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MEASURE CONSTRUCTIONS OF TURKISH: SYNTAX AND SEMANTICS

Türkçe Ölçme İfadelerinin Sözdizimsel ve Anlambilimsel Yapısı

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Abstract: Natural language allows us to attribute properties to entities, some of which are not possessed wholly but to a certain extent, the most obvious example of which are expressions of measure that relate entities to a certain degree along a given dimension. This paper addresses the syntactic constituency and ensuing interpretation of measure expressions of Turkish. Standard measure phrases are demonstrated to obtain when a measure word takes a numeral for its degree argument, which is then applied to a number-neutral NP, yielding a quantized measured noun. A similar account is also provided for measure expressions built on container and collective nouns, which minimally differ from standard measures in involving derived measures. The analysis is further extended to classifiers which express the measure of cardinality. Overall, the proposal defended in this paper is shown to involve minimal machinery to derive the intended reading of measure

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expressions.

Keywords: *Measure, Dimension, Degree, Cardinality, Container, Collective, Classifier.*

Öz: İnsan dili, bütünsel özelliklerin yanı sıra belirli dereceye kadar sahip olunan özellikleri de varlıklara atfetmemize izin vermektedir. Bunu en belirgin örneği, varlıkları bir boyut üzerinde belirli bir dereceyle ilişkilendirmemizi sağlayan ölçme ifadeleridir. Bu çalışmada Türkçe ölçme ifadelerinin sözdizimsel yapısı ile bu yapının sonucu ortaya çıkan anlambilimsel yorum ele alınmaktadır. Standart ölçme ifadelerinin, bir ölçme sözcüğüne derece üyesi olarak bir sayı öbeği atamak suretiyle oluşturulup, söz konusu ada yüklemleme ya da niteleme yoluyla uygulanması süreci olduğu ve adın bu şekilde nicellendiği gösterilmektedir. Aynı yöntem, barındırma adları ve topluluk adlarına da uygulanmakta, bunların standart ölçme yapılarından tek farkının ise türetilmiş ölçme sözcükleri barındırmak olduğu vurgulanmaktadır. Geliştirilen bu yaklaşım, sınıflayıcı yapılarını da kapsayacak şekilde genişletilmekte ve bunların sayı anlatan ölçme yapıları olduğu öne sürülmektedir. Bütünsel olarak bakıldığında, bu yaklaşımın ölme ifadelerinin yapı ve yorumunu görece basit bir yöntemle açıklayabildiği gösterilmektedir.

Anahtar Sözcükler: *Ölçme, Boyut, Derece, Sayı, Barındırma adı, Topluluk adı, Sınıflayıcı.*

1. INTRODUCTION

An interesting property of natural languages is their ability to allow expressions of measurement, which "provides the means to answer the question of *how much*" (Scontras, 2014, p. 2). In (1a), for instance, the property of being cold is predicated of some entity whereas (1b) says something rather different: that the volume of the entity in question will evaluate to ten liters, if measured. (2) gives examples where the adjective and the measure expression are used attributively.

(1) a. The water is cold.
b. The water is ten liters.

(2) a. cold water
b. ten liters of water

The process of measuring implicates gradable properties that entities can have "not wholesale, but rather to a specific extent or point along some scale" (Scontras, 2014, p. 2). The extent of the measure is

referred to as a degree (Kennedy, 1999). A measure expression is thus composed minimally of three ingredients: (i) the entity being measured, (ii) the measuring dimension, and (iii) a degree, represented in (1b) by *water*, *liter*, and *ten*, respectively. As such, measuring is defined as mapping of individuals to degrees along a dimension (Krantz, Luce, Suppes, & Tversky, 1971).

Of the three ingredients of a measuring expression, the entity is the most obvious one: It denotes individuals that we can refer to. The dimension, however, is rather abstract. It gives us the means along which we can measure the extent of entities. The extent along a given dimension like volume may be measured in liters, cubic meters, gallons, so forth. Degree, on the other hand, is expressed as a non-negative[2] numeral, and represents the uniform intervals that the entity will evaluate to when measured.

Obviously, measures exist not in and of themselves, but rather in relation to the entity being measured. Thus, although (3a) is perfectly fine, (3b-c) are only interpretable under an elliptical reading.

(3) a. There is water on the table.
b. There is ten liters on the table.
c. Give me ten liters.

This highlights the fact that measures are not to be treated on a par with (sets of) entities.

So far, we have seen examples of what is known as standard measures, like *liter*. Nevertheless, measure expressions go beyond such simple forms, involving terms that, left alone, would denote sets of containers (4b), as well as those that refer to specific constellations of entities (4c).

(4) a. There are two *kilos* of apples on the table. (standard meas.)
b. There are two *boxes* of apples on the table. (container meas.)
c. There are two *bunches* of apples on the table. (collective meas.)

Although the italicized words in (4) possibly belong to different grammatical categories, we intuitively understand that what they do is

[2] Note that -10 °C does not really involve a negative numeral, as it does not signal lack of heat energy. It is our arbitrary choice to fix the freezing point of water as 0 °C. In fact, scientist use the absolutist term Kelvin to measure the degree of heat energy, according to which 0 °C corresponds to 273 °K.

the same: measure the amount of apples along a dimension (mass in this case). Langacker (1991) and Brems (2003) observe that container and collective measures diachronically evolve from stand-alone lexical nouns by a process of semantic bleaching and concomitant reanalysis as a functional head.

The syntax and semantics of measurement has received a lot of attention in the literature, and is thus a relatively well-understood phenomenon. Nevertheless, measure expressions of Turkish have not so far received due attention, except perhaps Kural (1997), who addresses the contrast in the syntactic status of measure phrases occurring with verbs of change of location (5a) and verbs of change of state (5b).

(5) a. Ahmet 400 metre(-yi) koş-tu.
Ahmet 400 meter-ACC run-PST
'Ahmet ran 400 meters.'
a'. 400 metre koş-ul-du.
400 meter run-PASS-PST
'400 meters were run.'
b. Gemi 400 metre(*-yi) bat-tı.
ship 400 meters-ACC sink-PST
''The ship sank 400 meters.'
b'. *400 metre bat-ıl-dı.
400 meter sink-PASS-PST
Int.: '400 meters were sunk.'

Based on the observation that *400 meters* accepts accusative marker (5a) and can participate in passive formation (5a') while neither is possible with verbs of change of state (5b-b'), and under the assumption that accusative marking and the ability to passivize signal the argument status of a nominal, Kural (1997) concludes that the measure phrase is an argument of the verb in the former but a secondary predicate in the latter. Kural (1997) thus links the contrast in (5a-a') and (5b-b') to the relation the measure phrase has with the verb, rather than the measure phrase itself.

Nevertheless, being restricted to the syntactic status of measure phrases occurring with the relevant classes of verbs, Kural's (1997) work does not offer a detailed syntactic and semantic account of measure phrases of Turkish. This is precisely what I intend to do in

this paper: develop a syntactic account of Turkish measure expressions, and the resulting semantics obtained, couched within the framework of Scontras (2014). I start in Section 2 with the relatively easier case of standard measures, and extend the emerging analysis to container measures in Section 3. It is demonstrated here that measuring and counting expressions built on container words are associated with distinct structural representations. Section 4 brings in collective measures, demonstrating that they have dual uses: a predicative one denoting a set of specifically arranged entities, and a measuring one with an identical semantics to their standard kin. An analysis of such expressions is proposed which strictly mimics those of container words. In Section 5, I discuss the status of classifiers, and demonstrate that they too are instantiations of measure, specifically the measure of cardinality. In particular, this view of classifiers is shown to be empirically supported, and has the added advantage of keeping the syntax and semantics of numerals uniform. Section 6 gives the concluding remarks.

2. STANDARD MEASURES

This section develops a syntactic account and the ensuing semantic interpretation of measure expressions in Turkish, strictly adhering to principles of compositionality. We will first establish the syntactic constituency of a measured NP, then assign to it an appropriate semantic type, and finally determine the denotation of each component in the construction with the aim of achieving the correct interpretation.

What is the constituency of the italicized string in (6a)?

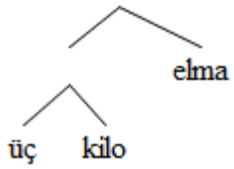
(6) a. Market-ten *üç* *kilo* *elma* al-dı-m.
market-ABL three kilo apple buy-PST-1SG
'I bought three kilos of apples from the supermarket.'
b. Market-ten *elma* al-dı-m *üç kilo*.
c. *Market-ten *kilo elma* al-dı-m *üç*.[3]

[3]Özgen (2018) notes, based on Turan (2002), that clefts are sentences with the nominalizer *-DIK* and an optional copula, and that clefting in Turkish targets nominal phrases.

(i) a. *pro* [Bira] sev-me-m.
beer like-NEG-1SG
'I do not like beer.'

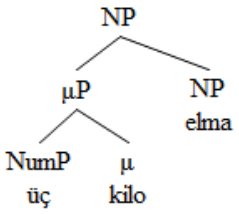
The grammaticality contrast between (6b) and (6c), involving extraposition, suggests that the numeral first combines with the measure word, and the resulting constituent then combines with the noun, giving us (7).

(7) Measure expression constituency



Following standard, I label the measure-denoting phrase μP, headed by a measure word like *kilo*. Numerals, on the other hand, can be rather complex (c.f. *three hundred and seventy-nine*) involving conjunctions, highlighting their phrasal status. Let us label the numeral-denoting expression Numeral Phrase (NumP). The measure word *kilo* cannot occur without a numeral (c.f. **kilo elma*), suggesting that it takes the numeral as an argument. Given the optional occurrence of μPs with nominal, they must be adjuncts of the measured NP. All these lead us to the structural representation in (8).

(8) Syntax of μP



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b. Sev-me-diğ-,m şey [bira].
like-NEG-NOML-1SG thing beer
'It is beer that I do not like.' (Özgen, 2018, p. 14)

Observe that the measure phrase sticks together under clefting, supporting the constituency in (7).

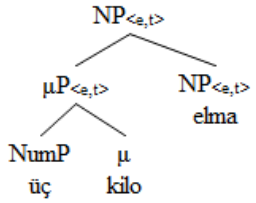
(ii) Market-ten *üç* *kilo* al-dığ-ım [elma-y-dı].
Market-ABL three kilo buy-NOML-1SG apple-COP-PST
'It was apples that I bought from the market.'
c.f. *Market-ten *üç* al-dığ-ım [*kilo* elma-y-dı].

I thank an anonymous reviewer for bringing this to my attention.

We have here a µ° taking a NumP argument to form a µP, which is then adjoined to the NP.

By all standards, NPs denote predicates of type <e,t>: *elma* ‘apple’ denotes a set of entities that satisfy the description of being an apple. But, so does *üç kilo elma* ‘three kilos of apples’: It, too, denotes a set of entities each member of which is a quantity weighing three kilos. Thus, both NPs must be of type <e,t>. The µP *üç kilo* ‘three kilos’, is also an obvious candidate for a predicate, given that it has predicative as well as attributive uses (c.f. (1) and (2)). Further, *three kilos* is a predicate true of individuals weighing three kilos. We thus arrive at (9).

(9) Involved semantic types (partial)



Obviously, the principle of composition that interprets the combination the NP and the µP is the predicate modification rule of Heim and Kratzer (Heim & Kratzer, 1998, p. 65).

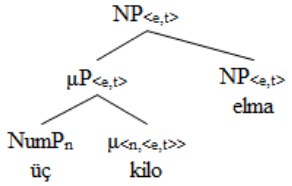
As for numerals, I subscribe to the Platonistic view in taking them to denote natural numbers (type *n*). This leaves us with µ, which must take an *n*-type numeral and return an <e,t>-type predicate. The µ° must therefore be a transitive object of type <n,<e,t>>.[4]

[4]A reviewer wonders whether the analysis can be extended to apparently adjectival words like *yarım* ‘half’, rightfully pointing to potential difficulties in doing so. I agree that fractional words cannot be of type *n*, given that they strictly reject classifiers, which I demonstrate in Section 5 to occupy µ° and thus require an *n*-type numeral for their degree argument.

(i) yarım/çeyrek (*tane) elma
half/quarter CL apple
‘half an apple / a quarter of an apple’

The English translations point yet to another difficulty in treating *half* and *quarter* as *n*-type entities: They combine with the numeral-like *a(n)*, which would normally lead to a type clash if they were themselves of type *n*, not to mention the challenge that comes from phrases like *two quarters of an apple*.

(10) Involved semantic types (full)



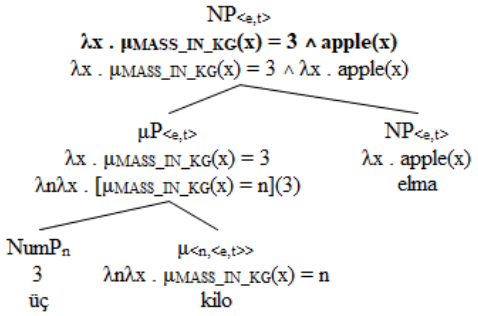
We are now in a position to derive the meaning of (10) compositionally. I propose (11) for the terminal nodes.

(11) a. ⟦elma⟧ = λx . apple(x)
b. ⟦üç⟧ = 3
c. ⟦kilo⟧ = i. λnλx . μ_{kg}(x) = n
ii. λnλx . μ_{MASS}(x) = n kg
iii. λnλx . $\mu_{MASS\_IN\_KG}$(x) = n

For *kilo*, each of the denotations in (11c.i-iii) will do, but I will use (11c.iii) as it also makes clear the dimension of measure as well as the unit employed, allowing us to capture the shared dimension between, say, *three kilos* and *three thousand grams*.

Let us now derive the interpretation of (10) bottom up.

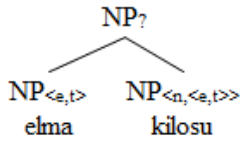
(12) *üç kilo elma* 'three kilos of apples'



This gives us the set of entities that satisfy the description of being apples that would evaluate to 3 if measured in kg units along the mass dimension.

Note that the semantics assigned to *kilo* correctly rules out unattested cases like (13), where the standard measure appears as the head of a compound.

(13) *elma kilo-su[5]
apple kilo-COMP
Int.: ‘apple kilos’



This is predicted under the reasonable assumption that a compound must yield an <e,t>-type object. Given the semantics in (10), we have no way of escaping a type clash in (13).

A note on the status of the NP is in order. Based on the fact that singular count nouns are disallowed in measure constructions (c.f. *three kilos of *apple/apples*), Scontras (2014) follows Carlson (1977) in taking the NP to denote a kind.

(14) ⟦apples⟧ = APPLE, or
= $^{\cap}\lambda(x)$. apple(x) (if derived from a predicate)
(Scontras, 2014, p. 79)

Nevertheless, given that abstract kinds cannot be measured meaningfully in terms of mass, Scontras (2014) proposes that measure phrases apply to instantiations extracted from the relevant kind. He thus proposes (15) for *kilo*.

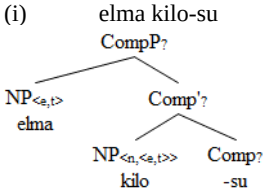
(15) $[\![\text{kilo}]\!] = \lambda k \lambda n \lambda x.\ ^{\cup}k(x) \wedge \mu_{kg}(x) = n$
(Scontras, 2014, p. 37)

This, too, gives us the intended semantics of (12). The last line of (16) denotes a set of entities instantiating the APPLE kind, which would evaluate to three if measured along the kg dimension.

(16) $[\![\text{üç kilo elma}]\!] = \lambda k \lambda x.\ [^{\cup}k(x) \wedge \mu_{kg}(x) = 3](\text{APPLE})$
$= \lambda x.\ ^{\cup}\text{APPLE}(x) \wedge \mu_{kg}(x) = 3$

[5] On the other hand, if we were to insert *–(s)I* in the head position as in (i), we would have to make stipulative assumptions regarding the type and semantic entry for *–(s)I*.

(i) elma kilo-su



Note however, that, in order to prevent an inevitable type clash, we need to make sure, as Scontras (2014) proposes, that the μP triggers a type shift on the NP, raising its denotation from *e*-type of kind-level entities to an <e,t>-type predicate.

Carlson's (1977) account of English bare plurals as names of kinds has been assumed as is in many subsequent analyses (Chierchia, 1998a; Chierchia, 1998b). Nevertheless, arguments have been proposed to the effect that bare nouns are not originally kind-denoting, but in fact ambiguous between kind and object readings (Wilkinson, 1991; Diesing, 1992; Gerstner-Link & Krifka, 1993; Dobrovie-Sorin, 1997; Nomoto, 2013). Turgay (2020a; 2020b) demonstrates that the ambiguity view of bare NPs fares much better in accounting for Turkish facts, and is free of some of the problems inflicting the kind-only view. In light of this, I stick with the simpler entry for *kilo* in (11c) and reject the unnecessarily complex one of Scontras' (2014) in (15), which, despite assuming the measured NP to be kind-denoting, eventually attempts to extract specimens.

3. CONTAINER MEASURES

Having established the syntax and the resulting interpretation of standard measure expressions, we can extend the analysis to those involving container words. Container words like *bardak* 'glass', however, differ from standard measure words in that the former have non-relational uses that normally denote sets of ordinary objects.

(17) a. Masa-da üç bardak var.
table-LOC three glass exist
'There are three glasses on the table.'

b. Bazı bardak-lar kırık.
some glass-PL broken
'Some glasses are broken.'

Note, however, that (17a) is actually ambiguous between two readings. The first (in fact the most salient) reading of it asserts the presence of three individual glasses on the table. Under the second reading, it asserts the presence of not three individual glasses but rather some substance (say water) that, if measured, would fill three glasses. This reading obtains if the speaker opts to elide the measured entity, of the form *there are three glasses ~~of water~~ on the table*. The derivation of this measuring reading will be our attention in this section.

Expressions involving container words are notorious for giving rise to

two distinct interpretations: a measuring reading, and a counting reading. I address them in turn.

3.1. MEASURING READING

We must start with the assumption that container words are actually <e,t>-type predicates denoting sets of entities.

(18) ⟦bardak⟧ = λx . glass(x)

Given the productivity of container words in acting as expressions of measure, we are in fact forced to treat them as ordinary predicates, and their measuring use as derived from this predicative form, as demonstrated in Brems' (2003) historical account.

(19) a. üç bardak su
three glass water
'three glasses of water'
b. bir duvar tablo
one wall painting
'one wall of paintings'
c. beş salon insan
five hall people
'five halls of people'

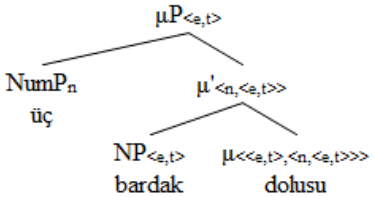
We see in (19) examples of predicative NPs like *bardak* 'glass', *duvar* 'wall' and *salon* 'hall' that serve to measure. Perhaps a more striking example is given in Sassoon (2010).

(20) two aspirins sick

However abstract it might be, *aspirin* here is clearly serving to measure the degree of sickness.

Against this background, I propose that the container-derived measure expression in (19a) is associated with the following syntax.

(21) üç bardak (dolusu)



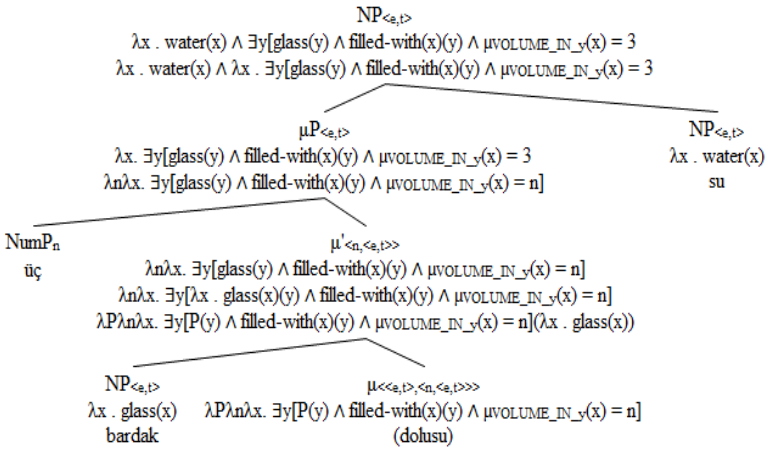
Here, we derive a measure term from a predicative NP either by filling μ° with *dolusu* '-ful' overly or covertly, or by conflating *bardak* 'glass' into μ°. Since both will give us the desired result, I take no sides as to which option is empirically supported. Significantly, though, (21) correctly captures the observation that standard measure words are in complementary distribution with *dolusu* '-ful' (c.f. **iki litre dolusu su*), as they both target μ°.

On the semantic side, then, *dolusu* '-ful' must be assigned the following interpretation.

(22) $[\![\text{dolusu}]\!] = \lambda P \lambda n \lambda x.\ \exists y[P(y) \wedge \text{filled-with}(x)(y) \wedge \mu_{\text{VOLUME\_IN}\_y}(x) = n]$

Assuming the predicative semantics in (18) for *bardak* 'glass', we arrive at the derivation in (23).

(23) *üç bardak su* 'three glasses of water' (measure reading)



This denotes an amount of water which, if measured in glass units along the volume dimension, will pick up the value 3. The reader can easily verify that this is the intended reading of (19a). Likewise, (19c) would denote a set of paintings that, if measured along the volume dimension in terms of hypothetical walls they might cover, will evaluate to 1. Note here the creativity of measuring units speakers have at their disposal, which might go as far in (20) as to measure the degree of sickness in terms of the number of aspirins it will take to recover from.

3.2. COUNTING READING

There is, however, another use of expressions like (19), referred to in Rothstein (2011) as the "counting" reading (24a), in contrast to the measuring reading in (24b) that we have already addressed.

(24) *three glasses of water*

a. counting reading

three individual glasses containing water

b. measuring reading

a volume of water that will measure three glasses

To the best of my knowledge, all expressions involving container words come with this sort of counting/measuring ambiguity. Rothstein (2011) argues that the counting reading requires the water to be in glasses, while no such requirement exists for the measuring reading, concluding that the expression must be headed by *glasses* in the former and by *water* in the latter. Scontras (2014) further argues that counting-to-measuring and measuring-to-counting shift, schematically represented in (25a), goes beyond simple container words. He argues that while (25b) is an example of counting-to-measuring shift of a predicative expression, (25c) is an example of measuring-to-counting shift of a standard measure expression.

(25) a. container noun ⟶ individual interpretation

⇕

amount term ⟶ quantity interpretation

b. counting-to-measuring shift

Mary poured *three glasses* of water into her soup.

c. measuring-to-counting shift

I dropped *two beautiful liters* of wine.

The idea is that *beautiful* modifies the abstract object derived from the containing use of *liter*. Since such expressions are now allowed in Turkish (c.f. **iki güzel litre şarap*), I will not pursue the issue further here.

Rejecting Rothstein's (2009) type-shifting account that derives the container use of *glasses* from its basic predicative use, Scontras (2014), proposes instead to relegate the job to the preposition *of*.

(26) $[\![\text{of}]\!] = \lambda k \lambda x.\ \exists y[^{\cup}k(y) \wedge \text{filled-with}(y)(x)]$

(Scontras, 2014, p. 68)

Applied to the kind denoting *water*, Scontras (2014) derives (27b) for *glass of water* (note that *glass* is taken to be a predicate).

(27) $[\![\text{glass of water}]\!]$

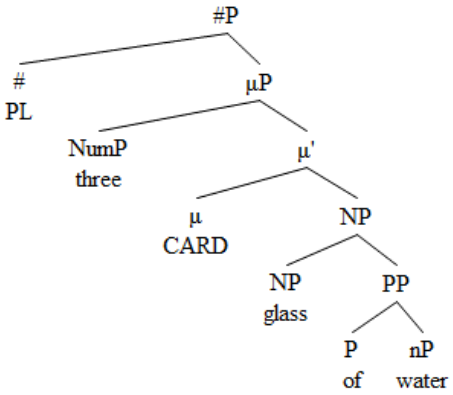
$= \lambda x.\ \exists y[^{\cup}\text{WATER}(y) \wedge \text{filled-with}(y)(x)] \wedge \lambda x.\ \text{glass}(x)$

$= \lambda x.\ \exists y[^{\cup}\text{WATER}(y) \wedge \text{filled-with}(y)(x)] \wedge \text{glass}(x)$

(Scontras, 2014, p. 68)

The outcome of the derivation will then be taken as a complement by *three CARD* (see Section 5), giving us (28).

(28) three glasses of water (counting reading)



((Scontras, 2014, p. 73), my modification)

Note that Scontras' (2014) objection to Rothstein (2009) is in part motivated by the desire to treat the semantics of *glass* uniformly. If so, we might as well attempt to treat the semantics of *of* uniformly (assigning no interpretation to it, like Scontras (2014) does in the measuring reading in (24) anyways). The validity of this argument comes from the interpretive identity between (29a) and (29b), the latter of which involves *full*. It would then be more cost-effective to assume the presence of a covert *full* that does the job Scontras (2014) assigns to *of*.

(29) a. three glasses of water

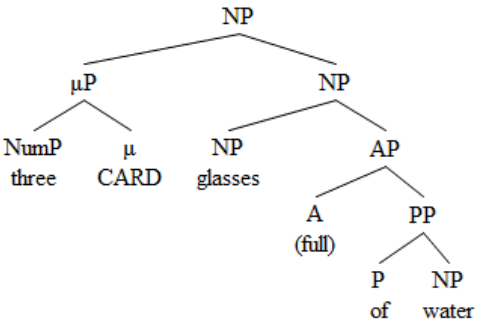
b. three glasses full of water

With this in place, I propose (30a) to be the semantics of *full* and (30b)

to be the relevant syntax, again assuming a predicative semantics for *water* and no interpretation for *of*.

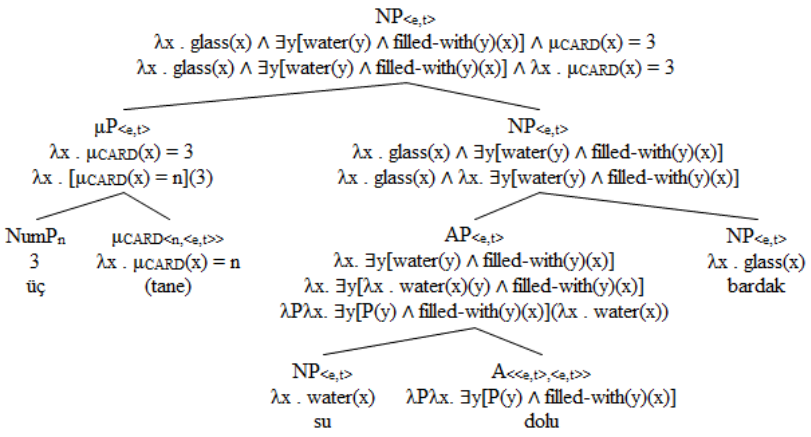
(30) a. ⟦full⟧ = λPλx. ∃y[P(y) ∧ filled-with(y)(x)]

b. three glasses (full) of water



In light of this, I propose the derivation in (31) for the counting reading of *üç bardak su = su dolu üç (tane) bardak* 'three glasses of water'.

(31) *üç bardak su* 'three glasses of water' (counting reading)



We thus capture the interpretive difference between measuring and counting readings in structural and semantics terms: (23) denotes a set of water entities whose volume, if measured in terms of glasses it would fill, evaluates to three, while (31) denotes a set of water-filled glasses of cardinality three.

Obviously, (31) is not the surface order of constituents in Turkish, which would come at the expense of a set of complicated movement mechanisms that goes beyond the confines of this work. Still though, I

consider such a path preferable to the unnecessary complication of the semantics of lexical items like *bardak* ‘glass’.

4. COLLECTIVE MEASURES

Collective measure expressions like *demet* ‘bunch’, *sürü* ‘flock’, and *deste* ‘deck’ pattern with standard measures in several respects and with container words in others. (32) demonstrates that the collective measure *demet* ‘bunch’ rejects an individual reading, as is the case with the standard measure *kilo* ‘kilo’.

(32) a. Masa-da iki kilo var.
table-LOC two glass exist
‘There are two glasses ~~of something~~ on the table.’
*individual reading, √elliptical measure reading

b. Masa-da iki demet var.
table-LOC two bunch exist
‘There are two kilos ~~of something~~ on the table.’
*individual reading, √elliptical measure reading

In that sense, collective measures are strictly relational: A bunch is always a bunch of something and cannot denote entities in the sense that *bardak* ‘glass’ can.

On the other hand, collective measures pattern with container nouns in occupying the head position of compounds, which is not possible with standard measures.

(33) a. su bardağ-ı
water glass-COMP
‘water glass’

b. çiçek demet-i
flower bunch-COMP
‘flower bunch’

Before attempting to make sense of the above data, we need to settle on what collective measures denote at the very base. Consider *bunch*. Bunches contrast with glasses in that they denote not stand-alone entities, but specific constellations thereof. We can buy glasses, put them on counters and drop them, neither of which is possible with bunches. Thus, a bunch does not exist in and of itself, but rather in relation to a collection of entities which, when arranged in a specific

way, form a bunch. (34) demonstrates the interpretive difference between measure expressions built on container nouns and those built on collective terms.

(34) a. There is a box of apples here, in fact there is just one big apple that would fill a box.

b. There is a bunch of flowers here, *in fact there is just one big flower that would form a bunch.

Although the container-derived measure *box* in (34a) imposes no requirements with respect to the cardinality of the measured entity, the collective noun in (34b) does require it to be of more than one in cardinality. If *bunch* denotes a specific arrangement of entities, it comes as natural that the entity it applies to must be plural so as to allow their desired arrangement.[6]

This being the case, we can propose the semantics in (35a) for *demet* 'bunch', and the derivation in (35b) for *çiçek demeti* 'bunch of flowers'.

(35) a. ⟦demet⟧
= λPλx . ∃y[P(y) ∧ bunch_of(y)(x)]

b. ⟦çiçek demeti⟧
= λx . ∃y[flower(y) ∧ bunch_of(y)(x)]

Or, we can alternatively leave the correct characterization of (33b) to the semantic effect of the compound marker *–(s)I*. It suffices for our purposes as long as the compound denotes a set of flower entities (not abstract bunches) arranged in a specific way.

What interests us more in this section is the striking parallel between the counting and measuring readings of container nouns like *glass* on the one hand collective nouns like *bunch* on the other. Consider (36).

(36) a. iki demet çiçek (measure reading)
two bunch flower
'two bunches of flowers'

[6]One further peculiarity of *bunch* is that it does not specify what counts as a bunch. It is our clear intuition that, when we put together two bunches, what results is still a bunch, unpredictable if its domain consisted of non-overlapping atomic entities. This, however, is not a peculiarity of collective measures only. Filip and Sutton (2017) observe that words like *fence* behave in a similar fashion, which leads them to propose a semantics according to which such nouns behave as quantized in counting contexts, but as unquantized in non-counting contexts.

c.f. *iki bardak su* ‘two glasses of water’

b. demet halinde iki (tane) çiçek (container reading)
bunch in two CL flower
‘two flowers in bunches’

c.f. *su dolu iki (tane) bardak* ‘two glasses full of water’

In what follows, I take this structural and interpretive parallelism seriously and develop an account of the two readings of collective measures that strictly parallel those of container words.

4.1. MEASURING READING

We need to first settle on an appropriate semantics for *demet* ‘bunch’. In our discussion of containers words, we treated them as predicates which, when fed to *dolusu* ‘-ful’, returned a measuring dimension. With the relational entry in (35a), this is no more possible, for the simple reason that (35a) is not a simple predicate. On the other hand, were we to assume a predicative semantics of the form in (37), we would lose the relational nature of *bunch* and the requirement that the flowers it applies to must form a specific constellation.

(37) $[\![\text{demet}]\!] = \lambda x \,.\, \text{bunch}(x)$

Luckily, we do not need to assume that *bunch* qua measure requires the flowers to be in a specific configuration; it simply acts as a dimension along which flowers are measured. As such, (38) is true under a scenario where a number of flowers are scattered across the table.

(38) Masa-da iki demet çiçek var.
table-loc two bunch flower exist
‘There are two bunches of flowers on the table.’

Assuming this line of reasoning to be on the right track, we can stick with the one-place predicate for *demet* ‘bunch’ in (37). All that is left is to feed this predicate to a silent *dolusu* ‘-ful’ to derive a measure word, a process that strictly mimics our container-to-measure derivation for *bardak* ‘glass’ in the preceding section.

(39) $[\![\text{demet dolusu}]\!]$
$= \lambda n \lambda x. \exists y[\text{bunch}(y) \wedge \text{filled-with}(x)(y) \wedge \mu_{\text{VOLUME\_IN}\_y}(x) = n]$

Accordingly, I assign the following derivation to the measuring reading of *iki demet çiçek* ‘two bunches of flowers’.

(40) ⟦iki demet (dolusu) çiçek⟧

= λx. flower(x) ∧ ∃y[bunch(y) ∧ filled-with(x)(y) ∧ $\mu_{VOLUME\_IN\_y}$(x) = 2

I invite those who might find (40) ungrammatical to do a quick Google search, which will turn many examples of expressions like *bir demet dolusu çiçek/papatya/sarı gül* 'a bunchful of flowers/daisies/yellow roses', highlighting the validity of this line of reasoning.

4.2. COUNTING READING

The counting reading of collective measure expressions, on the other hand, will be identical to the that of container words like *glass*, with one trivial difference: The adjective *full* is replaced by the preposition *in* (or perhaps by the more adjectival *in the form of*), which translates to the Turkish adjective *halinde*.

(41) a. ⟦halinde⟧

= λPλx. ∃y[P(y) ∧ in(y)(x)]

b. ⟦demet halinde iki (tane) çiçek⟧

= λx. flower(x) ∧ ∃y[bunch(y) ∧ in(y)(x)] ∧ μ_{CARD}(x) = 2

Surely, since *bunch* requires a plurality of flowers, what is counted in (41b) must be specifically arranged collections of flowers. We have already tied this to the semantics of *bunch*.

5. CLASSIFIERS

In this section, I would like to extend the developed model to expressions involving classifiers. We will see that things fall out quite nicely once we assume classifiers to occupy μ°.

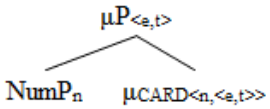
The literature is divided into two opposing camps regarding the correlation between classifiers and measure terms. On the one side of the continuum is the argument, defended in Cheng and Sybesma (1999), Borer (2005), and Zhang (2009; 2011), that classifiers and measure words are associated with distinct structural representations; on the other is the proposal made in Tang (2005), Hsieh (2008), and Hsu (2015) classifiers and measure words have the same syntax and that their interpretive difference follows from their semantics. I refer the reader interested in the relevant discussion and the evidence adduced in favor of either proposal to Turgay (2020a).

Recall from the introductory section that in a sentence like (42), *elma* 'apple(s)' denotes a set of entities the extent of which is not specified in any dimension, be it volume, mass, or size.

(42) Masa-da elma var.
table-LOC apple exist
'There are apples on the table.'

In the same vein, *elma* 'apple(s)' in (42) is also unbounded in terms of cardinality: There may be any number of apples on the table, including some parts of a single apple. In light of this, it makes sense to consider cardinality as some sort of a dimension along which entities can be measured (Scontras, 2014). I assume in what follows, that counting is essentially a measuring operation, represented syntactically by CARD, which takes a numeral as a degree argument. The resulting μP is applied to a number-neutral set[7], thereby quantizing it. I further assume, with Turgay (2020a) that classifiers are overt spellouts of CARD, as in (43).

(43) Cardinality measure



The reason behind taking classifiers to be heading μ_{CARD} is the crucial difference between measure words and classifiers in (44).

(44) a. üç kilo elma
three kilo apple
'three kilos of apples'
b. üç tane elma
three CL apple
'three (individual) apples'

Üç kilo in (44a) measures apples along the mass dimension, with no commitment as to how many apples there are. *Üç tane*, however, does denote cardinality. Under the proposal I am entertaining here that it is not the numeral per se but rather the CARD dimension that counts, it makes sense to insert the general classifier *tane* into μ°.

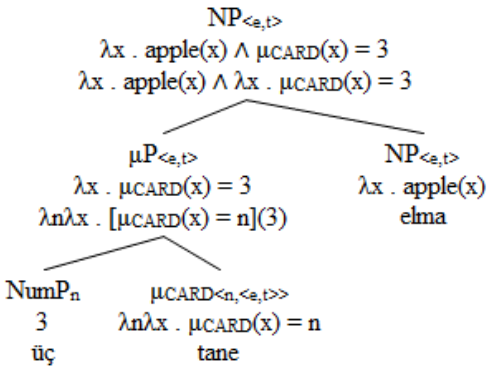
Now, I propose (45) for the least marked general classifier *tane*.

[7]The number-neutrality of English plurals is well known by their presence in downward entailing contexts. Turgay (2020a; 2020b) demonstrates that semantic number-neutrality in Turkish is encoded in the bare form of the NP.

(45) $[\![\text{tane}]\!] = \lambda n \lambda x \, . \, \mu_{CARD}(x) = n$

Applied to (44b), we get (46).

(46) *üç tane elma* ‘three apples’



As we see, *tane* simply serves to count the atoms in the denotation of *apple*(*s*). But other specific classifiers (like *adet* ‘single’, *baş* ‘head’, *çubuk* ‘bar’), beside counting, also impose selectional requirements on the entity being counted. *Baş* ‘head’, for instance, can only be used with round vegetables and domestic animals like “cow”. I propose the non-exhaustive entries in (48) for the specific classifiers in (47).

(47) a. iki *adet* masa
two CL table
‘two tables’

b. iki *baş* davar
two CL cattle
‘two heads of cattle’

c. iki *çubuk* demir
two CL rebar
‘two bars of rebar’

(48) Specific classifiers

a. $[\![\text{adet}]\!] = \lambda n \lambda x \, . \, \mu_{CARD}(x) = n \wedge \text{inanimate}(x)$

b. $[\![\text{baş}]\!] = \lambda n \lambda x \, . \, \mu_{CARD}(x) = n \wedge \text{animal}(x)$

c. $[\![\text{çubuk}]\!] = \lambda n \lambda x \, . \, \mu_{CARD}(x) = n \wedge \text{long\_thin\_object}(x)$

(48) makes it clear that the selectional restriction imposed by classifiers usually pertains to shape of the entity counted. Turgay

(2020a) argues, with Nomoto (2013), that beside measuring along the cardinality dimension, classifiers serve to restrict the kind/object ambiguous interpretation of a bare noun to object entities only. If so, it comes as natural that classifiers lexicalize such selectional restrictions, given that physical shape is a property not of abstract kinds but of concrete object individuals.

The desire to achieve crosslinguistic coverage may raise questions at this point regarding the status of non-classifier languages like English, which seemingly lack classifiers as a grammatical category. I propose μCARD to be crosslinguistic, not a peculiarity of obligatory classifier languages like Chinese or optional classifier languages like Turkish. If so, considering that English does involve expressions of cardinality, we are forced to the conclusion that μCARD is mostly filled by a null morpheme. McEnery and Xiao (2007) demonstrate in this regard in their comparative corpus-based study of English and Chinese that all of the eight categories of classifiers they study do exist in either language and that the obligatory presence of classifiers in Chinese should be attributed not to a conceptual/semantic difference, but to the lack of the relevant morphological inflection. If so, the classifier/non-classifier contrast turns out to be quantitative rather than qualitative.

5. CONCLUSION

This paper addressed the syntactic constituency and semantic interpretation of measure expressions of Turkish, with an eye to achieving a strict compositionality. It was shown in the introductory section that measure expressions are mathematical objects that quantify the size of an otherwise indeterminate set, helping locate an entity at the appropriate degree along a given dimension. Section 2 developed an account of how this is achieved with standard measure terms. The emerging model was then applied in Section 3 to measure expressions built on container words, deriving their ubiquitous measuring and counting readings without resorting to unwarranted assumptions. Section 4 brought in measure expressions involving collective terms, demonstrating their strong similarity to those involving containers and showing that virtually no further assumption is needed to account for their behavior. Finally, I extended the analysis in Section 5 to constructions involving classifiers, arguing that they too are expressions of measure, precisely the measure of cardinality. Classifiers are argued to occupy the head position of μ_{CARD}, and are thus only compatible with countable nouns that make available atoms

in their denotation. It was concluded then that, if μ_{CARD} is responsible for the expression of cardinality, the traditional contrast between obligatory, optional and non-classifier languages is merely an illusion, of quantitative rather than qualitative nature.

As it stands, the analysis developed in this work involves less machinery than that of Scontras (2014) in that it assumes a common derivational base for counting and measuring readings of both container and collective measures. It also lends support to the argument defended in Tang (2005), Hsieh (2008), and Hsu (2015) that classifiers and measure words are associated with identical syntax, and to the proposal advanced in Wilkinson (1991), Diesing (1992), Gerstner-Link and Krifka (1993), Dobrovie-Sorin (1997) that bare nouns are inherently ambiguous between kind and object reference and that, given sufficient conditions, they may take their referents from either domain.

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