HUMAN COGNITIVE PROCESSING 29

Cognitive Approaches to Tense, Aspect, and Epistemic Modality

Edited by
Adeline Patard
Frank Brisard

John Benjamins Publishing Company

The paper used in this publication meets the minimum requirements of American National Standard for Information Sciences – Permanence of Paper for Printed Library Materials, ANSI Z39.48-1984.

Library of Congress Cataloging-in-Publication Data

Cognitive approaches to tense, aspect, and epistemic modality / edited by Adeline Patard, Frank Brisard.

p. cm. (Human Cognitive Processing, ISSN 1387-6724 ; v. 29)

Includes bibliographical references and index.

1. Cognitive grammar. 2. Grammar, Comparative and general--Tense. 3. Grammar, Comparative and general--Modularity. 4. Psycholinguistics. I. Patard, Adeline. II. Brisard, Frank.

P165.C636 2011

415'.6--dc22 2011014902

ISBN 978 90 272 2383 8 (Hb ; alk. paper)

ISBN 978 90 272 8521 8 (Eb)

John Benjamins Publishing Co. · P.O. Box 36224 · 1020 ME Amsterdam · The Netherlands

John Benjamins North America · P.O. Box 27519 · Philadelphia PA 19118-0519 · USA

Table of contents

List of contributors

Ronny Boogaart
University of Leiden
R.J.U.Boogaart@hum.leidenuniv.nl

Renaat Declerck
K.U.Leuven Campus Kortrijk
renaat.declerck@kuleuven-kortrijk.be

Renata Geld
University of Zagreb
renatageld@yahoo.com

Katarzyna M. Jaszczolt
University of Cambridge
kmj21@cam.ac.uk

Ronald W. Langacker
University of California at San Diego
rlangacker@ucsd.edu

Tanja Mortelmans
University of Antwerp
tanja.mortelmans@ua.ac.be

Adeline Patard
University of Antwerp
adeline_patard@hotmail.com

Elena Smirnova
Leibniz University Hanover
elena.smirnova@germanistik.uni-hannover.de

Jiranthara Srioutai
Chulalongkorn University, Bangkok
jiranthara.s@chula.ac.th

Mateusz-Milan Stanojević
University of Zagreb
mmstanoje@ffzg.hr

Ceyhan Temürcü
Middle East Technical University, Ankara
ctemurcu@gmail.com

Radoslava Trnavac
Simon Fraser University
radoslava_trnavac@sfu.ca

Lazhar Zanned
University of Manouba, Tunis
zanned_lazhar@yahoo.fr

Aspect as a scanning device in natural language processing

The case of Arabic*

Lazhar Zanned
University of Manouba

This chapter investigates the claim that aspect is a verbal device for constructing mental images of processes and these aspectual values correspond to the way(s) a process is profiled in different scanning modes: summary vs. sequential scanning and monosequential vs. polysequential scanning. This occurs through other cognitive abilities, such as chaining, scope of awareness, and zooming ((in) and (out)). The analysis is based on data from Standard Arabic. The study proceeds by presenting an overview of the aspectual system in Arabic and investigating the different facets involved: aspect as an image-building tool, aspect as a scanning device, scanning modes in Arabic (summary scanning, monosequential scanning, polysequential scanning) and, finally, scope of awareness and the process of zooming in aspectual representation.

Keywords: summary vs. sequential scanning, monosequential vs. polysequential scanning, chaining, scope of awareness, zooming, Cognitive Grammar

1. Introduction

Notions such as imagery, scanning, summation, and sequentiality are well established in Mental Imagery and Cognitive Grammar. In both theories, mental imagery (Kosslyn 1980, 1994, 1995, 1999; Tversky 1999) or mental simulation (Langacker 1987, 2008, 2010) involves basic functions in cognition in general and in verbal conceptualization in particular.

Scanning is one of the basic modes of cognitive processing in making mental images by recalling the events we experienced in the past or by describing a

* I would like to thank Adeline Patard, Frank Brisard and Mark Turner for their helpful comments.

situation using symbolic resources. In Mental Imagery, scanning is characterized in terms of tracking distances and configurations of the recalled images. In Cognitive Grammar, summary and sequential scanning are seen as playing a role in characterizing the semantics of verbs (Langacker 1987, 2008), but this is still a matter of debate (Broccias & Hollmann 2007).

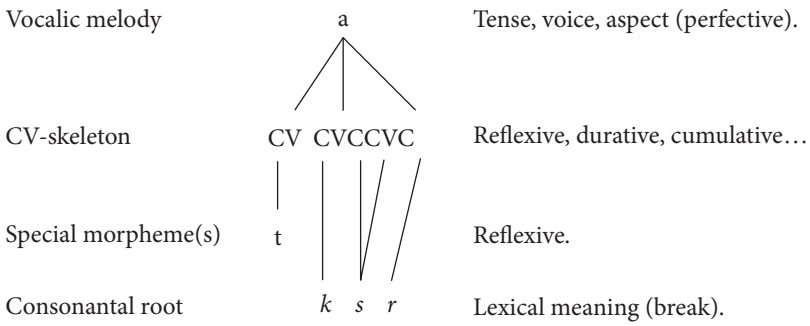
In this chapter, we assess the claim that aspect is a verbal device for constructing mental images of processes (states and events) and that all aspectual values may be handled in terms of scanning. This occurs through other cognitive abilities, such as chaining, attention management based on scope of awareness, and zooming ((in) and (out)). The analysis is based on data from Standard Arabic. It is divided into three sections: section (2) presents an overview of the aspectual system in Arabic derivational markers (reduplication, vowel lengthening, and affixation) and lexical markers expressing aspectual values such as nearness, inchoation, duration, habituality, and termination. Section (3) is devoted to aspect in imagery and presents an attempt to demonstrate that aspect is as an image-building tool (3.1), and that it is a scanning device in verbal communication (3.2). Section (4) deals with modes of aspectual scanning in Arabic. Three modes are investigated: aspectual summary scanning (4.1.1), aspectual monosequential scanning (4.1.2), and aspectual polysequential scanning (4.1.3). Finally, the roles of aspectual representation in attentional management are examined: framing the scope of awareness (4.2) and zooming (4.3).

2. The aspectual system in Arabic: An overview

Historically, studies of aspect in Arabic focused on external elements, i.e. the verbal conjugations and the context that helps to indicate tense. Aspect was considered to be a matter of simple perfective-imperfective opposition. Studies that considered the interaction of time and aspect improved upon this simplicity (Comrie 1976, Fleisch 1979, Cohen 1989). The literature does indicate some basic aspectual values, such as those of inflectional, derivational, and lexical markers, but the internal constituency of the process denoted by the verbal stem has not been given sufficient attention yet.

Arabic morphology is nonconcatenative. The formation of the lexical item is multi-tiered: each morpheme bears its own meaning and associates with the CV-skeleton (template) following the rules of association (McCarthy 1979: 1981). The verb *takassar*, for instance, meaning that something broke in the past by itself into pieces, is derived as shown in (1):

The simple opposition perfective vs. imperfective is inflectional. The inflected verbal forms are of two types:



→ *takassar* ('break', reflexive, repetitive, past tense, perfective)

a. stem + inflection: *katab* + *ta* (write + 2M.SG): past perfective ('you wrote'),
b. inflection + stem: *ta* + *ktub* (2M.SG + write): present, imperfective ('you write/ you are writing').

Considered at this level, the aspectual system is based on the binary opposition: perfective vs. imperfective (Comrie 1976: 78, Cohen 1989: 183) and derivational, syntactic, and lexical markers optimize it.

Derivational markers

Derivational markers are morphemes incorporated in the CV-skeleton to create the *augmented verbs*, which comprise more consonants or vowels than the simple triliteral verbs. The triliteral verbs always keep the lexical aspect (Aktionsart) related to the lexical meaning expressed by the consonantal root, but the augmented verbs express other aspectual values which may overlap with the original lexical aspect.

Derivational markers of aspect are of three types: (a) reduplicated consonantal roots, (b) lengthened vowels, and (c) special morphemes affixed to the verbal stem. Some verbs may undergo reduplication and vowel lengthening. These markers bear their aspectual value(s) regardless of the conjugation of the verb.

Reduplication (gemination)

Reduplication indicates a variety of aspectual values including intensive, iterative, durative, distributive, and gradual meanings. It comes in two kinds: partial and total. Partial reduplication occurs on the second consonant in the root and total reduplication bears on the first and second consonants in the root.

The lexical root √*ksr*, for instance, is related to the punctual process of breaking. The simple form *kasara* means that the act of breaking occurred once and it

expresses punctuality as in (2a). However, the augmented form *kassara* means that the act occurred many times and expresses iteration: the act of breaking is repeated until the object (cup) is reduced into pieces as in (2b); or, until the whole set of the object is exhausted as in (2c):

(2) √*ksr* ('to break')
   a. *kasar-a al-walad-u al-kaʔs-a.*
      break.punctual.PST-3M DEF-boy-NOM DEF-glass.SG-ACC
      'The boy broke the glass'
   b. *kassar-a al-walad-u al-kaʔs-a.*
      break.iterative.PST-3M DEF-boy.SG-NOM DEF-glass.SG-ACC
      'The boy broke the glass into pieces'
   c. *kassar-a al-walad-u al-kuʔūs-a.*
      break.iterative.PST-3M DEF-boy.SG-NOM DEF-cup.PL-ACC
      'The boy broke all the cups'

Partial reduplication also expresses duration and continuity of the process. The reduplicated verb related to the root √*drb* ('to exercise, to be skillful') means that the process of training and exercising covers an extensive amount of time:

(3) √*drb* ('to exercise, to be skillful')
   a. *darib-a al-walad-u ʕalā al-sibāħat-i.*
      be skilled.PST-3M DEF-boy-NOM on DEF-swimming-GEN
      'The boy is skilled at swimming'
      (The boy is skillful at swimming)
   b. *darrab-a al-mudarrib-u al-walad-a.*
      train.DUR-PST-3M DEF-coach-NOM DEF-boy-ACC
      'The coach trained the boy (for a long time)'
   c. *ta-darrab-a al-walad-u ʕalā al-sibāħat-i.*
      REFL-train.DUR.PST-3 DEF-boy-NOM on DEF-swimming-GEN
      'The boy trained for swimming on his own for a long time'

Furthermore, partial reduplication expresses the gradualness of the process. It occurs in successive or continuous steps: the process √*xrʒ* ('to go out'), for instance, is conceived of happening in a gradual fashion when reduplicated verbal forms are used:

(4) √*xrʒ* ('to leave, to go out')
   ta-xarraʒ-a al-ṭālib-u min jāmiʕat-i Manouba.
   REFL-go out.stepped fashion.PST-3M DEF-student-NOM from University of Manouba
   'The student graduated from the University of Manouba (after some years)'

Some processes, like √*mwt* 'die' and √*qtl* 'kill', usually conceived as a single whole that cannot be partitioned, are multiplied by partial reduplication. Therefore, reduplicated verbs derived from those roots are used in situations where the agents (experiencers) and/or the patients (victims) are multiple, to express iteration and cumulation. In order to be iterated, the process √*mwt* 'die' requires only multiple experiencers, as exemplified in (5a), but √*qtl* 'kill' requires a single agent and a multiple victim as in (5b), or both a multiple agent and a multiple victim as in (5c):

(5) a. *mawwat-at al-ʔibil-u.*
die.cumulative.PST-3F DEF-camels-NOM
'All the camels died in the same period'

b. *qattal-a Zayd-un al-ʔibil-a.*
kill.cumulative.PST-3M ZAYD-NOM DEF-camels-ACC
'Zayd killed all the camels' (Zayd slaughtered the camels)

c. *qattal-at al-šurṭat-u al-mutaẓāhir-īna.*
kill.cumulative.PST-3F Def-police-NOM DEF-demonstrators-ACC
'The police slaughterd the demonstrators'

In addition, the total reduplication of the consonantal root, usually biliteral, expresses duration or iteration of the process, as in (6b):

(6) √*zl* ('to slip')
a. √*zll* ('to slip (once)')
zall-a Zayd-un.
slip.punctual.PST-3M Zayd-NOM
'Zayd slipped'

b. √*zlzl* ('to quake, to shake')
zal~zal-at al-ʔarđ-u.
slip~slip.iterative.PST-3F DEF-earth-NOM
'The earth shook (for a long time)'

Vowel lengthening

Along with reduplication, mostly partial, vowel lengthening is used in Arabic morphology to express duration in time or in space, thus changing a punctual process into a durative one as exemplified in (7). The notion related to √*qṭr* ('to drip'), for instance, is conceived as a punctual action when the simple verb form is used ((7a)), and as a continuous action that lasts for a long time when the second vowel of the template is lengthened ((7b)):

(7) √*qṭr* ('to drip (+liquid)')
   a. *qaṭar-a* *al-māʔ-u.*
      drip.PST-3M DEF-water-NOM
      'Water dripped'
   b. *ta-qāṭar-a* *al-māʔ-u.*
      REFL-drip.durative.PST-3M DEF-water-NOM
      'Water dripped for a long time'

Reduplication and vowel lengthening may occur in the same template to express intensity, mostly in the field of colors. The notion of 'being red,' or 'getting red' related to √*ḥmr*, for instance, is conceived as a normal or neutral hue in (8a) and as an intensive one in (8b):

(8) √*ḥmr* ('to (be, get) red')
   a. *ʔiḥmarr-at* *ʕayn-u* *Zayd-in.*
      get red.PST-3F eye-NOM Zayd-GEN
      'Zayd's eye reddened'
   b. *ʔiḥmārr-at* *ʕayn-u* *Zayd-in.*
      get red.intensive.PST-3F eye-NOM Zayd-GEN
      'Zayd's eye got very red'

Affixation

Other special morphemes are affixed to the template to convey a variety of aspectual values: inchoation, intensity, duration, etc. For instance, the prefix (*ʔa*) means inchoation, generally in processes of entering a space, as in (9a), or being at the beginning of a period of time, as in (9b):

(9) √*bḥr* ('sea')
   a. *ʔa-bḥar-a* *Zayd-un.*
      get.into-sea.PST-3M Zayd-NOM
      'Zayd got into the sea' (Zayd sailed)

      √*ṣbḥ* ('morning')
   b. *ʔa-ṣbaḥ-a* *Zayd-un.*
      get.into-morning.PST-3M Zayd-NOM
      'Zayd got in the morning' (Zayd started his morning)

The infixed morpheme (*w*) expresses duration and intensity of the process, generally related to states (shapes), feelings and colors as exemplified in (10):

(10) √*ħdb* ('to curve, to be curved')

a. *ʔiħdawdab-a* *ẓahr-u* *Zayd-in.*
be.curved.intensive.PST-3M back-NOM Zayd-GEN
'Zayd's back got very curved'

√*ħlw* ('to be sweet, sweetness')

b. *ʔiħlawl-ā* *ʕayš-u* *Zayd-in.*
be.sweet.PST.intensive-3M life-NOM Zayd-GEN
'Zayd's life got very sweet for a long time (intensely sweet)'

√*xḍr* ('to (be, get) green')

c. *ʔixḍawḍar-a* *al-ʕušb-u.*
be.green.intensive.PST-3M DEF-grass-NOM
'The grass got very green' (The grass was intensely green)

Lexical markers

In addition to the derivational markers of aspect (reduplication, affixation and vowel lengthening), Arabic has lexical markers. They are a closed set of grammaticalized verbs, usually used as inflected 'auxiliaries' and followed by an imperfective verb expressing the main process in the sentence. Therefore, the marking of aspect bears on the main process conceived as a whole or sliced into successive stages. Depending on the way the process is conceived, the array of aspectual values they convey varies: inchoation, restarting, duration or continuation, habituality, and completion or termination, as summarized in the following paragraphs.

a. Nearness

Verbs derived from the roots √*kwd* ('to near') and √*wšk* ('to hurry, to near') are used in Arabic to express aspectual nearness, i.e. the state of being near or on the point of implementing the process. Nearness does not necessarily require intention or awareness of the agent, as illustrated in (11a). The state of nearness may be captured at any stage of the unfolding process; for instance, (11b) conveys the ultimate phase before termination:

(11) √*kwd* ('to near')

a. *kād-a* *Zayd-un* *ya-ksir-u* *al-kaʔs-a.*
near.PST-3M Zayd-NOM 3M-break.PRS-IND DEF-cup-ACC
'Zayd almost broke the cup'

b. *kād-a* *Zayd-un* *ʔan* *yu-nhiy-a* *al-qaṣīd-a.*
near.PST-3M Zayd-NOM that 3M-finish.PRS-SBJV DEF-poem-ACC
'Zayd almost finished (writing) the poem'

b. Inchoation

Inchoation is expressed in Arabic by verbs related to many roots with different meanings: √*nšʔ* ('to create'), √*bdʔ* ('to start, to begin'), √*ʔxð* ('to take, to grasp'), √*šrʕ* ('to start, to open'), √*tfq* ('to start'), √*rwħ* ('to go away') and √*dfʕ* ('to push'). As regards the characterization of inchoation, all these verbs only indicate inchoation, except the last one √*dfʕ* ('to push'), which indicates the rate at which the agent started the process, as exemplified in (12b):

(12) √*ʔxð* ('to take, to grasp')

a. *ʔaxað-a Zayd-un ya-ktub-u.*
take.PST-3M Zayd-NOM 3M-write.PRES-IND
'Zayd started writing'

√*dfʕ* ('to push')

b. *ʔin-dafaʕ-a Zayd-un ya-ktub-u.*
REF-push-PST-3M Zayd-NOM 3M-write.PRES-IND
'Zayd rapidly started writing'

c. Duration

Verbs indicating immobility are always used to express duration and continuation. The absence of motion is conceived in terms of maintaining the same posture, which causes the same state to last for a long time; the result is duration. Consequently, verbs related to the roots √*byt* ('to stay during the night'), √*ẓll* ('to stay, to stand still') and √*qʕd* ('to sit, to rest') etc. are always used in the affirmative mode (i.e. with positive 'polarity'). Some other verbs express a duration bounded in time: the night in (13b), for instance, is the location in time for the process of writing. However, durative aspect is conveyed by other verbs related to roots meaning separation and distantiation, such as √*fkk* ('to separate, to dissociate'), √*zwl* ('to vanish, to get away'), √*ftʔ* ('to stop') and √*brħ* ('to leave (a place)'). All these verbs are negated (by the particles *mā* ('not') or *lam* ('not')), to express duration in the process as in (13c):

(13) √*ẓll* ('to stay, to stand still')

a. *ẓall-a Zayd-un ya-ktub-u šiʕr-an.*
stay.PST-3M Zayd-NOM 3M-write.PRES-IND poetry-ACC
'Zayd was writing poetry for a long time'

√*byt* ('to stay during the night')

b. *bāt-a Zayd-un ya-ktub-u šiʕr-an.*
stay.night.PST-3M Zayd-NOM 3M-write.PRES-IND poetry-ACC
'Zayd spent the night writing poetry'

√*zwl* (to vanish, to get away)

c. *mā zāl-a* *Zayd-un* *ya-ktub-u* *šiʕr-an.*
NEG get.away.PST-3M Zayd-NOM 3M-write.PRES-IND poetry-ACC
'Zayd did not stop writing poetry'

d. Habituality

Habituality is expressed by a verb derived from √*kwn* ('to be, to exist'). It is always in the past form (*kāna*) followed by the main verb of the sentence in the imperfective; therefore it marks durative (progressive) aspect in the past (14a). However, some adverbs make the aspect of habituality more explicit by indicating the cyclical or continuous way the process occurred in time, as illustrated in (14b) and (14c), respectively:

(14) √*kwn* ('to be, to exist')

a. *kān-a* *Zayd-un* *ya-ʒrī.*
be.PST-3M Zayd-NOM 3M-jog.PRES-IND
'Zayd was jogging'

b. *kān-a* *Zayd-un* *ya-ʒrī* *kull-a* *yawm-in.*
be.PST-3M Zayd-NOM 3M-jog.PRES-IND every-LOC day-GEN
'Zayd used to jog every day'

c. *kān-a* *Zayd-un* *ya-ʒrī* *bākir-an.*
be.PST-3M Zayd-NOM 3M-jog.PRES-IND early-LOC
'Zayd used to jog early (in the morning)'

e. Termination

Terminative aspect is expressed in Arabic by the use of full verbs derived from either the root √*nhy* ('to end, to reach'), or √*frγ* ('to empty'), where the process is conveyed by a nominal form in the completive position, as exemplified in (15):

(15) √*frγ* ('to empty')
faraγ-a *Zayd-un* *min* *kitāba-ti al* *qaṣīd-i.*
empty.PST-3M Zayd-NOM from writing-GEN DEF-poem-GEN
'Zayd finished writing the poem'

Furthermore, Arabic uses the same verb related to the root √*ʕwd* ('to come back') to mark some related aspectual values such as restarting, termination, and habituality. The affirmative use of the verb expresses restarting aspect, which is a kind of (new) inchoation since it presupposes that the process was interrupted and then resumed, as illustrated in (16a). When the verb is negated, it indicates the termination of the process regardless of the frequency at which it occurs: it may be an activity that stopped suddenly or a habit that lasted for long, as in (16b). However,

the use of the nominal form *ʕādat* ('habit') as an adverbial expresses habituality in expressions such as (16c):

(16) √*ʕwd* ('to come back')

a. *ʕād-a Zayd-un ya-ktub-u šiʕr-an.*
come.back.PST-3M Zayd-NOM 3M-write.PRS-IND poetry-ACC
'Zayd is writing poetry again'

b. *lam ya-ʕud Zayd-un ya-ktub-u šiʕr-an.*
NEG 3M-come.back.PRS Zayd-NOM 3M-write.PRS-IND poetry-ACC
'Zayd no more writes poetry'

c. *ya-ktub-u Zayd-un al-šiʕr-a ʕādat-an.*
3M-write.PRS-IND Zayd-NOM DEF-poetry-ACC habit-LOC
'Zayd usually writes poetry (or habitually, regularly)'

The preceding presentation of the aspectual system of Arabic is offered as a basic overview, skipping many details. I now turn to analyzing this system with respect to imagery and scanning as treated in cognitive linguistics.

3. Aspect in imagery

This section deals with the extent to which aspect might be considered as a verbal device to construct mental images related to states, events, and processes. The analysis will be based on attested evidence concerning mental imagery as presented in the literature on cognitive psychology. In turning to cognitive psychology, we follow the Cognitive Commitment principle (Lakoff 1990), which stipulates that "principles of linguistic structure should reflect what is known about human cognition from other disciplines, particularly the other cognitive sciences (philosophy, psychology, artificial intelligence and neuroscience)." (Evans & Green 2006: 40–41).

3.1 Aspect as an image-building tool

Imagery is the cognitive faculty that elaborates perceptual representations (Langacker 1987: 110, Wraga & Kosslyn 2003) into mental images. Mental images are the internal representations that produce the experience of perception while the appropriate sensory input is absent. Therefore, images (visual and mental) play a central role in human cognition.

Normal language use involves the description of actual, virtual, or fictive entities (Langacker 1999). Events, processes, and states have a particular status in the

perception, the organization, and the memorization of the actual or fictive world, since they stand for the individual actions performed by the agents and the interactions between the agents: in brief, they profile the changing (dynamic) part of the world. Hence, change, by itself, is a constituent of the perceived or represented scene and may be dissociated from the other entities present in it. We can consider the mental representations of a dynamic scene to include aspectual representations that focus on the changing part(s) in it, i.e. the participants and their roles in the course of their interaction. This might explain why the verb is the most important component of the sentence and bears the markings of time, aspect, and modality.

Language offers the symbolic resources to express actions conceived from a variety of vantage points. The mental images of actions are conveyed (or triggered) by the lexical items ("run", "jump", "sleep"...) and aspectual forms express the ways in which they occur (duration, phases, intensity, etc.) Therefore, aspect as the verbal coding of mental images related to processes and aspectual forms is one of many grammatical tools constituting the mental representations of states, events, and processes.

The functions of mental imagery are multiple. They are used in predicting, creating, retrieving, navigating, tracking, and reaching objects or movements (Kosslyn 1995; Wraga & Kosslyn 2003):

Imagery is the ability to predict the outcome of an action like planning something ahead. The notion of 'making a chair', for instance, is based on that ability. From a cognitive view, the maker is following a general plan (prototype) made up of many partial plans. Making the different parts of the chair, following precise steps, is guided by this plan at two levels: the partial plan elaborates the individual part; the general plan outlines its place and function in the whole representation of the chair. In aspectual terms, it implies *telic* aspect, because the verb "make" indicates the result of the process, which presupposes that the agent achieves all the stages mentioned earlier.

Mental imagery is the ability to create a mental model in a variety of situations, such as problem solving, learning new tasks, or improving skills by repeating an action (Kosslyn 1995). In aspectual terms, this ability is exemplified by the verbal description of actual scenes (events, processes, states) or the elaboration of fictive ones planned ahead to give directions to perform an act or operation with reference to the internal organization structuring the whole.

Furthermore, the analogy between visual and verbal representations is widely acknowledged (Denis, Gonçalves & Memmi 1995), and language may be considered a source of constructing mental images. Wraga & Kosslyn (2003) view mental imagery as relying more on visual perception to construct representations than verbal descriptions, since mental (visual) images include more details than verbal images do. The visual mental image of a 'dog under the tree', for instance, comprises the

shape, size, orientation, and proportions of the observed objects, etc., while the sentence "the dog is under the tree" only specifies these two entities' physical relation.

Mental images based on verbal descriptions convey a minimal amount of information. This might be true for images of static situations like the one mentioned by Wraga & Kosslyn, but when it comes to dynamic situations in general and to processes in particular, verbal mental images are richer in specifications, since their aspectual representation indicates how the process unfolds in much more detail. The act of writing, for instance, is lexically represented, through the verb "write", as hand movement(s) making graphic symbols on a material surface. However, other relevant details are conveyed by other linguistic elements expressing aspectual values, as illustrated in (17b–e):

(17) a. *I wrote the book.*
b. *I **am** writ**ing** the book.*
c. *I wrote the book **line by line**.*
d. *I **started** writing the book.*
e. *I **finished** writing the book.*

As for depiction in mental imagery, Denis & Cocude (1997) argue that visual images incorporate the metric structure of represented objects and their configurations. Depiction is considered as the correspondence between the representation and the represented object: each portion of the representation is a representation of a portion of the object, such that the distances among portions of the representation correspond to the distances among the corresponding portions of the object. Depictive representations always stand for parts of the object, even when they are divided in an arbitrary way, just like the fragments of a picture cut out randomly still represent the corresponding portions of the represented object or scene (Kosslyn 1994; Kosslyn, Thompson & Ganis 2002). Moreover, not only do images based on verbal descriptions have the same structural properties as images derived from perception (Denis & Kosslyn 1999), the sequencing of a verbal description is also reflected in the internal structure of images (Denis, Gonçalves & Memmi 1995). Representations of scenes constructed from verbal descriptions tend to preserve the spatial relationships occurring in the scene (Tversky & Lee 1998).

However, aspectual representation is depictive, too: it indicates the schematic temporal architecture of the process. The basic spatial relationships are related to the timing of the action as it unfolds: the notion of 'jump', for instance, is always indicated schematically, without indicating any precise details about the length or height of the jump, unless some other grammatical means are used to give more details about them (as in "jump *high*", "jump *higher and higher*", "jump *backward*" or "*forward*"). In some contexts, more information about portions of the action is available, in a schematic fashion, such as information about the start, the middle, or

the end sequences, as in "*start* jumping", "be jump*ing*", and "*stop* jumping," etc. Aspectual representations reflect the basic distances between the different phases that constitute the process as it unfolds in conceived or real time. They are conveyed by aspectual forms bearing notions such as repetition, frequency, habituality, etc.

I argued in this section that aspect is a verbal tool for building mental images. It is an inherent part of the symbolic resources available in grammar to depict the dynamic part of the perceived (or represented) situations and to construct mental images based on verbal descriptions. Aspectual mental imagery – if we may call it that – is schematic and depictive and may be considered as the verbal facet of mental imagery.

3.2 Aspect as a scanning device

In the previous section, I argued that aspect might be considered as a verbal image-building tool. In this section, I try to show that building aspectual mental images of actions is based on scanning as a general cognitive mental ability, a step that leads to considering aspect as a verbal scanning device. In the end, I argue that all aspectual values related to events, processes, and states commonly discussed in the linguistic literature can be handled in terms of scanning, be it summary or sequential.

In cognitive psychology, mental scanning is considered to be the basic mechanism of mental imagery. It involves the systematic shifting of attention over visualized objects. Kosslyn (1994) affirms that two mechanisms are at the base of mental scanning: shifting attention and transformation (rotation). *Shifting* attention occurs while moving from one portion of the mental image to another. A portion is selected by focusing attention on it. *Rotating* the visual mental image of an object preserves the motor properties of skills involved during the actual perception of this object. It relies on motor programs that ordinarily move the eyes, the head, and different parts of the body. Scanning or rotating a mental image occurs in the same way as scanning or rotating an actual object, since the cognitive system simulates actual behavior (Berthoz 1997).

In Cognitive Grammar, scanning is a type of cognitive processing that occurs ubiquitously and automatically (Langacker 1987). It does not relate to attention, neither in its general sense nor in its specialized sense as involving shifts in focal area. Scanning is the operation relating a standard of comparison to a target and registering any discrepancies between them. Scanning and comparison are inherently interrelated cognitive processes, since they occur in all domains and at all levels of cognitive functioning (Langacker 1987: 108).

Scanning is an event on its own, distinguishable from the representation of standard of comparison and the target. It is a complex directional event: complex

because it consists of a chain of scanning operations, and directional because the chain defines a path through the field of representation through which the perceiver scans in a constant direction until a contrast is registered (Langacker 1987: 109).

Three sets of scanning events are listed in Langacker (1987): (a) scanning events recognizing the standard as separate entity, (b) scanning events to recognize the target as a distinct entity, and (c) a comparison of the two entities thus recognized with their relative positions in the mental field. In the case of a falling object, set (a) would establish the top-most structure of the field as a standard, set (b) would present the lower structure as a target, and set (c) would compare the two positions of the same object in multiple phases.

The perception and the conceptualization of any situation (event, process, state) are based on scanning to detect change or stativity through time. Mental representation follows the same process. The concept of 'walking', for instance, is characterized by changes in the location of the mover. The latter starts at a given location in space, which coincides with a certain point in time. This location is the standard, recognized as a distinct entity by a first set of scanning events. Then, as (s)he moves and changes location, every new location is considered as a target of comparison. The comparison stage then back and forth between two contingent locations, turning the perception and the conception of the movement to one complex image. Processing goes on until the mover reaches some (arbitrary) point and stops. Mental scanning is thus made up of countless continued acts of comparison (Langacker 1987: 108), and this fact makes for the complexity of the scanning event.

In aspectual terms, scanning is based a comparison between different successive phases of the action as it unfolds, such that each phase is at the same time a standard and a target: a target for the previous and a standard for the following act of comparison. The starting point is a target for a standard that corresponds to the initial state (the absence of movement); the end is a target for the pre-final phase and a standard for the following phase (again, the absence of movement). The different successive phases making up the entire (uniform) movement make scanning chains.

Given that an action unfolds through chained successive phases and that it is perceived and conceptualized through chained scanning operations, we may consider that aspectual values can be handled in terms of standards and targets. Nearness, or the state of preparing to start an action, for instance, is a target for a precedent state and a standard for the following one, which is the first phase of the process itself. Furthermore, nearness may coincide with any phase in the unfolding process, under one condition, which is the presence of a landmark somewhere in or outside the action: in (18a), nearness is captured just before the breaking of

the cup would have occurred. It is captured just before the terminative phase of writing the poem in (18b):

(18) a. *kād-a* *Zayd-un* *ya-ksir-u* *al-kaʔs-a.*
near.PST-3M Zayd-NOM 3M-break.PRS-IND DEF-cup-ACC
'Zayd almost broke the cup'

b. *kād-a* *Zayd-un* *yu-nhī* *al-qaṣīd-a.*
near.PST-3M Zayd-NOM 3M-finish.PRS.IND DEF-poem-ACC
'Zayd almost finished (writing) the poem'

Inchoative aspect is related to the initial phase recognized as a separate state different from the other state(s) occurring or imagined in the background. The initial state may be conceived as a single point in time as in (19a), where the starting of the running is an intermediate short state between resting or walking (the standard) and speeded movement (the target). It may be conceived as an intermittent state or intermittent states varying in length, as in (19b), where the agent is starting the process of writing poetry. This process does not necessarily take place in a single moment: (19c) presents writing a poem as an ongoing process. The process is renewable, manifested through trials and drafts, as is common for poets. In general, scanning in inchoatives is expansive, since it involves only the subsequent phases of the process:[1]

(19) a. *badaʔ-a* *Zayd-un* *ya-ʒrī.*
start-PST-3M Zayd-NOM 3M-run.PRS.IND
'Zayd started running'

b. *badaʔ-a* *Zayd-un* *ya-ktub-u* *šiʕr-an.*
start-PST-3M Zayd-NOM 3M-write.PRS.IND poetry.INDF-ACC
'Zayd started writing poetry'

c. *badaʔ-a* *Zayd-un* *ya-ktub-u* *qaṣīd-an.*
start-PST-3M Zayd-NOM 3M-write.PRS.IND poem.INDF-ACC
'Zayd started writing a poem'

Terminative aspect relates to the final phase recognized as a terminative state of the process. It is the target for the immediate pre-final phase on the one hand and for the whole process on the other. Finishing a poem, for instance, is a terminative phase of the whole process of writing, which may take a long time, and its final step, when the writer puts away his or her pen, as illustrated in (20). Scanning in

1. Langacker (1987: 225) uses "expansive" and "contractive" as two kinds of scanning operations in the case of 'above' and 'below'. This applies in aspectual scanning too.

terminative aspect is contractive when the target is the pre-final phase. However, it is expansive when the target includes the whole precedent process:

(20) *faraɣ-a Zayd-un min kitābat-i al-qaṣīd-i.*
empty-PST-3M Zayd-NOM from writing.F-GEN DEF-poem.GEN
'Zayd finished writing the poem'

Durative aspect involves comparison between the phases of the process in a way that is necessarily bidirectional. To detect continuation, scanning goes back and forth, switching standards and targets and adding new ones as the process unfolds. Even though landmarks are moving and comparison operations are numerous, discrepancies are neglected in favor of similarity between different successive phases. This similarity makes us conceive the state as lasting and the process as enduring.

Duration may be bounded and the process may be bounded, too, as in (21a), where the two boundaries (standard/target) are fixed and continuation occurs within those boundaries: writing poetry is bounded by the night between evening and dawn. Duration may also be unbounded and the process may be unbounded, too, as illustrated in (21b, c, d):

(21) a. *bāt-a Zayd-un ya-ktub-u šiʕr-an.*
stay.night-PST-3M Zayd-NOM 3M-write.PRS.IND poetry.INDF-ACC
'Zayd spent the night writing poetry'

b. *kān-a Zayd-un ya-ktub-u šiʕr-an.*
be-PST-3M Zayd-NOM 3M-write.PRS.IND poetry.INDF-ACC
'Zayd was writing poetry'

c. *ẓall-a Zayd-un ya-ktub-u šiʕr-an.*
stand.still-PST-3M Zayd-NOM 3M-write.PRS-IND poetry.INDF-ACC
'Zayd kept writing poetry'

d. *mā zāl-a Zayd-un ya-ktub-u šiʕr-an.*
NEG get.away-PST-3M Zayd-NOM 3M-write.PRS-IND poetry.INDF-ACC
'Zayd did not stop writing poetry'

Restarting, as an aspectual value, relates to durative aspect and inchoation. It is a new inchoation in a durative process that stopped at a given time. It also relates to habituals in this respect, since they refer to an intermittent durative process. Writing poems, for instance, is a habit that occurs every day for a long time in (22a), and that is restarted in (22b). The comparison is built on the precedent durative process of writing as a standard and the new episode of the process or its renewal as a target. Thus, comparison in aspectual scanning can be based on episodes that last a long time:

(22) a. *kān-a* *Zayd-un* *ya-ktub-u* *šiʕr-an* *kull-a*
be-PST-3M Zayd-NOM 3M-write.PRS.IND poetry.INDF-ACC every-LOC
yawm-in.
day-GEN
'Zayd used to write poetry every day'

b. *ʕād-a* *Zayd-un* *ya-ktub-u* *šiʕr-an*
come.back.PST-3M Zayd-NOM 3M-write.PRS-IND poetry-ACC
kull-a *yawm-in.*
every-LOC day-GEN
'Zayd is writing poetry every day again'

I have argued so far that aspectual representations might be dealt with in terms of scanning as a cognitive operation based on comparisons between successive phases of the action. In the following section, I try to show that aspectual representations include spatial and temporal dimensions related to actions and processes.

In imagery, the *mental scanning effect* resides in a linear relationship between scanned distances and scanning times: the visual images incorporate the metric structure of represented objects or configurations (Denis & Cocude 1997). Kosslyn (1995: 283) argues that visual mental images contain references to space. As distance is an intrinsic part of space, it is part of the representation, and, thus, it affects the processing time: scanning times increase linearly with increasing distances scanned across. Borst, Kosslyn, and Denis (2006: 476) take the view that mental images incorporate the metric information present in the original stimulus.

Aspectual representations are also based on distances in space and/or time. Distances in aspectual terms are schematic representations of real or virtual dimensions. Aspectual scanning depicts them in two ways: as a whole or as partitioned, as illustrated in (23), (24) and (25). In Arabic, verbal morphological forms with an inner long vowel convey continuation or duration in space and/or time, as a basic dimension, (see vowel lengthening (Section 2)). Precisely, distances in space and in time are expressed by the morphological template ((CV)C1aaC2aC3), where C1C2C3 corresponds to the consonantal root bearing the lexical meaning (the process) and the long vowel (*ā*) marks the extent or duration of the action in space and in time.

In (23a), the event is rendered as a whole and the act of receiving the award is summarized, although it incorporates many different actions related to the ceremony and to the actual act of stretching out the hand to grasp the awarded object. In this case, distances are not considered relevant, so they are ignored. In (23b) and (23c), distance in space is a basic component of the representation: in (b) Syrine hands Salmā the cup by taking it in her hand and stretching her arm to reach Salmā, covering all of the distance separating them. We may imagine that

the distance is longer when, for example, one of them is on the ground and the other is in a tree. In (c), Syrine does the same thing as is done in (b), until she reaches for the cup:

(23) √*nwl* ('to acquire, to get')
  a. *nāl-at Syrine jāʔizat-an.*
  get.PST-3F Syrine prize.INDF-ACC
  'Syrine got a prize'
  b. *nāwal-at Syrine Salmā al-kaʔs-a.*
  hand.PST-3F Syrine Salmā DEF-cup-ACC
  'Syrine handed the cup to Salmā'
  c. *ta-nāwal-at Syrine al-kaʔs-a.*
  REFL-grasp.PST-3F Syrine DEF-cup-ACC
  'Syrine grasped the cup – by stretching her arm to reach it'

Likewise, aspectual scanning may depict distance in time. The process √*qṭr* ('to drip (+liquid)'), for instance, is scanned in two different ways in (24) and has two aspectual construals: in (24a), it is represented as a punctual event that does not last because it is rendered as a completed whole. However, it is construed in (24b) as a continuous action in time. The meaning of both expressions is referentially, but the difference bears on the mental scanning translated into aspectual marking:

(24) √*qṭr* ('to drip (+liquid)')
  a. *qaṭar-a al-māʔ-u.*
  drip.PST-3M DEF-water-NOM
  'Water dripped'
  b. *ta-qāṭar-a al-māʔ-u.*
  REFL-drip.durative.PST-3M DEF-water-NOM
  'Water dripped for a long time'

The duration of a process may be conceived as successive cycles, as illustrated in (25). The transition of possession, as in inheritance for instance, is expressed in two ways: a single cycle or transition as in (25a), where the agent inherits the object from his immediate ancestor(s), or a chain of successive transitions between generations, where each generation is at the same time an ancestor and a descendant, as in (25b):

(25) √*wrθ* ('to inherit')
  a. *wariθ-a Zayd-un al-qaṣr-a.*
  inherit.PST-3M Zayd-NOM DEF-palace-ACC
  'Zayd inherited the palace'

b. *ta-wāraθa-t ʔusrat-u Zayd-in al-qaṣr-a.*
REFL-inherit.durative.PST-3M family-NOM Zayd-GEN DEF-palace-ACC
'Zayd's family inherited the palace, generation after generation'

Furthermore, aspectual scanning implies directionality in the represented process. According to Langacker (1987: 224), scanning involves transition, which makes chains. The chaining may be linear as illustrated in (23) and (25), where linearity is spatial and temporal, respectively. However, it may also be conceived as a multitude of divergent lines starting at a real or virtual center. The event is then a multilinear process occurring in all directions simultaneously, where the trajector (agent) is multiple (plural, generic etc.), as shown in (26):

(26) √*ṭyr* (to fly)
a. *ṭāra-t al-farāšat-u.*
fly.PST-3F DEF- butterfly.F.SG-NOM
'The butterfly flew away'
b. *ta-ṭāyar-a al-farāš-u.*
REFL-fly.PST-3M DEF-butterfly.PL-NOM
'The butterflies flew away in all directions, simultaneously and sporadically'

In (26a), the trajector is singular and the flying is linear. Scanned in a summary fashion, the flying is reported as a whole event and there is no indication of the way in which it happened. In contrast, the trajector is multiple in (26b), and the template (ta-C1aaC2aC3) expresses the way the process is performed: a multitude of butterflies are flying simultaneously, sporadically and in all directions, starting from a central point where they were gathered. The scanning involves many acts of comparison between different butterflies at two levels: the first is the level of the individual whose movement is scanned, making an individual linear chain following the trajector's different locations in space. The second is the level of the mass, where many acts of comparison between the individuals occur to register the simultaneity and the variety of flying directions and to elaborate the scene as a homogenous coherent percept.

Linearity in space also involves static configurations. In (27), the same event of spreading is construed in two ways: in (27a), the scene is dynamic because it involves moving objects ('grains') thrown by an agent (*Zayd*) and distances are not in focus. The scene in (27b) is static, since there is no movement. Comparison is based on a fictive movement starting at the center of a circle and reaching the periphery in a kind of network established through scanning. Two crossing views indicate distances. The first one involves fictive motion by starting from the center and going in a radial fashion until the individual location of each grain is covered. The other is

tracking the location of each grain circularly. Both views hold simultaneously and need to be mutually superimposed in order to constitute a coherent scene:

(27) √*nθr* ('to spread')

a. *naθar-a* *Zayd-un* *al-ħabb-a.*
spread.PST-3M Zayd-NOM DEF-grain-ACC
'Zayd spread the grains'

b. *ta-nāθar-a* *al-ħabb-u.*
REFL-spread.PST-3M DEF-grain-ACC
'The grains spread all the way around'

I have argued in this section that aspect may be considered as a verbal scanning device: aspectual scanning is the basic mechanism in building linguistic representations of processes. It is based on comparisons between successive phases of the action as it unfolds. Inchoative aspect focuses on the initial phase(s); terminative aspect relates to the final phase(s); durative aspect involves a bidirectional comparison between all the phases of the process. Aspectual scanning includes spatial and temporal configurations and thus linearity and directionality in the represented (dynamic or static) situation. In section (4), I now deal with modes of aspectual scanning, based on data from Arabic.

4. Aspectual scanning: The case of Arabic

Comrie (1976: 13) proposes a difference between states, events, and processes. States are static, they continue until changed. Events and processes are dynamic and require continuous input of energy. They differ in the way they are viewed: while events are viewed as a complete whole (perfective aspect), processes are viewed in progress, from within (imperfective aspect).

In Cognitive Grammar (Langacker 1987: 244), the conceptualization of a process follows its temporal evolution. This evolution is made up of a series of successive states standing for the different phases of the process and is conceived as occupying a continuous series of points in conceived time, where each state consists of a relation between the trajector and the landmark. Langacker takes the view that the mental flexibility that humans have to dissociate processing time from the conception of objective time should be the basis for analyzing linguistic structure in general and aspect in particular. In the light of this dichotomy, the verb profiles a process, which is a relationship, viewed with respect to its evolution through conceived time, while adjectives, adverbs, and prepositions profile a non-processual relationship; they are atemporal since evolution through time is not in focus. Two kinds of processes of verbs are thus established: perfectives and

imperfectives. The perfectives involve a change through time; imperfectives do not (Langacker 1987: 254). A perfective verb profiles a process bounded within the immediate temporal scope, while an imperfective verb profiles a constant situation persisting indefinitely through time (Langacker 2001: 257). Imperfective processes are conceived as a mass made up of parts of the same event, so any portion may be an instance of the process type, and any portion that coincides with the speech event will qualify as a representative instance. Imperfective processes are nonreplicable while perfectives are replicable (Langacker 1987: 260). However, this is not a rigid dichotomy partitioning the class of verbs into disjoint subsets. Some imperfective verbs (as in (28a)) can receive a perfective, dynamic construal in specific contexts, as in (28b) (Langacker 1987: 257):

(28) a. *This road winds through the mountains*. (Imperfective)
b. *This road is winding through the mountains*. (Perfective)

The scope of predication determines the aspect of the verb by either encompassing the entire scene simultaneously or only successively through time.

4.1 Scanning modes

Aspect is one of many grammatical tools for epistemic grounding since it indicates the way a profiled process is related to time, construed, and scanned. In CG, scanning has two modes: summary and sequential. A complex scene may be processed in either mode; the scene of "getting in a room through the door," for instance, may be profiled in a summary or sequential fashion (Langacker 1987: 248). When the component states are profiled individually as relations, then sequential scanning is employed and the verb 'enter' is used. When the components are profiled collectively as one thing, then summary scanning is employed and the noun 'entrance' is used. The difference between the verb ("enter") and the noun ("entrance") thus reflects the difference between two ways a process is scanned. In this view, the basic opposition between summary and sequential scanning is related to the opposition of the verb (infinitive, conjugated) and the noun (action) that share the same lexical root.

In summary scanning, the situation is conceived as stable, but in sequential scanning, it is conceived as changing, with one single state captured at a time (Langacker 1987: 264). On the one hand, summary scanning is additive in that all aspects are coexistent and simultaneously available (Langacker 1987: 144–145, 248). On the other hand, sequential scanning involves disparity related to the recognition of change and implies the transformation of a configuration into another or a continuous series of transformations. Sequential scanning profiles a coherent unfolding scene divided into phases where each configuration serves as the standard for an act of comparison and where each configuration is successively

recognized as different from the other. Summary scanning is the ability we display when examining a still photograph and sequential scanning is what we do in watching a motion picture (Langacker 1987: 248).

In CG, the notion of change is pivotal for cognitive processing. It is the source of the difference between summary scanning (zero change) and sequential scanning (presence of change). In aspectual terms, it is the source of the difference between perfectives (presence of change) and imperfectives (zero change). We may establish a correspondence between the pairs in a one-to-one fashion: summary scanning/imperfectives, on the one hand, and sequential scanning/perfectives, on the other. This fact may suggests that imperfectives should be defined as processes scanned in a summary fashion and perfectives as processes scanned sequentially.

In processes scanned in a summary fashion, the trajector (agent, subject, mover...) is occupying all the positions in its trajectory simultaneously (imperfective) and the view is global and fixed. However, in those processes scanned sequentially, the trajector is at a determined position (location in space and/or in time etc.) and the view is partial and cut into slices. Slicing occurs in two ways. The first applies when a single sequence of the process is profiled. I will call this the monosequential scanning. The second applies when all the sequences or some of them are profiled. I will call this polysequential scanning.

We have the ability to capture (one of) the internal sequences of a process. This fact may be unnoticed in everyday use, but we may imagine the following scene. A detective and his colleague are screening a tape of a scene recorded in a shopping center: someone is stealing money from a drawer. He has many ways to comment it:

a. Using summary scanning and focusing on the sequence of taking money would give something like "Now, he takes the money."
b. Using sequential scanning, he has the ability to follow the successive phases of the operation as if he were shooting each one of them, but instead of using a camera, he uses verbal tools. This would give "Now, he opens the drawer with his right hand, and now, he introduces the left one, grasps the money, takes it out, closes the drawer, ...". Moreover, he can screen every sequence as it starts, unfolds, and ends. Opening the drawer, for instance, would be described in the following terms: "Now, he reaches out the right hand, grasps the edge of the drawer, starts pulling it carefully, pulls it, pulls it... now, the drawer opens...". The last step he may reach is the ultimate component of the different processes involved in the sequence: the atomic elements of the process are suitable for monosequential scanning.

In this respect, Chang, Gildea, & Narayanan (1998) established some schematic sequences of the processes, based on ordered phases: ready-start-ongoing-iterate-finish-done. Some other properties are related to other parameters, including the

rate (slow-fast), continuity (stop-restart-suspend-cancel), etc. This may help us assess the link between scanning and aspectual representations in general and the link between some standard aspectual values and monosequential or polysequential scanning in particular.

Tversky (1999) established an analogy between drawings and language since they both include a small number of segments (words) that combine to form an infinite number of drawings or sentences. We may posit that aspectual constructions are made of a limited number of schematic forms (aspectual schemas) that combine to form an infinite number of representations of processes: these forms are the grammatical elements expressing all the aspectual values.

4.1.1 *Aspectual summary scanning*

Considering that a process is bounded, we have the faculty to scan it in a summary fashion and construe it as a whole including its beginning, evolving, and ending. This corresponds to perfectives, in Langacker's conception. Summary scanning applies to all types of processes regardless their semantic properties (punctual, duration etc.):

(29)	Action	*kataba*	*yaktubu*	*sa-yaktubu*
		He wrote	writes	will write
	State	*ʔalima*	*yaʔlamu*	*sa-yaʔlamu*
		He suffered	suffers	will suffer
	Experience	*mariḍa*	*yamraḍu*	*sa-yamraḍu*
		He was sick	is sick	will be sick
		nāma	*yanāmu*	*sa-yanāmu*
		He slept	sleeps	will sleep

4.1.2 *Aspectual monosequential scanning*

Processes are of two types: punctual and non-punctual. Punctual processes do not take a long time to occur. They are conceived, depicted, and scanned as a single event that cannot be divided into parts. They are non-countable, unless repeated: √*qṭr* ('drip (liquid)'), √*ksr* ('break'), √*qṭʕ* ('cut'), √*qsm* ('divide') etc. Other processes behave like punctuals, but they may have some inherent duration, like √*mwt* ('die'), √*qtl* ('kill'), √*sqṭ* ('fall') etc. Punctual processes are the best candidates for monosequential scanning due to their nature. However, we have the ability to scan any process in a single mood to capture just one of its sequences, as illustrated in (30):

(30) a. *kād-a* *Zayd-un* *ya-squṭ-u.*
near.PST-3M Zayd-NOM 3M-fall.PRS-IND
'Zayd almost fell'

b. *ʔaħṣad-a* *al-zarʕ-u.*
harvest.ready.PST-3M DEF-CROP-NOM
'The crops are ready for harvest'

c. *ʔaxað-a* *Zayd-un* *ya-ktub-u.*
take.PST-3M Zayd-NOM 3M-write.PRS-IND
'Zayd started writing'

d. *ʔabħar-a* *Zayd-un.*
get.into-sea.PST-3M Zayd-NOM
'Zayd got into the sea' (Zayd sailed)

e. *ʔaṭfal-at* *Zaynab-u.*
child.get.PST-3F Zaynab-NOM
'Zaynab gave birth to a child'

4.1.3 *Aspectual polysequential scanning*

We may scan a process in a polysequential fashion to represent some of its fragments or its repetition or continuation as a whole. An ongoing process is scanned sequentially and the chaining of the sequences makes it polysequential. Progressive forms are the best representatives of this mode of scanning, as illustrated in (31):

(31) a. *kān-a* *Zayd-un* *ya-rfaʕ-u* *al-ʕalam-a* *lammā*
be.PST-3M Zayd-NOM 3-hoist.PRST-IND DEF-flag-ACC when
daxal-tu.
enter.PST-1
'Zayd was hoisting the flag when I entered'

b. *ʔar-ā* *Zayd-an* *ya-rfaʕ-u* *al-ʕalam-a.*
1-see.PRST Zayd-ACC 3-hoist.PRST-IND DEF-flag-ACC
'I see Zayd hoisting the flag'

Arabic shows a frequent use of the name of the agent to profile a continuous process related to the time of speaking or to a constant state. Being a noun derived from the verb, the name of the agent oscillates between the verb and the adjective. Thus, it may have the valence of the verb when it expresses a continuous process; otherwise, it is an adjective. Some names of the agent are proper nouns. The name of the agent *kātib* ('writer'), for instance, profiles a perfective process, which is already finished as in (32a), or an imperfective process, which occurs or will occur as in (32b), or it may designate a political position with no act of writing and no aspectual value as in (32c):

(32) a. *Zayd-un* *kātib-u* *al-risālat-i.*
Zayd-NOM write.agentive-NOM DEF-letter-GEN
'Zayd is the one who wrote the letter (the writer of the letter)'

b. *Zayd-un* *kātib-u-n* *al-risālat-a.*
Zayd-NOM write.agentive-NOM-INDF DEF-letter-ACC
'Zayd (is) will(ing to) write the poem'

c. *Zayd-un* *kātib-u* *al-dawlat-i.*
Zayd-NOM write.agentive-NOM DEF-state-GEN
'Zayd is Secretary of State'

The progressive verb and the name of the agent may profile a continuous process. For instance, the process is scanned in a polysequential mode by the verb *yarfaʕu* in (31) and by the name of the agent *rāfiʕ* in (33):

(33) a. *kān-a* *Zayd-un* *rāfiʕ-an* *al-ʕalam-a* *lammā*
be.PST-3M Zayd-NOM hoist.agentive-ACC DEF-flag-ACC when
daxal-tu.
enter.PST-1
'Zayd was hoisting the flag when I entered'

b. *ʔa-rā* *Zayd-an* *rāfiʕ-an* *al-ʕalam-a.*
1-see.PRST Zayd-ACC hoist.agentive-ACC DEF-flag-ACC
'I see Zayd hoisting the flag'

Polysequential scanning profiles multiple phases in the process itself and/or multiple participants. Multiple phases correspond to some aspectual values, such as iteration, repetition, duration, cumulation, habituals, and partitioning. They constitute a variety of polysequential scanning, making a continuum of interconnected grades on a scale. Multiple participants correspond to either the plurality of the agent or the plurality of the patient. Adverbs can also express the multiplicity of the process or participants.

Iteration relates to the repetition or frequency of the process without focusing on the engagement of the agent to repeat it. The second consonantal root reduplication indicates iteration, as mentioned in Section 2:

(34) a. *qattal-a* *Zayd-un* *al-ɣuzāt-a.*
kill.itertaion.PST-3M Zayd-NOM DEF-invader.PL-ACC
'Zayd killed all the invaders, one by one'

b. *nawwam-a* *al-ʔaʧāl-u* *bākir-an.*
sleep.iteartion.PST-3M DEF-boy.PL-NOM early-LOC
'All the boys went to bed early, one after the other'

Duration is expressed by the long vowel in the verbal stem. The process is conceived as lasting for a while without necessarily being continuous, as shown in (35):

(35) a. *zāwal-a Zayd-un dirāsat-a-hu fī Manouba.*
follow.durative.PST-3M Zayd-NOM study-ACC-his in Manouba
'Zayd studied at Manouba for a long time'

b. *ta-qāṭar-a al-māʔ-u.*
REFL-drip.durative.PST-3M DEF-water-NOM
'Water was dripping for a long time'

Reciprocal processes based on alternation between participants are profiled as continuous in polysequential scanning. The processes in (36), for instance, occur necessarily by alternation between two people and last for a certain time. Nevertheless, they are profiled in polysequential scanning as occurring in a continuous way:

(36) a. *qātal-a Zayd-un al-ɣuzāt-a.*
fight.durative.PST-3M Zayd-NOM DEF-invaders-ACC
'Zayd fought the invaders for a long time'

b. *ta-nāqaš-at Syrine wa Salmā.*
RECP-argue.durative.PST-3F Syrine and Salmā
'Syrine and Salmā argued for a long time'

Cumulation is a staged operation, in which scanning follows consecutive sequences until it reaches the ultimate stage, that of saturation. Verbal stems expressing cumulation are attested in the description of colors as in (37a, b), and in a few other domains, as in (37c, d). The most intense hue of a color, for instance, is reached after a series of layering operations where the following one adds to the preceding one, making the color more and more intense:

(37) a. *ʔiħmārr-a wajh-u Zayd-in.*
get.red.cumulative.PST-3M face-NOM Zayd-GEN
'Zayd's face got *intensely red*'

b. *ʔixḍawḍar-a al-ʕušb-u.*
get.green.cumulative.PST-3M DEF-grass-NOM
'The grass got *intensely green*'

c. *ʔiħdawdab-a Zayd-un.*
get.curved.cumulative.PST-3M Zayd-NOM
'Zayd got his back *very curved*'

d. *ʔiʕšawšab-a al-ħaql-u.*
get.grass.cumulative.PST-3M DEF-field-NOM
'The field got *a lot of grass*'

Grammaticalized verbs indicating the length or the iteration of the process conveyed by the main verb express habituals and continuation:

(38) a. *kān-a Zayd-un ya-ktub-u al-šiʕr-a fī ṣibā-hu.*
be.PST-3M Zayd-NOM 3M-write.PRST-IND DEF-poetry-ACC in youth-he
'Zayd used to write poetry in his youth'

b. *ṭāl-a mā katab-a Zayd-un al-šiʕr-a fī ṣibā-hu.*
get.long.PST-3M that write.PST-3M Zayd-NOM DEF-poetry-ACC in youth-he
'Zayd used to write poetry for long time in his youth'

c. *mā fatiʔ-a Zayd-un ya-ktub-u al-šiʕr-a fī ṣibā-hu.*
NEG stop.PST-3M Zayd-NOM 3M-write.PRST-IND DEF-poetry-ACC in youth-he
'Zayd did not stop writing poetry in his youth'

Adverbs are one of the most common tools of aspectual representation in languages. Some adverbs in Arabic indicate polysequential scanning in general and the partitioning of the process in particular. The process of writing, for instance, is scanned in a summary fashion in (39a), but its sequences are profiled in (39b), where they coincide with the items of writing or with those of reading such as *kalimat* ('word') in (39b) or *sṭr* ('line') in (39c):

(39) a. *katab-a Zayd-un al-kitāb-a.*
write.PST-3M Zayd-NOM DEF-book-ACC
'Zayd wrote the book'

b. *katab-a Zayd-un al-kitāb-a* ***kalimat-an kalimat-an.***
write.PST-3M Zayd-NOM DEF-book-ACC word.INDF-ACC word.INDF-ACC
'Zayd wrote the book *word by word*'

c. *katab-a Zayd-un al-kitāb-a* ***saṭr-an saṭr-an.***
write.PST-3M Zayd-NOM DEF-book-ACC line.INDF-ACC line.INDF-ACC
'Zayd wrote the book *line by line*'

To conclude, two kinds of aspectual scanning were established: summary scanning and sequential scanning. The former corresponds to imperfectives and the latter corresponds to perfectives. In aspectual summary scanning, the process is depicted in a summary fashion where the view is global and involves no change. However, when the process is scanned sequentially, the view is partial and cut into

slices. Slicing occurs in two ways. The first one is monosequential *scanning*, in which a single sequence of the process is profiled. This corresponds to aspectual values such as nearness, inchoation, termination, and stop. The second one is *polysequential scanning*, in which multiple sequences of the process itself are rendered and/or multiple participants are described. This corresponds to the aspectual values usually related to progressive forms, such as iteration, habituals, continuation, and cumulation.

4.2 Scope of awareness in aspectual representation

Aspectual scanning involves the representation of scope. In CG, an expression's maximal scope is the full array of conceptual content it evokes as the basis of its meaning. Its immediate scope is the limited portion directly relevant for a particular purpose, and its profile is the specific focus of attention within the immediate scope.

In aspectual terms, the maximal scope is the whole scene of the process. Summary scanning, where the focus of attention coincides with the entire process including all its parts, captures this, as shown in (26), where the immediate scope and the maximal scope coincide.

The immediate scope is the portion of the process made salient by the aspectual marker in monosequential and polysequential scanning. As salience relates to size, centrality, or importance (Tversky 1999: 97), the inchoative form, for instance, profiles the initial phase(s) of the process and its starting point in time. As it is captured, it constitutes the focus of attention, and all the other phases of the process are in the background. The aspectual values sketched in (26) render different portions of the process, where each one is focalized regardless of its position in the sequentiality of the whole process.

Polysequential scanning is of an intermediate step between summary scanning and monosequential scanning. The aspectual values dealt with in 4.1.3, namely ongoing, iteration, duration, cumulation, habituals, continuation, and partitioning, represent a scope of awareness maximally encompassing the single process as a maximal scope. Iteration, for instance, is made up of the replication of any replicable process. However, the replicates are considered as identical, thus making up a single entity. The maximal scope will shift from the single process to a more general level, which includes the replicates of that process. The enlargement of the scope, creating a maximal scope where the immediate scope is the entire process, accompanies this shift: the verb *qattala* in (34a) expresses the iteration of killing. We cannot conceive of the process as occurring instantly for all the victims, so we have to conceive of it as repeated continuously or occurring in bounded episodes (Langacker 2001: 258) as long as there remain some living creatures

among the *yuzāt* ('invaders'). Verbs profiling processes construed as occurring in bounded episodes are the best candidates for polysequential scanning.

In polysequential scanning, the aspectual value itself is the immediate scope, since it is the basic value profiled by the verbal form, and the maximal scope is the larger scene or historical context in the common background of speakers and hearers.

4.3 Aspect as a zooming device

Zooming, in mental imagery, is the process of focusing attention on an imaged object to see finer details or particular features (Kosslyn 1980, 1995; Wraga & Kosslyn 2003). Langacker (2001: 259) considers the progressive as a kind of 'zooming in' and taking an internal view of a bounded event. Zooming has two directions in and out. The first relates to the registration of details, increasing image accuracy (Tversky & Lee 1998), whereas the second relates to the general view, in which details are ignored. Between the two extremes, there is some graded scale.

In aspectual terms, summary scanning is a standard for zooming since the process is captured as a whole. It is the base for two kinds of zooming operation: a *zooming in* which focuses on a limited portion, and a *zooming out* which includes more than one portion.

Monosequential scanning is a *zooming in* device, whereby we capture, select and single out a single phase of a process. The phase may be a portion or an interval in the process: nearness, starting, restarting, ending or any other phase in between. Polysequential scanning is a *zooming out* device. The aspectual values related to it treat the process as a unit (bounded or unbounded) and make it multiple to express duration, replication, cumulation, and partitioning.

Moreover, inherent semantic properties of the process determine the mode of aspectual scanning for which the verb is a candidate and the type of zooming. In theory, we may scan all types of processes in a summary fashion. However, some processes are more suitable for monosequential than for polysequential scanning and vice-versa. In some cases, the conflict between the semantic properties of the verb and the aspectual scanning mode makes the utterance ungrammatical, as shown in (40):

(40) √*nwm* (to sleep)
  a. *nāma Zaydun.*
     'Zayd slept'
  b. **badaʔa Zaydun yanāmu.*'
     '*Zayd started sleeping'
  c. *badaʔa Zaydun yanāmu bākiran.*
     'Zayd started to sleep early'

The process √*nwm* ('sleep') cannot be partitioned; it is an obligatory candidate for summary scanning, as in (40a). The element of inchoation *badaʔa* ('started') in (40b) makes the sentence ungrammatical because of the conflict between the process of sleeping, which cannot be partitioned, and the aspectual value of inchoation. However, the adverb *bākiran* ('early') in (40c) solves the conflict by introducing another temporal dimension without altering the process itself: the starting relates to the new habit Zayd is developing, namely to sleep early. The agent does not start to sleep. He starts a new habit related to sleeping.

The conflict may be solved also by other grammatical means of polysequential scanning. Punctual processes cannot be conceived as lasting unless replicated, as shown in (41):

(41) √*qfz* ('to jump')
- a. *qafaza Zaydun ʕalā al-ħāʔiṭi.*
  'Zayd jumped over the wall'
- b. *qafaza Zaydun ʕāliyan.*
  'Zayd jumped high'
- c. *qafaza Zaydun baʕīdan.*
  'Zayd jumped away'
- d. *qafaza Zaydun qafzatan.*
  'Zayd jumped once'
- e. *qafaza Zaydun qafzatayni.*
  'Zayd jumped twice'
- f. *qafaza Zaydun kaθīran.*
  'Zayd jumped a lot'
- g. *qafaza Zaydun ṭawīlan.*
  'Zayd jumped for a long time'
- h. *badaʔa Zaydun yaqfizu.*
  'Zayd started jumping'
- i. *rāħa Zaydun yaqfizu.*
  'Zayd continued jumping'

The process √*qfz* ('jump') involves a vertical movement starting from the ground. The trajector leaves the ground, rises and reaches a certain height, and then falls back to the ground, not necessarily at the same location he left. We have the cognitive ability to grasp any portion of the process as we do in slow-motion mode. In aspectual terms, we cannot consider the sequence of 'leaving the ground' as inchoation, or 'the landing' as termination, and so forth. As a punctual process, √*qfz* ('jump') is a candidate for summary scanning, as shown in (41a, b, c, d).

The jumping process is not suitable for monosequential scanning, so it is not compatible with inchoation, termination, or duration. When the process is

replicated, which is the case in current language use; it becomes suitable for both monosequential and polysequential scanning. This is possible thanks to the use of verbs of inchoation (41h) and continuation (41i) or to the use of adverbs indicating plurality (41f, e) or duration (41g), as long as the process is repeated. Furthermore, the use of numerals as an aspectual marker makes a clear cut between two modes of scanning: summary and polysequential. In this case, polysequential scanning is indicated in Arabic by numerals (*marratan* ('once'), *marratayni* ('twice'), *marrātin* ('many times'), *xamsa marrātin* ('five times')... *n* times) or by the noun of the action (*qafzatan* ('one jump'), *qafzatayni* ('two jumps'), *qafazātin* ('many jumps')). When the number indicated is one, then the process is scanned in a summary fashion. Otherwise, the scanning is polysequential.

5. Conclusion

As "drawings reveal people's conceptions of things, not their perceptions of things" (Tversky 1999: 94), aspectual forms reveal people's conceptions of processes, not their perceptions of processes. I have argued that aspect in language should be considered as a verbal scanning device used in profiling processes. Using data from Arabic, I have shown that aspect profiles processes either as a whole (bounded or unbounded) in summary scanning, or as sliced into (bounded) sequences in sequential scanning. Sequentiality bears on a single phase (part or slice) of the process in monosequential scanning to convey nearness, inchoation, termination, etc. It also bears on multiple successive phases in polysequential scanning to convey duration, iteration, habituality, cumulation, etc. In both cases, aspect functions as a verbal zooming device to determine the scope of attention in predication, framed in between a large scope of the process in summary scanning and a limited portion of this process in sequential scanning.

This chapter is a preliminary attempt to establish a link between insights from cognitive psychology (Mental Imagery) and cognitive linguistics (Cognitive Grammar) regarding the use of aspect in language. A very important link is the cognitive ability of scanning. This chapter contributes to enlarging the scope of study in cognitive framework(s) to less-investigated languages such as Arabic.

References

Berthoz, Alain. 1997. *Le sens du mouvement*. Paris: Odile Jacob.

Broccias, Cristiano & Willem B. Hollmann. 2007. Do we need summary and sequential scanning in (Cognitive) Grammar? *Cognitive Linguistics* 18 (4): 487–522.

Borst, Grégoire, Stephen M. Kosslyn, & Michel Denis. 2006. Different cognitive processes in two image-scanning paradigms. *Memory and Cognition* 34 (3): 475–490.

Chang, Nancy, Daniel Gildea, & Srini Narayanan. 1998. A dynamic model of aspectual composition. In *Proceedings of the Twentieth Annual Meeting of the Cognitive Science Society COGSCI-98*. Madison. (http://www.icsi.berkeley.edu/NTL/papers/asp.pdf).

Cohen, David. 1989. *L'aspect verbal*. Paris: Presses Universitaires de France.

Comrie, Bernard. 1976: *Aspect, An introduction to the study of verbal aspect and related problems*. Cambridge: Cambridge University Press.

Denis, Michel & Marguerite Cocude. 1997. On the metrical properties of visual images generated from verbal descriptions: Evidence for the robustness of the mental scanning effect. *European Journal of Cognitive Psychology* 9: 353–379.

Denis, Michel & Stephen M. Kosslyn. 1999. Scanning visual mental images: A window on the mind. *Current Psychology of Cognition* 18: 409–465.

Denis, Michel, Marie-Rose Gonçalves & Daniel Memmi. 1995. Mental scanning of visual images generated from verbal descriptions: Towards a model of image accuracy. *Neuropsychologia* 33: 1511–1530.

Evans, Vyvyan & Melanie Green. 2006. *Cognitive Linguistics: An Introduction*. Edinburgh: Edinburgh University Press.

Fleisch, Henri. 1979. *Traité de philologie arabe*, vol.2, Beyrouth: Dar El Machriq Editeurs.

Kosslyn, Stephen M. 1980. *Image and Mind*. Cambridge, MA: MIT Press.

Kosslyn, Stephen M. 1994. *Image and Brain*. Cambridge, MA: MIT Press.

Kosslyn, Stephen M. 1995. Mental Imagery. In *Visual Cognition. An Invitation To Cognitive Science*, vol.2, S. M. Kosslyn & D. N. Osherson (eds.), 267–296. Cambridge, MA: MIT Press.

Kosslyn, Stephen M. 1999. Visual Mental Images as re-presentations of the world: A cognitive neuroscience approach. In *Visual and Spatial Reasoning in Design*, J. S. Gero & B. Tversky (eds.), 83–92. Sydney: Key Centre of Design Computing and Cognition, University of Sydney.

Kosslyn, Stephen M. 2002. Einstein's Mental Images: The Role of Visual, Spatial, and Motoric Representations. In *The Languages of the Brain*, A. M. Galaburda, S. M. Kosslyn, & Y. Christen (eds.), 271–287. Cambridge, MA: Harvard University Press.

Kosslyn, Stephen M., William L. Thompson, & Giorgio Ganis. 2002. Mental imagery doesn't work like that. *Behavioral and Brain Sciences* 20: 198–200.

Lakoff, George. 1990. The invariance hypothesis: Is abstract reason based on image schemas? *Cognitive Linguistics* 1 (1): 39–74.

Langacker, Ronald W. 1987. *Foundations of Cognitive Grammar*, Volume 1: *Theoretical Prerequisites*. Stanford, CA: Stanford University Press.

Langacker, Ronald W. 1999. Virtual reality. *Studies in the Linguistic Sciences* 29 (2): 77–103.

Langacker, Ronald W. 2001. The English present tense, *English Language and Linguistics*, 5 (2): 251–272.

Langacker, Ronald W. 2008. Sequential and summary scanning: A reply. *Cognitive Linguistics* 19 (4): 571–584.

Langacker, Ronald W. 2009. The English present: Temporal coincidence vs. epistemic immediacy, *Investigations in Cognitive grammar*, 185–218. Berlin & New York: Mouton de Gruyter.

Langacker, Ronald W. 2010. Reflections on the functional characterization of spatial prepositions, (http://corela.edel.univ-poitiers.fr/index.php?id=999#descriptionauteurs)

Lyons, John 1968. *Introduction to theoretical linguistics*. Cambridge: Cambridge University Press.

Mast, Fred W., Alain Berthoz, & Stephen M. Kosslyn. 2001. Mental imagery of visual motion modifies the perception of roll-vection stimulation. *Perception* 30: 945–957.

McCarthy, John. 1979. *Formal Problems in Semitic Phonology and Morphology*. PhD Dissertation, MIT, United States.

McCarthy, John. 1981. A Prosodic Theory of Nonconcatenative Morphology. *Linguistic Inquiry* 12: 373–418.

Mumford, David, Stephen M. Kosslyn, Lynn A. Hillger, & Richard J. Herrnstein. 1987. Discriminating figure from ground: The role of edge detection and region growing. *Proceedings of National Academy of Sciences* 84: 7354–7358.

Olivier, Gérard & Juan L. J. De Mendoza. 2000. Motor Dimension of Visual Mental Image Transformation Processes. *Perceptual and Motor Skills* 90: 1008–1026.

Rouw, Romke, Stephen M. Kosslyn, & Ronald Hamel. 1998. Aspects of mental images: is it possible to get the picture? *Cognition* 66: 103–107.

Tversky, Barbara. 1999. What does drawing reveal about thinking? In *Visual and spatial reasoning in design*, J. S. Gero & B. Tversky (eds.), 93–101. Sydney: Key Centre of Design Computing and Cognition.

Tversky, Barbara & Paul U. Lee. 1998. How space structures language. In *Spatial Cognition: An interdisciplinary approach to representing and processing of spatial knowledge*, C. Frecsa, C. Habel, & K. F. Wender (eds.), 157–175. Berlin: Springer-Verlag.

Wraga, Mary & Stephen M. Kosslyn. 2003. Imagery. *Encyclopedia of Cognitive Science*, vol. 2, 466–470. London: Nature Publishing Group.