.

that, in section 2.2, I turn to the notion of affordance and show how it can be conceptualized as well as semantically modeled, namely as (the characteristic function of) a particular relation between entities and events. I then propose that modal existential wh-constructions should be mapped to such functions. Section 2.3 shows that the proposal has a number of welcome predictions about the grammatical properties of modal existential wh-constructions.

2.1. Phenomenon

Modal existential wh-constructions (MECs), examples of which are *kde spát* ‘where [he could] sleep’ in (1a) and *na koho by se obrátila* ‘who she [would] turn to’ in (1b), have puzzled linguists for the curious and yet cross-linguistically remarkably stable bunch of distributional, morphosyntactic, and modal properties that they exhibit. Unless noted otherwise, examples in this paper are taken from Czech, though in principle any language that has MECs could be chosen.³

- (1) a. Karel nemá [_{MEC} kde spát].
 Karel neg.has where sleep.inf
 ‘There is no place where Karel could sleep.’
- b. Marie hledala [_{MEC} na koho by se obrátila].
 Marie looked.for to who subj.3 rfl turn.pst.ptcp
 ‘Marie was looking for somebody that she could turn to [for help].’

In the following paragraphs I summarize the core properties of MECs. Most of them will in one way or another be reflected by the analysis proposed in this paper. For a more complete description and discussion of many “exceptions” I refer the reader to Šimík (2011).

Distribution MECs are embedded under existential verbs like *be* and *have* (as in (1a)), change-of-state verbs like *arrive*, or (implicit) achievement/accomplishment verbs like *look for* (as in (1b)), *find*, *buy*, *send*, etc. Following this observation, first made in Grosu (2004), I argued in Šimík (2011) that the distribution of MECs is sensitive to an “availability” component in the meaning of the embedding predicate: when embedding an MEC, the predicates *be* and *have* are interpreted roughly as ‘be/have available’, *arrive* is interpreted as ‘become available (by arriving)’, and *buy* as ‘cause to become available (by buying)’.⁴ In this paper, I will show how the notion of availability relates to the notion of affordance. The connection proves to be important in explaining why MECs—being affordance descriptions—are distributed as they are.

³Abbreviations: 3 = 3rd person, inf = infinitive, nci = negative concord item, neg = negation, pst = past, ptcp = participle, rfl = reflexive, subj = subjunctive.

⁴What I call ‘availability’ is closest to the type of relation conveyed by verbs like *have* sometimes described as ‘(being in) control (of something)’ (for discussion, see Zaroukian and Beller, this volume). Yet, examples involving “having” more abstract entities such as ‘time’ suggest that ‘availability’ is more general than ‘control’. I should also point out that I treat ‘availability’ as a primitive, i.e. non-decomposed state.

Morphosyntax The main predicate of MECs is in the infinitive (*spát* ‘sleep.inf’ in (1a)) or subjunctive (*by obrátíla* ‘subj.3[would] turn’ in (1b)). The left-periphery of MECs is occupied by a wh-fronted wh-word (rarely a wh-phrase), mostly of the interrogative kind, which is selectionally and Case-licensed only in the embedded clause; the matrix verb imposes no requirement on the form of the wh-word, i.e., there are no “matching effects” of the kind known from free relative clauses. MECs are typically structures transparent for extraction and various tests show that, despite the wh-movement, they can be structurally as small as vPs/VPs (if independent factors allow for this). Though MECs are usually paraphrased in English translations by using a narrow scoping indefinite pronoun modified by a relative clause (‘(no) place where Karel could sleep’ in (1a) and ‘somebody that she could turn to [for help]’ in (1b)), research has shown that one should not take the parallel between MECs and relative clauses too seriously: the idea that MECs are dependent on or adjoined to some covert nominal head (whether an NP or a D) proved very difficult to defend (see esp. Šimík, 2011, chapter 3).⁵ Nowadays, it is hardly controversial that MECs are (extended) projections of the main predicate (vPs, TPs, or CPs) which are directly selected by the matrix verb, without the mediation of any nominal. Capturing the ambivalent nature of MECs—their apparently non-nominal syntax with their apparently nominal distribution and meaning—has proved to be a hard nut to crack. I believe that the present proposal fares very well in combining these properties.

Modality The most puzzling semantic property of MECs is their highly restricted modality: they invariably express the modality of circumstantial possibility (‘... Karel **could** sleep’ in (1a) and ‘... she **could** turn to’ in (1b)). The universal force (necessity) as well as epistemic, bouletic, and deontic flavors are not attested in MECs. This fixed nature of MECs’ modality is somewhat surprising provided their structural similarity to infinitival questions and infinitival relative clauses in English, which are known for their modal underspecification in the grammar and ultimate contextual resolution of modal readings, both regarding modal flavor and modal force (at least in some cases, cf. Bhatt, 2006; Hackl and Nissenbaum, 2012). The existing semantic analyses of MECs either leave the question of modality open (and consequently overgenerate, cf. Caponigro, 2003), or find only partial and stipulative solutions (Pancheva-Izvorski, 2000; Šimík, 2009). In Šimík (2011) I argued that the fixed modal force and flavor is a grammaticalization of a (conventional) implicature associated with the matrix ‘availability’ predicate: if *x* has the property of being available, it follows that one can do something with *x*, while it does not follow that one has to/wants to do something with *x*. In this paper, I build on this idea and adapt it to the analysis of MECs as affordance descriptions.

⁵A headed-relative-clause analysis for MECs is pursued by Plann (1980) and a free-relative clause analysis by Suñer (1983). With the exception of Agouraki (2005), who assumes an empty D heading the MEC, virtually all recent approaches have refrained from analyzing MECs as relatives, though the terminology is sometimes kept, cf. the terms “existential free relatives” used in Caponigro’s work (most recently in Caponigro et al., 2011) or “irrealis free relatives”, which goes back to Grosu (1994) and is used, e.g., by de Vries (2002).

2.2. Proposal

I propose that a particular relation between entities and events is one way to characterize properties of entities. More specifically, an entity can be characterized in terms of the events which it *affords*. To give an example used by Steedman (2002b)—a (particular) door affords opening the door, closing the door, or going through the door. Of course, there are many more (potentially an infinite number of) *affordances* of a door⁶—one can knock at the door, one can lean against the door, one can break the door with a hammer, etc. All these are very natural, though perhaps not always very conventional, conceptualizations of what one can do or what can happen with a door. Such a conceptualization of a door in terms of the events it affords easily lends itself to standard linguistic notations: the (set of) affordances of a door **d**, (2a), can be characterized by listing the events that **d** affords—(2b), or more abstractly, by the set of all events *e* such that **d** affords *e*—(2c). That set, in turn, can be formulated by its characteristic function—(2d), i.e. a function from events to truth-values, yielding 1 for all *e* which are affordances of **d** and 0 otherwise.⁷

- (2)
- a. $\mathbb{A}(\mathbf{d})$ (= the set of affordances of a door **d**)
 - b. {opening **d**, closing **d**, going through **d**, knocking at **d**, leaning against **d**, breaking **d** with a hammer, ... } =
 - c. { $e : e$ is an event that **d** affords} =
 - d. $\lambda e.e$ is an event that **d** affords

Now, suppose we want to characterize the set of affordances of all possible entities, not just of a particular door. We can take (2d) and proceed as usual: replace the door **d** by a variable and abstract over it. The result is given in (3a) and it is a characteristic function of the set of entity-event pairs such that the entity affords the event—(3b). A far from exhaustive list of members of such a set is in (3c), which, besides the already familiar pair of a door and opening that door, contains pairs of a pen and writing with the pen, a bed and sleeping on the bed, and so forth. Finally, \mathbb{A} —the affordance constant—is the most concise notation of this relation. Further on, I will also use the symbol \mathcal{A} —the affordance variable—which ranges over subsets of \mathbb{A} .

- (3)
- a. $\lambda x.\lambda e.e$ is an event that *x* affords =
 - b. { $\langle x, e \rangle : e$ is an event that *x* affords} =
 - c. { \langle door **d**, opening **d** \rangle , \langle door **d**, leaning against **d** \rangle , \langle pen **p**, writing with **p** \rangle , \langle bed **b**, sleeping on **b** \rangle , ... } =
 - d. \mathbb{A} = (the set of all affordances)

⁶I will use the following terminological shortcut: an affordance of *x* = an event which *x* affords. This is not to be confused with the affordance as such (i.e. as opposed to affordance of *something*), which is not an event, but rather an entity-event pair/relation.

⁷For completeness, let me point out that though this notion of affordance is very permissive, it is not trivial. There are many events which are in no way natural affordances of the door **d**, such as watching TV, watering flowers, etc.

I will argue that modal existential wh-constructions describe affordances by specifying the value of affordance variables (\mathcal{A}). The way the value is specified is by providing a very general entity description (essentially just a sortal description—‘thing’, ‘place’, etc.) and possibly complex event description of all the entity-event pair picked out from \mathbb{A} . A particular example is given in (4). The MEC in (4a) describes affordances by providing the characteristic function of the set of entity-event pairs $\langle x, e \rangle$ such that x is a thing and x affords an event e of writing with x . Using the standard (semi-formal) notation, the affordance is provided in (4b).

- (4) a. Josef má [_{MEC} čím psát].
 Josef has what.instr write.inf
 ‘Josef has something that he can write with.’
 b. $[[\text{čím psát}]]^g = \lambda x. \lambda e. x$ is a thing that affords (Josef) an event e of writing with x

This analysis leaves us with two outstanding questions: How does the MEC get semantically integrated into the matrix predicate? Is there an object language correlate of the affordance relation \mathbb{A} (the predicate ‘afford’ in the paraphrases) or is it an “emergent” property of the construction? I will tackle these two questions in sections 3 and 4, respectively. But before I turn to that, let me demonstrate that the analysis of MECs as affordance descriptions has a good deal of initial plausibility.

2.3. Basic predictions

It is remarkable how precisely the properties of affordances predict the core properties of modal existential wh-constructions. In this section, I will briefly discuss two properties which have been regarded as primitive and underivable properties of MECs—the obligatory presence of a wh-fronted wh-word and the obligatory infinitive (or subjunctive) mood.⁸ Additionally, I will show how the proposal explains MECs’ restricted modal force, for which only stipulative explanations exist. I will first discuss the mood, along with some related issues, then I turn to the issue of wh-movement, and finally, to modality.

It is a common assumption that properties of events, on which affordances are “based”,⁹ are syntactically formed relatively low in the structure, namely at the vP-level (assuming the C-T-v-V sequence of categories), cf. e.g. Kratzer (1996). This assumption has received strong empirical support in Hacquard’s (2006; 2010) work on the interaction of aspect and modality in Romance languages. Simplifying somewhat, Hacquard’s conclusion is that root modals apply below aspect

⁸Caponigro (2003) claims that Italian MECs can utilize the indicative, too. Yet, it is unclear whether apparent indicative MECs are MECs at all. See Šimík (pear, footnote 25), where I provide some arguments these constructions are more likely to be free relatives.

⁹There is a sense in which a relation between entities and events “properly includes” the property of events. This is most clearly visible on the type-theoretical notation: the relation corresponds to the type $\langle e, \langle v, st \rangle \rangle$ and the property corresponds to the type $\langle v, st \rangle$.

(Asp), at the level of vP, which in turn maps to a property of events (type $\langle v, st \rangle$). This gives rise to the following hypothesis about the correspondence between semantics and syntax.

(5) property of events \leftrightarrow vP

The statement in (5) formulates a prediction about the syntax of MECs: since MECs are “based” on properties of events, they should be vPs syntactically. In Šimík (2011, chapter 5) I show that this prediction is borne out for a number of languages (mainly Slavic languages). The evidence for MECs’ vP-hood comes from their high degree of transparency for extraction (clitic climbing) and from the fact that in general, they display the behavior of infinitives embedded under raising or obliagory control verbs. But even for languages, whose MECs might not be as “small” as vPs, there are various pieces of evidence that these are structurally impoverished: Hungarian MECs must not contain a complementizer (as opposed to embedded interrogatives; cf. Grosu 2004), French MECs lack a left-peripheral position for topics (Michal Starke, p.c.), and with the exception of Italian, MECs in all languages are highly syntactically transparent (for A-bar extraction). Last but not least, the evidence for a structural impoverishment comes from the mood: the primary mood for MECs, cross-linguistically, is the infinitive (it holds that if a language has the infinitive, it can use it in MECs). Wurmbrand (2001) and many others have argued that infinitival morphology signals structural smallness or, in fact, vP-hood. The status of the subjunctive in MECs (mostly used as the second best option to a non-existing infinitive, e.g. in Greek, but sometimes used alongside the infinitive, e.g. in Hungarian) is perhaps not that clear and certainly requires more investigation. Yet, the affordance-based approach makes a clear prediction: the MEC (or rather the pre-*wh*-movement proper subpart of the MEC) must map to a property of events.

If the structurally impoverished/non-finite nature of MECs “derives” a property of events, the question remains how this property is turned into an entity-event relation. As already suggested above (cf. (3a)), this can be achieved by abstracting over some entity-type variable within the representation of the property of events. This corresponds to the derivation of an $\langle e, \langle v, st \rangle \rangle$ -type expression from an $\langle v, st \rangle$ -type expression. Now, it has been argued on independent grounds that the syntactic correlate of the process of (lambda) abstraction is *wh*-movement (Groenendijk and Stokhof, 1984; Heim and Kratzer, 1998).¹⁰

(6) lambda abstraction over x within $\phi \leftrightarrow \text{wh}_x [\underbrace{\phi \dots t_x \dots}]$

Thus, the affordance-based analysis of MECs, combined with the lambda-abstraction-triggering approach to *wh*-movement yields the prediction that MECs will display *wh*-movement, a prediction which is clearly and unexceptionally borne out.¹¹

¹⁰Caponigro (2003, 2004) holds a similar view, which, however, yields problems in cases of multiple *wh*-movement. See Šimík (2011, 125–126) for discussion.

¹¹More precisely, the prediction is that there is operator movement. In Šimík (2011) I argued that the present analysis should be extended to English purpose clauses (see e.g. Jones, 1991), which display empty operator movement.

Finally, as noticed in section 2.1 and as illustrated in (7), MECs only express possibility modality, never necessity modality.

- (7) Mám s kým mluvit.
 have.1sg with who speak.inf
 ‘There is somebody who I can/*should/*have to speak with.’

If MECs are descriptions of affordances, this modal behavior is actually expected. According to the proposal, the MEC in (7) expresses a relation between some person and an event of speaking with that person such that the person affords the event. Without having to go deep into the precise semantics of the affordance relation, it seems clear that it involves possibility rather than necessity. That is, if a person “affords talking to”, it is understood that the person somehow makes it possible that one speaks to him. Similarly, if a door “affords going through”, it makes it possible to go through it. As the reader can check for him/herself, by no means does affordance lend itself to analogous paraphrases involving necessity.

I conclude that the affordance-based analysis makes at least three correct predictions about the core morphosyntactic and semantic properties of MECs: (i) that MECs would be structurally relatively small, which is made visible, among other things, on the use of the infinitive mood, (ii) that they would involve *wh*-(operator) movement as a common mechanism to encode abstraction over variables in the syntax, and (iii) that they would be interpreted as involving possibility rather than necessity modality. In the upcoming section, I will discuss another puzzling property of MECs, namely their highly restricted distribution, and will argue that also in that empirical domain the affordance-based analysis fares quite well.

3. The relation between affordance and availability: Explaining MECs’ distribution

In 2.1 I mentioned that all MECs are embedded by verbs which express ‘availability’. The ‘availability’ component is expressed either directly—as the semantic contents of verbs like ‘be’ or ‘have’, or indirectly—as the semantic contents of the implicit result state of more complex predicates like ‘appear’ or ‘buy’. To the best of my knowledge, there are no other (*wh*-)clausal complements to this class of verbs (putting aside free relatives and complements to auxiliary and modal ‘be’ and ‘have’). Hence, there seems to be a one-to-one relationship between MECs and the verbs that embed them. In the following lines I will suggest that this one-to-one relationship is in fact a one-to-one relationship between the concept of availability and the concept of affordance.

But let us slow down for a moment and think about some aspects of how entities and their affordances are related. Whether an entity has an affordance (i.e. whether it affords an event) depends on many factors, including various inherent and circumstantial properties of that entity and the properties and abilities of the participants of the afforded event. Let us take some examples (again drawing on Steedman, 2002b). The event going through a door **d** is an affordance of **d** provided that at least the following two conditions are satisfied: **d** is open and the agent of going is capable

of “going” in the first place. For instance, the open door in my office has the affordance of me going through the door into the corridor. For my chair, there is no such affordance, as my chair cannot “go”, at least not in the canonical sense of the word. On the other hand, the open cat-door in my friend’s house has the affordance of going through the door for my friend’s cat, yet, it does not have the affordance for my friend, for which the door is simply too small.

These simple examples probably already give the reader a sense that listing or generalizing the various aspects that influence the (non-)existence of affordances is a hopeless matter. Each entity-event pair in the affordance relation will be associated with idiosyncratic conditions associated with both the entity and the event. Yet, before we give up, we can let ourselves get inspired by the hypothesis that affordances are closely tied to availability and see how far we get with that. It seems to me that the property of availability is a necessary condition for any entity to have at least some affordance. Imagine that there is an open door of the right size but for whatever reason it is not available to you (for instance, it is located too high and there is no staircase leading to it). It automatically follows that the door does not have the affordance for you to go through it. To take another example, suppose that there is a book that you would like to read, you can read (in general), the book is written in a language you understand, etc. Does that book afford you to read it? Well, again, no matter how many “positive” properties the book or you have, the book will not afford you to read it unless it is also available to you. Based on these examples, it seems justified to postulate (8).¹²

(8) *The relation between affordance and availability (non-final)*

$$\forall x. [\exists e. \mathbb{A}(x)(e)] \rightarrow [\text{available}'(x)]$$

For any entity x , if x has an affordance, x is available.

Now, there seems to me to be a good reason to strengthen (8) to a biconditional, i.e., I believe that any available object has an affordance. The definition of the affordance relation used in this paper is very liberal, it includes any entity-event pair which allows the conceptualization under which the entity “affords” the event. As an exercise, the reader is invited to think of any object or entity available to her or him and then think about an event that this object affords. (A small demonstration of such an exercise: an arbitrary leaf on the plant on my office table is available to me and one of the many events that it affords is my picking the leaf.) If anybody finds an object available to them for which they cannot find an affordance, then the strengthened relation between affordance and availability is falsified (please, do let me know about that!). The proposed biconditional is provided in (9) and it is my final hypothesis about the relation between affordance and availability.

¹²Note that this relation does not hold of just any property and in that sense it is not trivial at all. It is easy to think of many properties of objects whose absence will have no drastic impact on the existence of their affordances. Even more strongly, I suspect it will be difficult to find a property whose absence would have such drastic impact on affordances as the property of availability.

- (9) *The relation between affordance and availability* (final)
 $\forall x. [\exists e. \mathbb{A}(x)(e)] \leftrightarrow [\text{available}'(x)]$
 For any entity x , x has an affordance if and only if x is available.

What are the consequences of the essentially cognitive statement in (9) for the grammar? I can imagine two plausible scenarios: either availability predicates come with a selectional requirement which specifies that they can/must select for affordances, or the affordance (more particularly the affordance *relation*, as opposed to the affordance *description*) is part of the lexical information of availability predicates. In the rest of this section, I will sketch an analysis in which availability predicates *select* for affordances. In section 4, I will use the syntactic substrate of this analysis to explore the second option, namely that the affordance relation is directly encoded in the availability predicate. The latter analysis also makes it possible to represent the affordance relation \mathbb{A} by using the well-known and independently needed instruments of Kratzer (1981; 1991)-style modal quantification.

Let us now explore the idea that the bidirectional entailment relation between affordance and availability gets translated to the grammatical relation of “selection” and let us see what this brings us for purposes of an explicit syntactic and semantic analysis of MECs and affordances. Suppose that the head expressing availability (‘be’, ‘have’, henceforth BE) selects for a phrase expressing affordance (an MEC) (and, potentially, a phrase expressing an affordance “wants” to be selected by a head expressing availability). This yields the following syntactic phrase-marker (assuming what has been said so far about the syntax of MECs in sections 2.1 and 2.2):



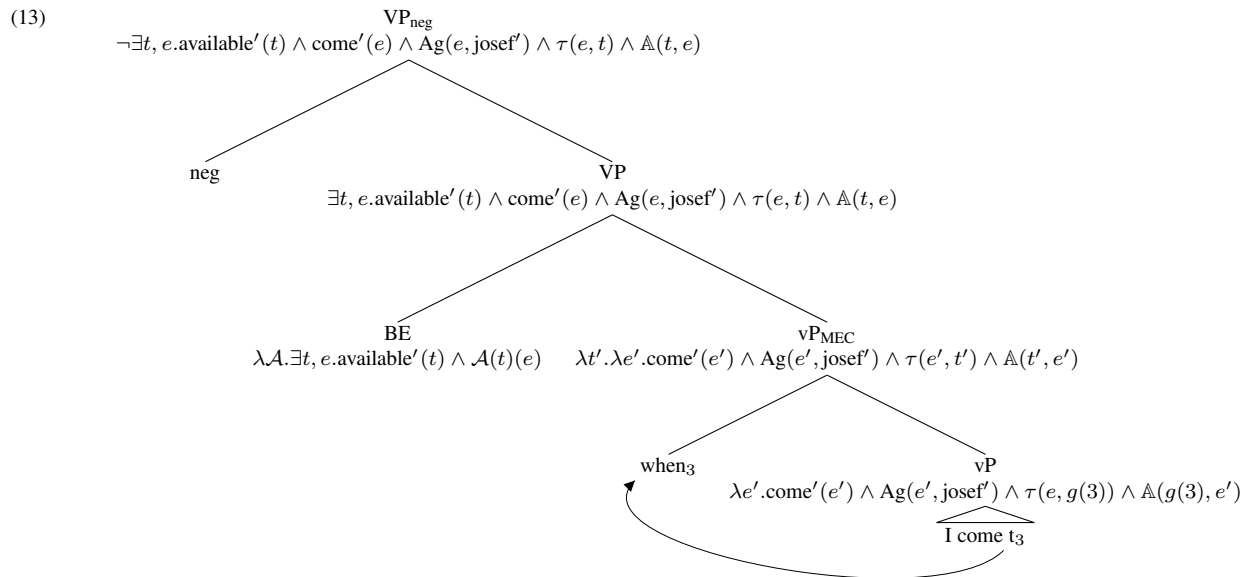
Of course, the head-complement relation between BE and vP_{MEC} in itself does not reflect the relationship of selection. But nothing speaks against encoding the selection at a later representational level, namely in semantics, by postulating that BE maps to a function from affordances. For expository reasons, I assume that the semantics of BE is a function from affordances to truth-values, yielding 1 just in case there is some entity x and some event e such that x is available and x affords the event e , characterized by the MEC. The existential quantification over the entity-type variable reflects the fact that MECs are analogous to narrow-scope existential quantifiers. It is also a way to deal with the missing/implicit argument of BE, which in this case is characterized only by the sortal restriction of the *wh*-word and the event it affords, expressed by the rest of the MEC.¹³

¹³English purpose clauses show that existential quantification over the implicit argument is by no means an inherent property of this type of construction. In (i), for instance, the argument position of BE (spelled out as *(is) available*) is

- (11) *The semantics of BE (non-final)*
 $[[BE]]^g = \lambda\mathcal{A}.\exists x.\exists e.\text{available}'(x) \wedge \mathcal{A}(x)(e)$

For concreteness, let us have a look at the example (12). The tree in (13) provides (12)’s simplified LF syntax (the first line) and its semantics (the second line), compositionally derived by feeding the syntactic nodes into the interpretation function $[[\cdot]]^g$, in the standard fashion. As suggested in section 2.3, fronted wh-words trigger lambda-abstraction at the level of their mother (in this case: vP_{MEC}). In this particular example, the wh-word is *when* and accordingly it binds a temporal-interval variable t ; τ is a function which relates an event and the temporal interval in which it takes place. The whole sentence is negated and the negation scopes over the existential quantification over the entity and event variables. This scope relation is an obligatory property of MECs (as known since Plann, 1980).

- (12) Josef nemá kdy přijít.
 Josef neg.has when come.inf
 ‘There is no time available (to Josef) such that the time would afford Josef to come (at that time).’



Let us take stock. In this section, I have tried to show that there is a reasonable way of syntactically and semantically integrating MECs into the matrix structure. If the availability of some object entails the existence of an affordance of that object and if MECs are descriptions of affordances, it seems natural to assume that the availability predication in the matrix gets “extended” by a

filled by *the book* and the semantic entry of BE must be modified along the lines of (ii), where the argument position introduced by λx is filled by the meaning of *the book* rather than being existentially quantified.

- (i) The book is available (for us) to read.
 (ii) *The semantics of BE (in purpose clauses)*
 $[[BE]]^g = \lambda\mathcal{A}.\lambda x.\exists e.\text{available}'(x) \wedge \mathcal{A}(x)(e)$

description of an event that the available object affords. The particular modeling in terms of a head-complement relation (as opposed to, e.g., an adjunction relation) between the matrix predicate and the MEC matches all standard analyses and has the standard welcome consequences (such as the transparency for extraction).

Yet, some aspects of the analysis call for further improvement. Firstly, it is the source of the affordance relation \mathbb{A} . In (13), \mathbb{A} is introduced as part of the MEC, but unfortunately, it appears in a total *deus ex machina* fashion: clearly, there is nothing in the object language of the MEC that would correspond to it.¹⁴ Secondly, we want the analysis to capture the observation that the modality in MECs is one of circumstantial possibility (as discussed in section 2.1). In the analysis as it stands now, the modality is somehow intuitively present in the affordance relation (where ‘ x affords e ’ can be paraphrased as ‘ x makes e possible’), which, of course, might prove to be the right way to think about it. Yet, we should first see whether a more standard analysis of the modality in MECs is possible. All these problems are tackled in the next section.

4. The affordance relation in BE and a minimal-situation account of MECs’ modality

In this section I will pursue the idea that the availability-affordance biconditional (9) is lexically encoded in the availability predicate BE. That is, BE does not only express the availability of some entity x but also that x stands in an affordance relation with some event. At the same time, the very affordance relation \mathbb{A} will be reformulated in terms of modal quantification, whereby the availability predication specifies the modal restrictor and the contents of the MEC provides the modal nucleus. The welcome consequence of letting BE express the affordance relation is a WYSIWYG-style analysis of MECs, which will now simply characterize an entity-event relation, i.e., just the *description* part of an affordance (the description of the entity and the event involved) without contributing the affordance *relation*. To give an example, the MEC in (4), repeated below, no longer denotes the (characteristic function of a) relation between a thing that affords an event of writing with that thing but rather simply a relation between a thing and an event of writing with that thing, as shown in (14b). In order to distinguish between a variable over affordance descriptions as defined above (ranging over relations between entities and events which they afford) and the updated variable (ranging over relations between entities and events in which the entity is somehow involved), I will use the notation \mathcal{A} for the former and \mathcal{E} for the latter.

- (14) a. Josef má [_{MEC} čím psát].
 Josef has what.instr write.inf
 ‘Josef has something that he can write with.’
 b. [[čím psát]]^g = $\lambda x.\lambda e.x$ is a thing and e is an event of writing with x

¹⁴If the way the analysis is further developed in section 4 proves not convincing or even wrong and if no other reasonable analysis is found, the resulting state of affairs could be used as an argument in favor of a non-compositional constructional analysis, for which it is no problem to attribute the affordance relation to the construction as a whole.

There are several assumptions which I will need to make in order for the envisioned analysis to work. First, I will treat availability as a property of states rather than a property of entities.¹⁵ Such a conceptualization of availability is relatively intuitive and, I believe, also harmless with respect to what has been said so far. Second, I will treat both events and states as *situations*, which in turn are parts of worlds (e.g., Kratzer, 1989).¹⁶ This assumption will make it possible to formulate the affordance relation in terms of modal quantification over minimal situations (cf. von Stechow, 1994), roughly stating that an availability situation can “grow” into a situation characterized by the affordance description. Speaking in more standard terms, the availability predication provides the restrictor of the modal quantifier, i.e., the modal quantifies over situations in which the availability of some x holds, and the MEC provides the nucleus of the quantifier, characterizing an event involving the x . The result is true if at least some restrictor-situation is also a nucleus-situation.

The denotation of BE under the present analysis (and the final one in this paper) is provided in (15). BE now denotes a function from (characteristic functions of) entity-event relations \mathcal{E} to propositions. Note that we assume propositions ($\langle s, t \rangle$ -type expressions) rather than truth-values in order to capture the modal quantification explicitly. After feeding some value of \mathcal{E} into BE, the resulting proposition is true in w iff in w there is some entity x and some minimal situation/state s of the availability of x and there is a possible world w' (accessible from w), a subpart of which is a minimal situation s'' , whose subpart in turn is the counterpart of s in w' ($s_{w'}$), i.e., in which the counterpart of x in w' ($x_{w'}$) is available, and s'' and $x_{w'}$ are in a relation characterized by \mathcal{E} .^{17,18} The use of the existential (rather than universal) quantifier over situations is a remnant of the affordance relation, which, as I noted in 2.3, supports a paraphrase involving possibility, but not necessity.

(15) *The semantics of BE (final)*

$$\llbracket \text{BE} \rrbracket^g = \lambda \mathcal{E}. \lambda w. \exists s. \exists x. w \geq s \wedge s \in \min(\{s' : \text{availability}'(s') \wedge \text{Th}(s', x)\}) \wedge \exists s''. \exists w'. R(w, w') \wedge w' \geq s'' \wedge s'' \in \min(\{s''' : s''' \geq s_{w'} \wedge \mathcal{E}(x_{w'})(s''')\})$$

Let us now see (15) at work. The LF and semantics of (16) is given in (17). The argument of BE (this time BE is realized by the impersonal *je* ‘is’) is the MEC *kam jít* ‘where [one can] go’, which maps to the relation between some place x and an event/situation s of going to x . After feeding this argument into BE, we get a proposition which is true in w if in w there is some situation s

¹⁵I believe that this can be formalized using Landman’s (2000) STATE SHIFT function, which, informally speaking, presupposes a correspondence between having a property P and being in a state of having a property P .

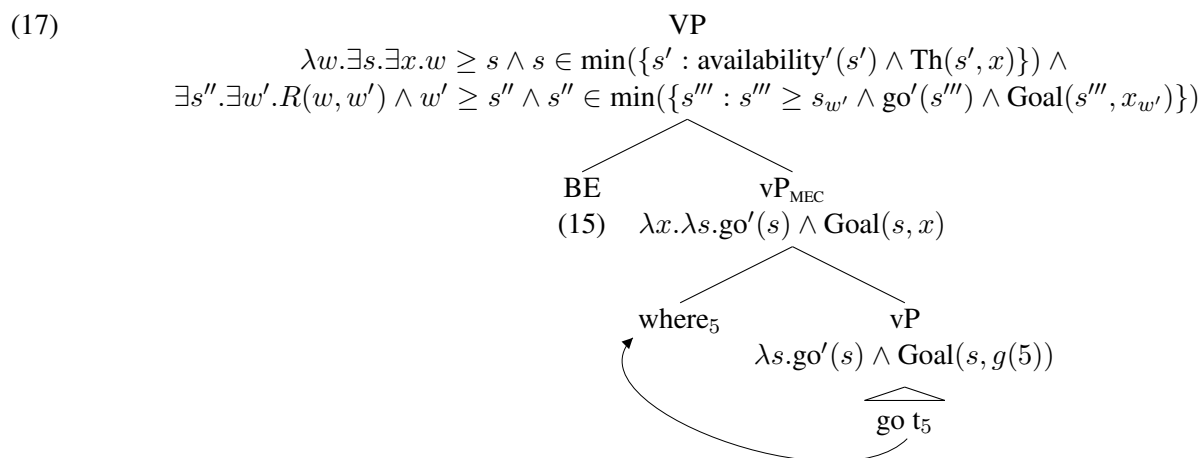
¹⁶Thinking of events and states (sometimes jointly referred to as ‘eventualities’) in terms of (minimal) situations was suggested in Kratzer (2008).

¹⁷The denotation relies on the notion of minimal situations, as utilized, e.g. in von Stechow (1994). Informally speaking, minimal situations are situations which contain just enough information to support a proposition and have no unnecessary subparts. For instance, $\min(\{s' : \text{availability}'(s') \wedge \text{Th}(s', x)\})$ denotes the set of situations s such that the proposition that x is available is true in s and there is no other proposition which is true or false in s .

¹⁸I assume that if a variable is bound by some operator, all the counterparts of the variable are bound by the same operator. Consequently, if a variable is assigned some value, all its counterparts are assigned a counterpart of that value. For a theory of counterparts which, I believe, is compatible with the present assumptions, see, e.g., Lewis (1968).

(subpart of w) and some place x such that s is a minimal situation of x being available and there is some world w' and some subpart of it s'' such that s'' is a minimal situation of x being available and somebody going to x . More concisely said, (16) expresses the proposition that some place is available and that it is possible, given this availability, that somebody goes to that place.

- (16) Je kam jít.
 is where go.inf
 ‘There is a place where one can go.’



The affordance relation \mathbb{A} between entities and events got replaced by a quantificational relation between two sets of situations. In other words, the proposition ‘that x affords e ’ is now modeled as the proposition ‘that there is a possible (minimal) situation containing e which contains the availability of x as its subpart’. My hope is that this change has no truth-conditional consequences, though I fear it will be difficult to tell, mainly because of the vagueness of the affordance relation. Nevertheless, let us see whether we find a less formal exposition of the formalism in (17), one that would bring it closer to the formulation in terms of affordance.

I have already suggested that ‘ x affords e ’ can be felicitously paraphrased as ‘ x makes e possible’. Furthermore, I argued in the previous section that it is not x itself (or some arbitrary inherent or circumstantial property of x) that ensures that some e is possible. Rather, it is the property x ’s availability. This brings us one step further: ‘ x makes e possible’ can now be reformulated as ‘the availability of x makes e possible’. Now, since ‘the availability of x ’ stands for the restrictor of the possibility modal and e stands for its nucleus, it remains to be determined whether it makes sense to conceptualize the relation between the two as a causal one (at least in some weak sense of the word), justifying the use of ‘make’ in the paraphrase. It seems to me that most possibility modals allow for a causal reformulation of the restrictor-nucleus relation: ‘Smoking is permitted here’ \approx ‘The regulations make it possible that one smokes here’ (deontic possibility), ‘Mary might be at home’ \approx ‘Our knowledge makes it possible for us to infer that Mary is at home’ (epistemic possibility), etc. Hence, I conclude that there is an intuitive understanding of the proposed formalism which retains the core idea of this paper, namely that at some level of representation MECs are

affordance descriptions.

Finally, I would like to show that the present analysis of affordance in terms of possibility modality makes some correct predictions, ones that the previous formulation in terms of the affordance relation does not (or at least not necessarily so). So far I have silently assumed that the accessibility relation R holding between the evaluation world w and the possible world w' has no substantial properties. That is, it is a purely technical device of modal logic and has no discernible impact on the conversational background (in Kratzer's terms, it contributes no modal base or ordering source). Hence, all that is required in order for the modal restriction to be verified is that some x in the (contextually restricted) domain determined by the *wh*-word (human', place', etc.) is available.¹⁹ The following example illustrates how relatively easy it is to verify the modal statement in MECs. In particular, (18) is compatible with any and all of the continuations from (18a) to (18c). This is predicted by the present analysis where the only non-trivial condition is that something is available to Pavel (something that is compatible with writing with it). All other potentially relevant conditions standardly associated with modal expressions (deontic, bouletic ones, etc.) do not restrict the modal, making it possible to verify (18) by picking a world in which, e.g., Pavel cannot write at all.

- (18) Pavel má čím napsat dopis.
 Pavel has what.instr write.inf a letter
 'There is something with which Pavel can write a letter.'
- a. but he wishes that he wouldn't write a letter, (\approx bouletic accessibility relation)
 - b. (but) he is not allowed to write a letter, (\approx deontic accessibility relation)
 - c. (but) he is not able to write a letter (e.g. because he is an aphasic). (\approx ability/circumstantial accessibility relation)

The result of the extremely weak possibility semantics of MECs is their overall truth-conditional weakness and, as a consequence, also their relatively low information value. Perhaps for this reason, the availability predicate is typically negated: one can hear (pseudo-English) 'I **neg**-have where to sleep' much more often than 'I have where to sleep'. By negating a verb which embeds an MEC, one creates a comparatively stronger and hence also more informative statement.²⁰

To summarize: I have argued that it is possible to locate the affordance relation within the availability predicate BE and to model it in terms of a modal quantifier, expressing weak possibility. One could ask whether it still make sense to call MECs affordance descriptions, now that they have been stripped off the affordance relation. Well, I believe it does. Note that BE only provides the semantic "skeleton"—the parts that are held constant across all instances of MECs, which is the

¹⁹Of course, further restrictions may come from whatever it means to be 'available' in the current context. If 'available' means 'being in physical reach of some agent', the truth conditions might be different from when it means 'being posted on the web'.

²⁰In some languages and with some kinds of *wh*-words, this tendency apparently turns into a stronger grammatical (semantic) condition in that some MECs exhibit the behavior characteristic of negative polarity items. For discussion and references, see Šimik (2011, 39ff.).

existential quantifier over situations and the availability predicate. The MEC itself, on the other hand, provides the “flesh”, i.e. the general description of the object that is available (the wh-word) and the description of the nucleus of the modal quantifier.

5. Conclusion

This paper develops a new semantic analysis of modal existential wh-constructions. I argued that MECs denote special eventive properties of entities, namely the events that some entities afford/make possible. Following previous literature (mainly Steedman, 2002b), I called this type of semantic object an affordance, and, accordingly, I called MECs affordance descriptions. The proposal captures the ambivalent nature of MECs: syntactically, MECs behave as extended verbal projections, while at the same time having apparent nominal meaning (made salient by the typical relative-clause paraphrase) and nominal distribution (they are complement to verbs like ‘have’, but also ‘send’, ‘buy’, etc.). The “verbal nature” of MECs reflects them being events of sorts and their nominal nature reflects them being properties of entities of sorts. In tackling the question why MECs are always embedded under predicates directly or indirectly expressing availability, I first argued that there is a biconditional relation between availability and affordance, the assumption being that this relation reflects the way humans perceive entities in the world. The biconditional is, therefore, essentially a (testable) hypothesis about our cognition. MECs’ distribution under availability predicates is then a grammatical “projection” of this cognitive property. In the last section of the paper, I analyzed the very affordance relation and argued that it can be modeled using standard instruments of modal quantification. The basic idea is that the affordance relation corresponds to a possibility operator (existential quantifier over situations), where the availability predication provides its restrictor and the affordance its nucleus.

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