

Defining 'bartizan' Through Contextual Vocabulary Acquisition

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Abstract

Contextual Vocabulary Acquisition (CVA) is the process of determining a meaning of an unknown word from context by application of previous knowledge. This project's goal is create a computational model of CVA through the use of the SNePS knowledge representation and reasoning system and its cognitive agent, CASSIE. We examine the results of human application of CVA on a passage including the unknown word 'bartizan', to determine what background knowledge is necessary to derive a meaning for the unknown word. The rules which result from this examination are given to CASSIE along with a representation of the original context. The output of CASSIE's noun algorithm confirm that at least for a structural noun, the most important contextual information relates to its structural elements and relative positioning.

Contextual Vocabulary Acquisition and SNePS

Sometimes in the course of everyday reading, one encounters a word that is unfamiliar. Although it may be possible in some cases to look the word up to learn its definition, it is often much more convenient to attempt to determine the unknown word's meaning for its context. By careful examination of the surrounding context and application of relevant background knowledge, one can construct a meaning for the unknown word. While the meaning drawn from a single context may not be identical to a dictionary definition, the addition of further contexts will supply more information, and eventually one's 'internal definition' of the word will approach a dictionary definition. The process of learning a word in this way is known as Contextual Vocabulary Acquisition (referred to henceforth as CVA.)

The exact mental processes which take context and background knowledge and convert them to a meaning for a new word are not well understood. One approach to understanding CVA is to build a computational model. For this project we have used SNePS (Semantic Network Processing System) and CASSIE, the SNePS cognitive agent. SNePS represents knowledge in the form of a semantic network, which then represents CASSIE's beliefs at any given moment. CASSIE is capable of revising her beliefs based on new information. The network itself can be described in terms of nodes and arcs of a graph, which, when

arranged in specific structures, or ‘case frames’, have a particular semantic meaning. The specific case frames used in this project will be described in more detail as they are used.

The context, definition, and role of this project in CVA

The source passage was provided by Dr. Michael Kibby, and is taken from *The Butcher of Vyonnes*, by Michael Minnis:

“But the closer they drew upon the butcher's abode, the less vociferous the mob's fury became. They were deep in Les Ruelles now, and far from the familiar. Bloodshed and retribution had scattered them widely. The wind was in their faces. The clouds had returned. The children had departed. They shouted to one another for courage, aware all the while that doubtful shapes had begun to gather along the rooftops and chimney pots. At last they arrived at Daumard's home - a weathered corner of ancient fortification and crumbling buttresses within a courtyard. Its crest was overshadowed by an angular bartizan speckled with small empty windows and murder-holes and archer-slits looking inward upon blackness. From corners and cornices grinned fractured gargoyles made nearly featureless by years of rain, freeze and thaw. To the side was a short flight of wide worn steps that ended before a great arched door.”

The unknown noun selected for definition is ‘bartizan’. Since the original context contains a great deal of information essential to the story but unhelpful in finding a meaning for the target word, we have reduced the original to a more compact version containing primarily the context essential to finding a meaning for ‘bartizan’:

“Daumard's home was part of an ancient fortification whose crest was overshadowed by an angular bartizan with small windows and murder-holes and archer-slits.”

The new context retains all of the relevant semantics of the original passage, despite our having removed a large portion of the actual text. The subsection that remains is all that actually relates to the word ‘bartizan’.

The goal of this project was, in part, to generate a definition of ‘bartizan’, so having a dictionary definition for comparison was useful. According to the Probert Encyclopaedia, (<http://www.probertencyclopaedia.com/>) a definition is:

“In architecture, a bartizan is a small, overhanging structure for lookout or defence, usually projecting at an angle of a building or near an entrance gateway.”

In addition to this goal, we tested CASSIE’s noun algorithm to verify that she is able to infer a definition of ‘bartizan’ in a similar manner to human subjects, both in order to check the functioning of the existing algorithm, and in order to suggest changes and additions.

Because ‘bartizan’ is a structural term, and because the context was rich in structural references such as location and part/whole relationships, the project also provides insight into what aspects of context and prior knowledge are used by humans when applying CVA to architectural or structural contexts.

Human protocols

In order to determine what background knowledge was necessary for CASSIE to infer a meaning of ‘bartizan’, it was necessary first to examine how a human being goes about the same task. In order to get a large selection of viewpoints from which to build CASSIE’s background knowledge, a request was posted on a game-related internet message board. (Specifically, the Contest board for “The Kingdom of Loathing”, located at <http://forums.kingdomofloathing.com/viewforum.php?f=10>) The requested was framed in the form of a contest, with a small in-game prize for all entrants, and several larger prizes awarded to randomly chosen entrants at the end. Using anonymous sources over the internet does tend to increase the likelihood of untruthful responses, so several steps were taken to minimize this risk:

- a) The word to be identified was not specified – only that entrants should define, and justify their definitions of, any unknown words. Since there were several other uncommon words, such as ‘vociferous’ and ‘cornice’, it was less likely that an entrant would look up any individual word.
- b) The contest rules specified that entries did not have to include any definitions at all – any entrant could simply state that there were no unknown words in the passage in order to enter the contest. This approach meant that anyone who just wanted to enter the contest without putting in any effort would most likely just claim to know all of the words without actually reading it, rather than spending time looking up any words.
- c) All entries were submitted as private messages, and were never made available to the general populace. Doing this meant that not only were the entries not available during the run of the contest to influence responses, there was also less motivation to fabricate answers in order to impress anyone.

When the contest closed, 89 entries had been received, 54 of which identified ‘bartizan’ as an unknown word and defined it in some way. There were several common themes to be found among these responses, such as the idea that a bartizan is used for defense, and that a bartizan is some kind of tower. Although the contest asked whether the entrant’s first language was English, this information was frequently missing from responses, and there were too few respondents for whom English was something other than a first language to draw any significant conclusions. The full text of the contest announcement, and the full set of bartizan-related responses are attached as Appendix C and D.

SNePS Representation

In order to simulate the process of human CVA, two parts are required – a representation of the context to be examined, and a representation of the background knowledge required to draw meaning from it. The background knowledge is represented first, much as the background knowledge existed in the minds of the human respondents before they read the passage.

The background knowledge is represented in the form of several rules, which govern what CASSIE assumes about an object based on its properties:

1. If archer-slits are part of something, that class of thing has the property of being used for defense.

In other words, if an object has archer-slits, all objects of that type are defensive structures. This is justified by responses such as: “[A bartizan is] some kind of defensive structure [...] there are murder-holes and archer-slits give the idea of a place to defend.”

In SNePS, this rule is represented as follows:

```
(assert forall ($archerslits $fordefense $fdclass)
  &ant ((build member *archerslits class
                    (build lex "archer-slits"))
        (build part *archerslits whole *fordefense)
        (build member *fordefense class *fdclass))
  cq (build subclass *fdclass superclass
      (build lex "used for defense")))
```

In other words: if some object is a member of the class of archer-slits, and it is also part of a greater whole, then the class of the greater whole is a subclass of the class of things used for defense.

Although a similar rule could be created which applies to murder-holes instead of archer-slits, it is unnecessary. For the purposes of this project, having separate rules to show a gradual progression of inference is more useful.

2. If murder-holes are part of something, that thing is a guard tower.

This rule is more specific than the first rule, and applies only to the object in question, rather than a class of objects. Responses like: “I think that it is probably a guard tower [...] because I recognize the other things named in conjunction with it (murder-holes and archer-slits) as fixtures used by defenders to repel attackers” provided the inspiration for this rule.

The SNePS representation is:

```
(assert forall ($murderhole $guardtower)
  &ant ((build member *murderhole class
    (build lex "murder-holes"))
    (build part *murderhole whole *guardtower))
  cq (build member *guardtower class
    (build lex "guard tower")))
```

If some object is a member of the class of murder-holes, and is part of a greater whole, then that greater whole is a member of the class of guard towers. Like rule 1, a rule could be created linking archer-slits to guard towers, but for the same reasons it has been left out.

3. If something contains murder-holes, that thing is above an entryway.

Again, this is a rule which applies to a specific object rather than a class. Placement of murder-holes is key in the reasoning behind this rule, as evidenced by responses like: “murder-holes, in particular, must be over an entryway.”

The SNePS representation is:

```
(assert forall ($murderholes $aboveentry)
  &ant ((build member *murderholes class
    (build lex "murder-holes"))
    (build part *murderholes whole *aboveentry))
  cq (build member #entryway class
    (build lex "entryway"))
  cq (build object1 *aboveentry rel
    (build lex "above")
    object2 *entryway))
```

If some object is a member of the class of murder-holes, and it is part of a greater whole, then some other object exists which is a member of the class of entryways, and the greater whole is above it.

4. If object A overshadows object B, the class of object A is a subclass of high things.

Like the first rule, this rule affects an entire class of objects based on the properties of one of its members. An example response leading to this rule is “My clues were ‘overshadowed’ (which implies it is higher than everything else).”

The SNePS representation is:

```
(assert forall ($overshadowed $higher $hclass)
  &ant ((build member *higher class *hclass)
    (build object1 *higher
      rel (build lex "overshadows")
      object2 *overshadowed))
  cq (build subclass *hclass superclass
    (build lex "high")))
```

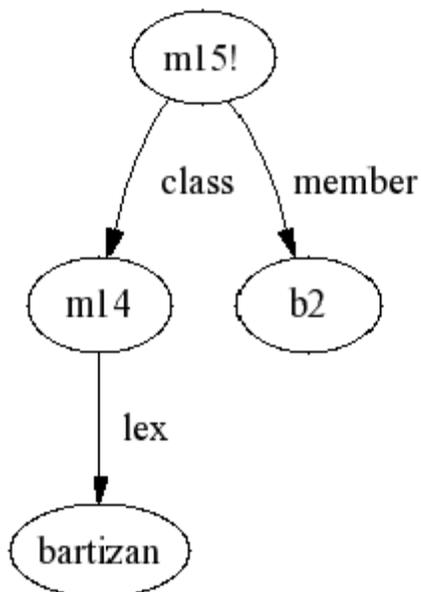
If some object overshadows something else, then the class of the overshadowing object is a subclass of the class of high things.

Now that we have defined some simple rules of inference, it is time to represent the context, which has been split into several simple sentences:

1. Something is a bartizan.

```
(add member #bartizan class (build lex "bartizan"))
```

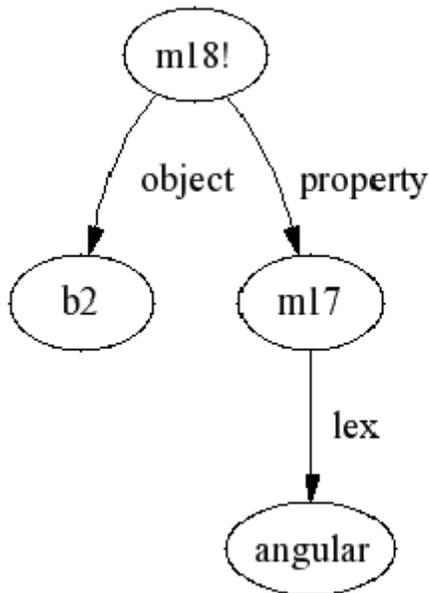
The SNePS network representation of this proposition is:



The node labeled 'm15' represents the proposition that some individual, labeled 'b2' is a member of the class with the name 'bartizan'. In other words, that b2 is a bartizan.

2. The bartizan is angular.

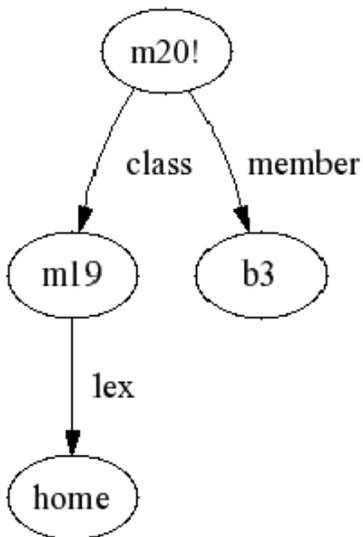
```
(add object *bartizan property (build lex "angular"))
```



'm18' represents the proposition that the object represented by 'b2', which is our bartizan object, has a property called 'angular'.

3. Something is a home.

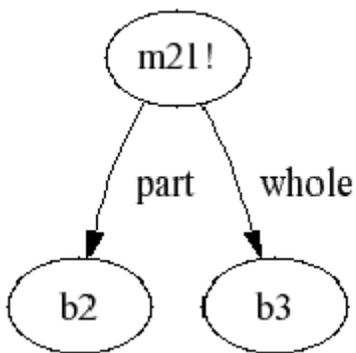
```
(add member #home class (build lex "home"))
```



'm20' represents the proposition that the new object represented by 'b3' is a member of the class named 'home'.

4. The bartizan is part of the home.

(add part *bartizan whole *home)



'm21' represents the proposition that 'b2', the bartizan, is a part of 'b3', the whole.

At this point, CASSIE has enough information to draw some first conclusions. When prompted, she responds with:

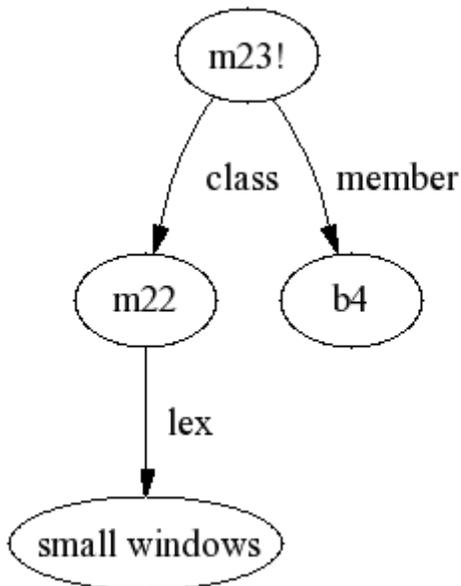
```

Definition of bartizan:
Possible Superstructure: home,
Possible Properties: angular
  
```

A conclusion labeled as ‘possible’ means that CASSIE is only able to determine that a particular bartizan has those traits, but not necessarily all bartizans. With the small amount of information she has received at this point, CASSIE can tell us that at least one bartizan is angular, and at least one bartizan is part of a home. Superstructure was not originally part of the noun algorithm – as part of this project, it was added to the algorithm as essentially a mirror image of the existing functions for finding the substructure of an object.

5. Something(s) is/are small windows.

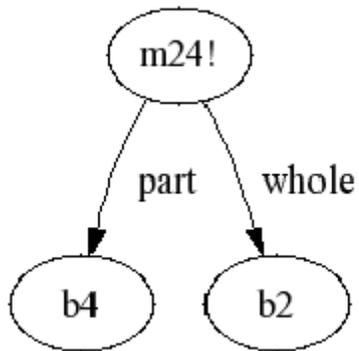
```
(add member #small-windows class (build lex "small windows"))
```



‘m23’ is the proposition that the object represented by ‘b4’ is a member of the class named ‘small windows’.

6. The small windows are part of the bartizan.

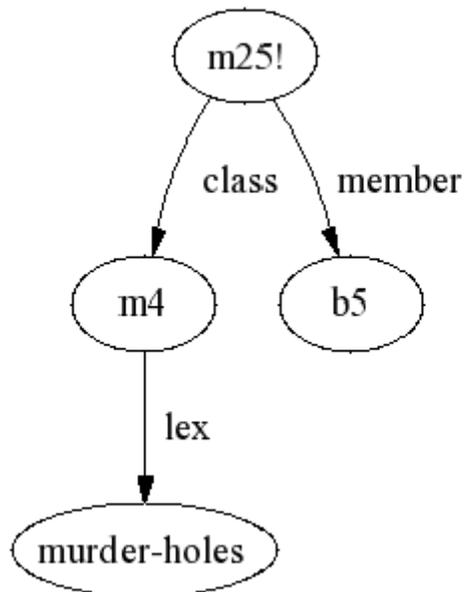
```
(add part *small-windows whole *bartizan)
```



'm24' is the proposition that 'b4', the small windows, are part of 'b2', the bartizan.

7. Something(s) is/are murder-holes.

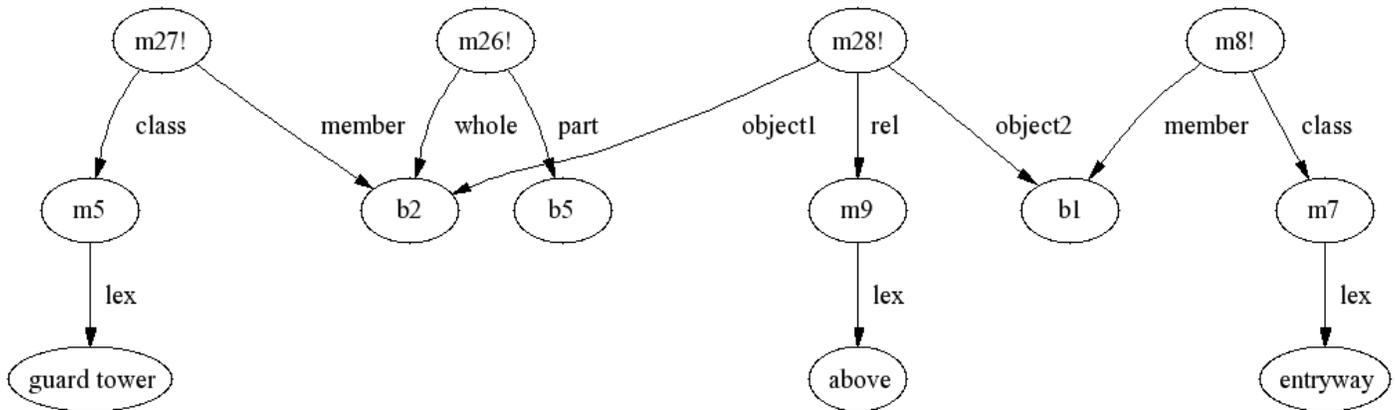
```
(add member #murder-holes class (build lex "murder-holes"))
```



'm25' is the proposition that the object represented by 'b5' is a member of the class named 'murder-holes'.

8. The murder-holes are part of the bartizan.

```
(add part *murder-holes whole *bartizan)
```



‘m26’ represents the proposition that ‘b5’, the murder-holes, are part of ‘b2’, the bartizan. At this point, some of the rules we defined are applicable. Applying rule 2 (if murder-holes are part of something, that thing is a guard tower,) node ‘m27’ is built, the proposition that the bartizan is a member of the class named ‘guard tower’. Applying rule 3 (if something contains murder-holes, that thing is above an entryway,) node ‘m28’ is built, which is the proposition that the bartizan, indicated by an ‘object1’ arc, has a relationship named ‘above’ to the object indicated by the ‘object2’ arc – a member of the class named ‘entryway’.

Again CASSIE is asked to define ‘bartizan’, and replies:

Definition of bartizan:

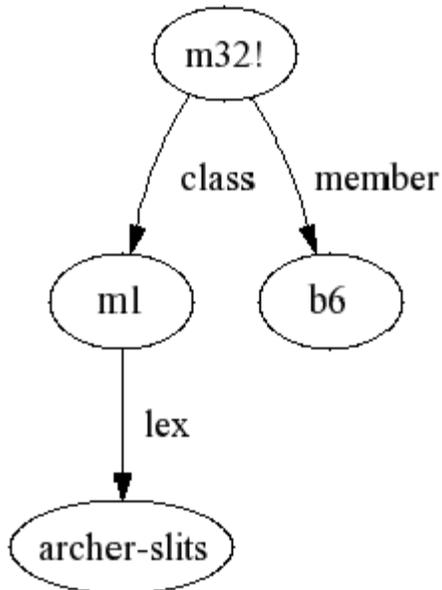
```

Possible Class Inclusions: guard tower,
Possible Structure: small windows, murder-holes,
Possible Superstructure: home,
Possible Properties: angular, above entryway
  
```

Aside from the inclusion of both the small windows and the murder-holes as structural elements of a particular bartizan, CASSIE has also inferred that a particular bartizan is a guard tower, and that a particular bartizan is situated above an entryway.

9. Something(s) is/are archer-slits.

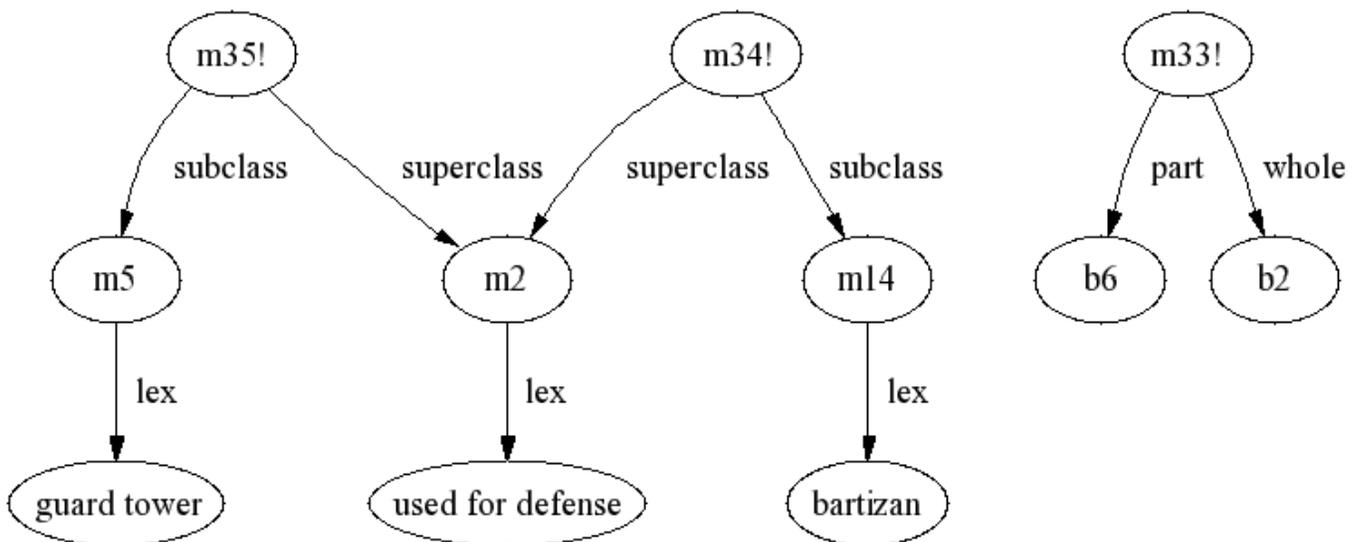
```
(add member #archer-slits class (build lex "archer-slits"))
```



'm32' is the proposition that the object represented by 'b6' is a member of the class named 'archer-slits'.

10. The archer-slits are part of the bartizan.

```
(add part *archer-slits whole *bartizan)
```



'm33' is the proposition that 'b6', the archer-slits, are part of 'b2', the bartizan. Rule 1 (if archer-slits are part of something, that class of thing has the property of being used for defense,) can now be applied. At this point, our bartizan is a member of two classes – bartizans and guard towers. Since rule 1 applies equally to both classes, two new propositions are built. 'm34' is the proposition that the class of

bartizans is a subclass of the class of things used for defense. 'm35' is the same proposition, but regarding guard towers rather than bartizans.

When asked again to define 'bartizan' at this point, CASSIE replies:

Definition of bartizan:

Class Inclusions: used for defense,

Possible Structure: small windows, murder-holes, archer-slits,

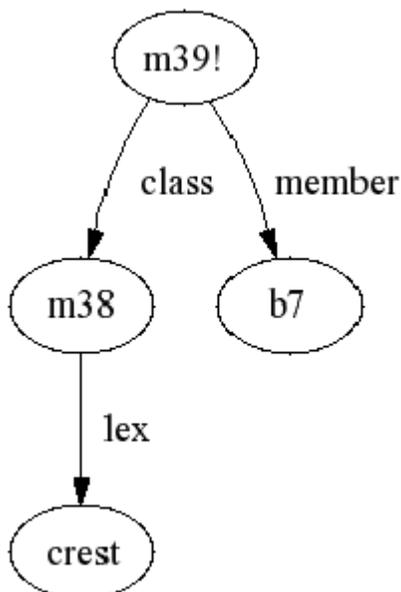
Possible Superstructure: home,

Possible Properties: angular, above entryway

Archer-slits are now listed as being part of at least one bartizan, and CASSIE has inferred that bartizans are part of the class of things used for defense. Since she is able to make this statement about the entire class of bartizans rather than just a specific bartizan, it takes precedence over the previous possible class inclusion of 'guard tower'.

11. Something is a crest.

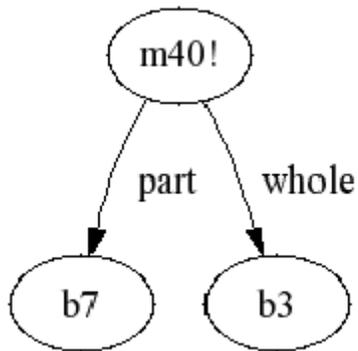
```
(add member #crest class (build lex "crest"))
```



'm39' is the proposition that the object represented by 'b7' is a member of the class named 'crest'.

12. The crest is part of the home.

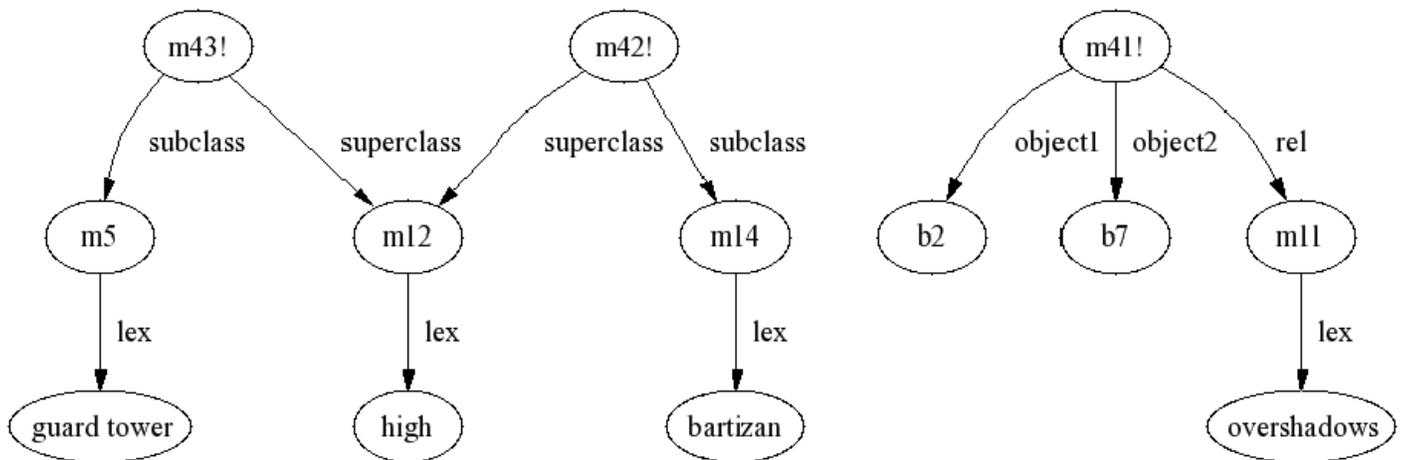
```
(add part *crest whole *home)
```



‘m40’ is the proposition that ‘b7’, the crest, is part of ‘b3’, the home.

13. The bartizan overshadows the crest.

```
(add object1 *bartizan rel (build lex "overshadows")
  object2 *crest)
```



‘m41’ is the proposition that ‘b2’, which has an ‘object1’ arc to it, has the relationship named ‘overshadows’ with regards to the object pointed to by the ‘object2’ arc – ‘b7’, the crest. Rule 4 now applies (if object A overshadows object B, the class of object A is a subclass of high things,) and two new propositions are created. Node ‘m42’ is the proposition that the class of bartizans is a subclass of the superclass of things that are high. Node ‘m43’ is the proposition that the class of guard towers is a

subclass of the superclass of things that are high. Since rule 4 applies equally to all of our bartizan's classes, it affects both the class of bartizans and the class of guard towers.

Asking CASSIE again to define 'bartizan', we receive the reply:

Definition of bartizan:

Class Inclusions: high, used for defense,
Possible Structure: small windows, murder-holes, archer-slits,
Possible Superstructure: home,
Possible Properties: angular, overshadows crest,
 above entryway,
Possibly Similar Items: guard tower

CASSIE now believes that overshadowing a crest is a possible property of a bartizan, since at least for the bartizan in the passage, this is the case. She also infers that because of that bartizan's placement above a crest, the entire class of bartizans must be part of the class of high things. Finally, CASSIE reports that guard towers are possibly similar to bartizans, since the class of guard towers and the class of bartizans have several superclasses (high, used for defense) in common. While this is an appealing conclusion, whether it is entirely an appropriate conclusion is in question, since rule 2 previous led to the conclusion that at least the bartizan from the passage *is* a guard tower.

The remaining portions of the context representation do not alter CASSIE's definition of bartizan in any way, and could actually be removed without any loss of semantic content. They appear in Appendix B, but will not be repeated here.

Conclusions and Future work

Starting with just four simple rules, three of which are structural in nature, and one which concerns relative position, CASSIE was able to infer a definition of ‘bartizan’ which approaches the dictionary definition. She has correctly identified that a bartizan is used for defense, and that it might be positioned over an entryway. The only significant information in the dictionary definition that is missing is the description of a bartizan as ‘small’, but the context does not contain sufficient information to make this conclusion, and it is unimportant to understanding the use of ‘bartizan’ in the passage.

CASSIE’s ability to make these conclusions indicates that, at least for structural nouns, what is most important to determining a meaning, assuming sufficient prior knowledge, are details regarding its substructure and superstructure, and relative position to other structural elements.

In the immediate future, a close examination of the new ‘Superstructure’ functions in the noun algorithm is in order. At present, it mirrors the ‘Structure’ functions, but there may be subtleties that are missed by this approach. Substructure is also not currently taken into account in the algorithm’s synonym-checking functions, and this should be done as well.

Some long-term goals for continuation of this project include:

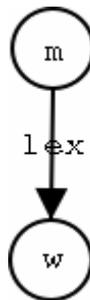
- Examining the synonym functionality to better understand what is being reported as a ‘Similar Item’. At the moment the algorithm is reporting similar classes even if an instance of the noun being defined is already a member of the similar class. It is possible that this is desirable behavior, but there may be a better way to report this relationship.
- Further examination of the currently-removed ‘function’ section of the algorithm. The only way at present to describe a noun’s function is as a property. In most cases this is probably sufficient, but it is conceivable that being able to describe a function differently than a property will be useful in the future.

Appendix A – SnePS Case Frames

The following case frames were used in the course of this project, and are taken verbatim from Scott Napieralski's Dictionary of CVA SNePS Case Frames, located at

<http://www.cse.buffalo.edu/~rapaport/CVA/CaseFrames/case-frames/>

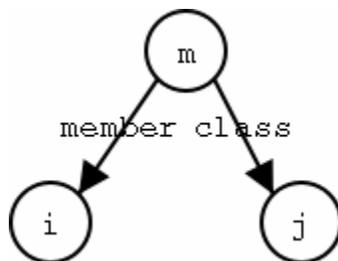
lex



Semantics:

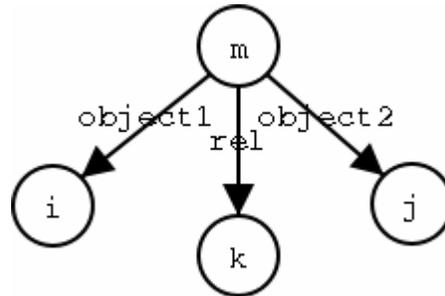
[[m]] is the concept expressed by uttering [[w]]

member/class



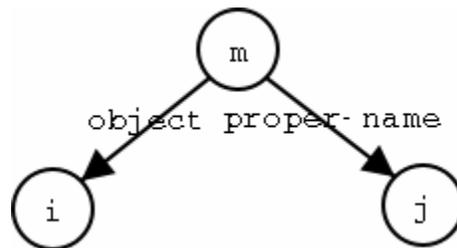
Semantics:

[[m]] is the proposition that [[i]] is a member of the class [[j]].

object1/rel/object2

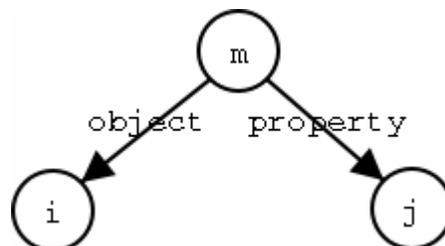
Semantics:

[[m]] is the proposition that [[i]] is related by relation [[k]] to [[j]].

object/proper-name

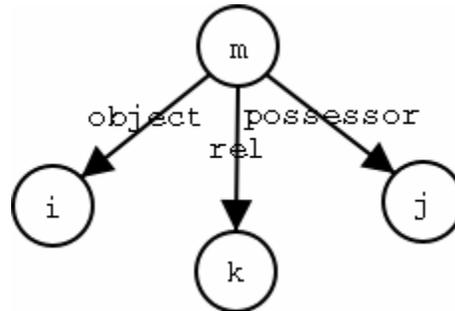
Semantics:

[[m]] is the proposition that [[i]] is called by the proper name [[j]].

object/property

Semantics:

[[m]] is the proposition that [[i]] has the property [[j]].

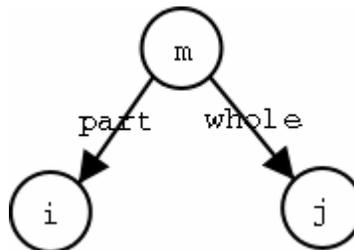
object/rel/possessor

Semantics:

[[m]] is the proposition that [[i]] is a [[k]] of [[j]];

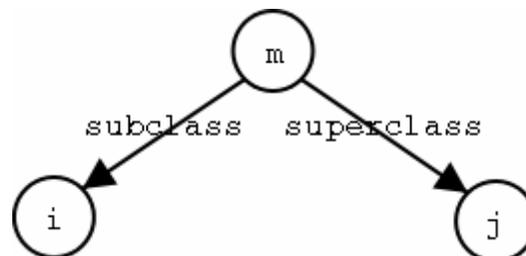
or: [[m]] is the proposition that [[i]] is [[j]]'s [[k]];

or: [[m]] is the proposition that [[i]] is possessed (in some unspecified way) by [[j]] and the relationship of [[i]] to [[j]] is [[k]].

part/whole

Semantics:

[[m]] is the proposition that [[i]] is a part of [[j]].

superclass/subclass

Semantics:

[[m]] is the proposition that [[i]] is a subclass of [[j]].

Appendix B – Demo Log

```
* (demo "bartizan2.demo" :av)
; Fast loading from bundle code/streama.fasl.
```

File /home/ssdue/jrhowell/CSE727/bartizan2.demo is now the source of input.

The demo will pause between commands, at that time press RETURN to continue, or ? to see a list of available commands

CPU time : 0.02

```
* ;
```

```
=====
```

```
; FILENAME:      bartizan2.demo
; DATE:          May 9, 2007
; PROGRAMMER:    Jeff Howell
```

```
; Turn off inference tracing.
```

```
; This is optional; if tracing is desired, then delete this.
```

```
^(
--- pause ---

--> setq snip:*infertrace* nil)

--- pause ---
nil
```

CPU time : 0.01

```
*
```

```
; Load the appropriate definition algorithm:
```

```
;; UNCOMMENT THE ONE YOU *DO* WANT
```

```
;; AND DELETE THE OTHER!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
```

```
^(
--> load "defun_noun.cl")
; Loading /home/ssdue/jrhowell/CSE727/defun_noun.cl
t
```

CPU time : 0.26

```
*
; Clear the SNePS network:
(resetnet)
```

Net reset - Relations and paths are still defined

CPU time : 0.00

```
*
; OPTIONAL:
; UNCOMMENT THE FOLLOWING CODE TO TURN FULL FORWARD INFERENCE ON:
;
; ;enter the "snip" package:
^(
--> in-package snip)
--- pause ---
#<The snip package>
```

CPU time : 0.00

```
*
;
; ;turn on full forward inferencing:
^(
--> defun broadcast-one-report (represent)
      (let (anysent)
          (do.chset (ch *OUTGOING-CHANNELS* anysent)
                    (when (isopen.ch ch)
                        (setq anysent
                              (or (try-to-send-report represent ch)
                                  anysent))))))
      nil)
broadcast-one-report
```

CPU time : 0.00

```
*
;
; ;re-enter the "sneps" package:
^(
--> in-package sneps)
--- pause ---
#<The sneps package>
```

CPU time : 0.00

```
*
; load all pre-defined relations:
(intext "/projects/rapaport/CVA/STN2/demos/rels")
```

Loading file /projects/rapaport/CVA/STN2/demos/rels.

```

; Fast loading /util/acl80/code/streamc.001
;;; Installing foreign patch, version 1
;   Fast loading from bundle code/efft-euc-base.fasl.
;   Fast loading from bundle code/efft-utf8-base.fasl.
;   Fast loading from bundle code/efft-void.fasl.
;   Fast loading from bundle code/efft-latin1-base.fasl.

```

CPU time : 0.49

*

```

; load all pre-defined path definitions:
(intext "/projects/rapaport/CVA/mkb3.CVA/paths/paths")
Loading file /projects/rapaport/CVA/mkb3.CVA/paths/paths.
before implied by the path (compose before
                            (kstar (compose after- ! before)))
before- implied by the path (compose (kstar (compose before- ! after))
                                      before-)
after implied by the path (compose after
                              (kstar (compose before- ! after)))
after- implied by the path (compose (kstar (compose after- ! before))
                                    after-)
sub1 implied by the path (compose object1- superclass- ! subclass
                              superclass- ! subclass)
sub1- implied by the path (compose subclass- ! superclass subclass- !
                          superclass object1)
super1 implied by the path (compose superclass subclass- ! superclass
                           object1- ! object2)
super1- implied by the path (compose object2- ! object1 superclass- !
                             subclass superclass-)
superclass implied by the path (or superclass super1)
superclass- implied by the path (or superclass- super1-)

```

CPU time : 0.01

*

```

; BACKGROUND KNOWLEDGE:
; =====

```

```

; If archer-slits are part of something, that class of thing has the
property of being
; used for defense.

```

```

(assert forall ($archerslits $fordefense $fdclass)
  &ant ((build member *archerslits class (build lex "archer-slits"))
        (build part *archerslits whole *fordefense)
        (build member *fordefense class *fdclass))
  cq (build subclass *fdclass superclass (build lex "used for
defense"))))

```

(m3!)

CPU time : 0.01

*

; If murder-holes are part of something, that thing is a guard tower.

```
(assert forall ($murderhole $guardtower)
  &ant ((build member *murderhole class (build lex "murder-holes"))
        (build part *murderhole whole *guardtower))
  cq (build member *guardtower class (build lex "guard tower")))
```

(m6!)

CPU time : 0.00

*

; If something contains murder-holes, that thing is above an entryway.

```
(assert forall ($murderholes $aboveentry)
  &ant ((build member *murderholes class (build lex "murder-holes"))
        (build part *murderholes whole *aboveentry))
  cq (build member #entryway class (build lex "entryway"))
  cq (build object1 *aboveentry rel (build lex "above") object2
*entryway))
```

(m10!)

CPU time : 0.00

*

; If object A overshadows object B, the class of object A is a subclass of
; high things.

```
(assert forall ($overshadowed $higher $hclass)
  &ant ((build member *higher class *hclass)
        (build object1 *higher
          rel (build lex "overshadows")
          object2 *overshadowed))
  cq (build subclass *hclass superclass (build lex "high")))
```

(m13!)

CPU time : 0.00

*

```

; CASSIE READS THE PASSAGE:
; =====

; Something is a bartizan.
(add member #bartizan class (build lex "bartizan"))

(m15!)

CPU time : 0.02

*
^(
--> defineNoun "bartizan")

Definition of bartizan:
nil

CPU time : 0.04

*

; The bartizan is angular.
(add object *bartizan property (build lex "angular"))

(m18!)

CPU time : 0.00

*
^(
--> defineNoun "bartizan")

Definition of bartizan:
Possible Properties: angular,
nil

CPU time : 0.08

*

; Something is a home.
(add member #home class (build lex "home") = home-concept)

(m20!)

```

CPU time : 0.01

*

```
; The bartizan is part of the home.
(add part *bartizan whole *home)
```

(m21!)

CPU time : 0.01

*

```
^(
--> defineNoun "bartizan")
```

--- pause ---

```
Definition of bartizan:
Possible SuperStructure: home,
Possible Properties: angular,
nil
```

CPU time : 0.08

*

```
; Something(s) is/are small windows.
(add member #small-windows class (build lex "small windows"))
```

(m23!)

CPU time : 0.02

*

```
; The small windows are part of the bartizan.
(add part *small-windows whole *bartizan)
```

(m24!)

CPU time : 0.00

*

```
^(
--> defineNoun "bartizan")
```

```
Definition of bartizan:
Possible Structure: small windows,
Possible SuperStructure: home,
Possible Properties: angular,
```

nil

CPU time : 0.08

```
*
; Something(s) is/are murder-holes.
(add member #murder-holes class (build lex "murder-holes"))
```

(m25!)

CPU time : 0.03

*

```
; The murder-holes are part of the bartizan.
(add part *murder-holes whole *bartizan)
```

(m28! m27! m26! m8!)

CPU time : 0.06

*

```
^(
--> defineNoun "bartizan")
```

```
Definition of bartizan:
Possible Class Inclusions: guard tower,
Possible Structure: small windows, murder-holes,
Possible SuperStructure: home,
Possible Properties: angular, above entryway,
nil
```

CPU time : 0.06

*

```
; Something(s) is/are archer-slits.
(add member #archer-slits class (build lex "archer-slits"))
```

(m32!)

CPU time : 0.04

*

```
; The archer-slits are part of the bartizan.
(add part *archer-slits whole *bartizan)
```

(m35! m34! m33!)

CPU time : 0.02

*

```
^(
--> defineNoun "bartizan")
```

Definition of bartizan:

```
Class Inclusions: used for defense,
Possible Structure: small windows, murder-holes, archer-slits,
Possible SuperStructure: home,
Possible Properties: angular, above entryway,
nil
```

CPU time : 0.08

*

```
; Something is a crest.
(add member #crest class (build lex "crest"))
```

(m39!)

CPU time : 0.02

*

```
; The crest is part of the home.
(add part *crest whole *home)
```

(m40!)

CPU time : 0.01

*

```
; The bartizan overshadows the crest.
(add object1 *bartizan rel (build lex "overshadows") object2 *crest)
```

(m43! m42! m41!)

CPU time : 0.03

*

```
^(
--> defineNoun "bartizan")
```

Definition of bartizan:

Class Inclusions: high, used for defense,
 Possible Structure: small windows, murder-holes, archer-slits,
 Possible SuperStructure: home,
 Possible Properties: angular, overshadows crest, above entryway,
 Possibly Similar Items: guard tower,
 nil

CPU time : 0.10

*

```
; Something is a fortification
(add member #fortification class (build lex "fortification"))
```

(m47!)

CPU time : 0.04

*

```
; The fortification is ancient.
(add object *fortification property (build lex "ancient"))
```

(m49!)

CPU time : 0.00

*

```
; The home is part of the fortification.
(add part *home whole *fortification)
```

(m50!)

CPU time : 0.01

*

```
; Something is named 'Daumard'.
(add object #daumard proper-name "Daumard")
```

(m51!)

CPU time : 0.01

```
*  
  
; Daumard possesses the home.  
(add object *home rel *home-concept possessor *daumard)
```

```
(m52!)
```

```
CPU time : 0.01
```

```
*  
^(  
--> defineNoun "bartizan")
```

```
Definition of bartizan:
```

```
Class Inclusions: high, used for defense,  
Possible Structure: small windows, murder-holes, archer-slits,  
Possible SuperStructure: home,  
Possible Properties: angular, overshadows crest, above entryway,  
Possibly Similar Items: guard tower,  
nil
```

```
CPU time : 0.09
```

```
*
```

```
End of /home/ssdue/jrhowell/CSE727/bartizan2.demo demonstration.
```

```
CPU time : 1.81
```

```
*
```

Appendix C – Human Protocol Contest Text:

So as part of my graduate studies, I have some research to do involving vocabulary acquisition, and I needed some guinea pigs. I talked to a few of my friends, some of my family, and realized I really needed a lot more subjects... and of course I thought of the Loathing Forumers!

So here's the deal: a passage follows. What I need you to do is this:

1. Read it carefully. Very carefully. Take your time. No skimming.
2. If you come across any words with which you are not familiar, *do not* look them up.
3. Using only the passage, determine what you believe the word to mean.
4. Send me a PM letting me know what words you weren't familiar with, what you believe they mean, and (most importantly) *why* you believe that. Specifically, I'd like to know what parts of the passage led to your conclusion, or if it's your own personal background knowledge.
The more detail you can provide for your reasoning, the better. This is the really important part of your reply.
5. In your PM, please let me know if you speak English as your native language, or if it's a second (or third, or fourth...) language.

If there are no words in the passage with which you are not familiar, PM me to tell me that. I'm not excluding people for having a large vocabulary.

Please be honest! The data collected here is important. Your chances of winning do not change based on your ability or inability to correctly determine the meanings of the words.

Oh, right! Prizes! Well, just for entering, everyone will receive one hi mein of their choice, delivered piping hot by kmail or gift package. Specify your favourite flavour along with your KoL account number when you send me your entry.

I'll keep track of all the entrants, and when the contest is over (at approximately noon Eastern on Sunday, March 4) one winner will be chosen at random to receive... one million meat! (not bad for a few minutes work, huh?)¹

¹ Within “The Kingdom of Loathing”, meat is used as currency. One million meat is a relatively large quantity.

Appendix D – Human Protocol Responses Involving ‘bartizan’

1. The only word I did not know of was "bartizan". I assume it is some sort of "mini-fortress" that allows archers to safely launch their onslaught.

"murder-holes and archer-slits " was the phrase that led me to that conclusion.

2. I'm thinking of the word "barbican", meaning a type of defensive building or part of a building, but I could be wrong on that.

It's the similarity of the word, and the fact that it's being described in a part of the passage where castle defenses are being mentioned.

3. bartizan: this is a wild guess. Are we talking about the frame surrounding a window?
Mostly the lack of knowledge of this specific word. I was led to believe that it is the window frame because "it was speckled with small empty windows" and that it was angular (a very common descriptor for a frame.)

4. bartizan: I'd say it's some sort of fortification positioned high on the wall for the purpose of killing invaders. The reasons are:

1) The bartizan overshadowed the crest, meaning that it was higher than the highest point in the building. Alternatively, the bartizan could be set above Daumard's heraldic arms, which are usually set above the main entrance, hence the bartizan would be even higher.

2) The bartizan had many "small empty windows and murder-holes and archer-slits". All of these can be or are used for hurling projectiles, shooting arrows or sticking weapons through.

5. bartizan - due to the talk of murder holes and such, and that it overshadowed the crest, I figured it's a tower.

6. bartizan = roof, a flat roof, top of building?

"At last they arrived at Daumard's home - a weathered corner of ancient fortification and crumbling buttresses within a courtyard. Its crest was overshadowed by an angular **bartizan** speckled with small empty windows and murder-holes and archer-slits looking inward upon blackness." the words angular and overshadowed, along with small windows made me think of a roof of some sort, like a castle turret top.

7. bartizan: i think it is some sort of tower thing. again i think this because of the surrounding sentence. for the second word, it says that there was a courtyard overshadowed by a bartizan. it says it is speckled with windows and archer slits. seeing as how towers have archer slits and tend to overshadow stuff that is what made me think that a bartizan is a tower of some sort.

8. bartizan- I believe that this is a type of architecture though I am not certain, I know this from a voice in the back of my head though and in the text it speaks of windows also linking my idea to that.

9. bartizan

I think it means a bridge-like part of a fortress/castle that has rooms inside for soldiers to hide in and shoot out of. It's large enough to have small empty windows and murder-holes and archer-slits in it, and it's at an angle which is why I'd guess it was bridge-like--makes it sound narrower than other parts of the fortress you mention.

10. I have absolutely no idea what a "bartizan" is. From context -- because I know what a fortification is and what murder-holes and archer-slits are -- I infer that it might be some sort of tower. I'm guessing a tower rather than just an angular section of high wall looking into the keep because it "overshadows" the "crest," which makes me envision something tall.

11. bartizan: A fortification similar to a castle? I got this because of the arrow slits in the walls.

12. Bartizan and buttress are the only two I am not quite sure I know the meaning of. Both must be architectural terms.

Buttress I've actually run into before and, from what I remember, it's some sort of a tower... or something built into a side of a building. I'd imagine it with a cone-shaped roof, or something.

The other one... reminds me of partisan, which, besides being a political/paramilitary thing... is some sort of a sharp object.. blade, or alike. Or maybe that thing that's usually seen on (medieval) rooftops? Having just re-read that part, this makes sense, here. If buttress is what I think it is.

Or, in other words, in my little world, I'd put that bartizan thing on a buttress's rooftop.

13. bartizan - pillbox/turret

The most obvious help was the word 'fortification' from the previous section that led me to think of things related to a fortress. Then I narrowed it down using the hint of 'window', 'murder-hole' and 'archer-slits', hence some sort of stationed weaponry. Not sure if this is exaggerated thought development, but yup that's my guess.

14. bartizan, but i assume it is some sort of castle due to murder holes and arrow slits...

15. bartizan

It's part of the description of a building, so I'm guessing it's part of the building. Overshadowing the crest suggests tall, so perhaps this is a form of tower. This is supported by having archer-slits and the ilk. A tall place is a good place to fire from.

16. Bartizan: Ok, I'm guessing this is some feature on a fortress. Angular implies that it's not round, it's triangular/square. It's probably jutting out of the rest of the wall to give it more of an angled, 3d look and it's casting a shadow onto the fortification. "Small empty windows and murder-holes and archer-slits" tells me that there are little windows on it. They're not windows for letting light in, but these are dark little holes. There's no light inside so it's just a hole into blackness. It is dark and secretive; murder hole implies that things which cannot happen out in the open happen here. Archer slits tell me that it's dangerous, like archers shooting out of nowhere, sneak attacking. So, summary: a bartizan is a feature of a building which juts out of the main building; dark scary things happen here. Of course, I could be wrong about the dark and scary part, that might apply only to your excerpt and other bartizans are well-lit.

17. "Its crest was overshadowed by an angular bartizan speckled with small empty windows and murder-holes and archer-slits looking inward upon blackness."

Bartizan - this was the one word in the passage I did not see before. I assume it is a corner tower in the fortress walls. (The arrow slits, murderholes and position on the corner are what clued me into its function.)

18. **bartizan** - A noun. Judging by its description I would say it's a small building structure (since it's atop a building), possibly used as a lookout point. Since it is described as angular, I would assume this to mean that it is not circular, but I would also assume it to possibly have more than 4 sides to provide for more angles of attack (based on the murder-holes and archer-slits). Perhaps something like an attack tower as seen on the outer walls of a castle, or perhaps a structure similar to the base of a church steeple.

19. bartizan

Tower/turret

I think this means a tower or turret, because from the description the building appears to be a castle or fort and it has windows and slits for archers to fire from. Either that or it's a wall of some description, but I think a tower is more likely.

Background knowledge of castles/forts (due to being a very big fan of fantasy fiction, where castles and forts feature heavily) led me to believe that the building is a castle or fort, and the features described on the bartizan would fit with what I remember about medieval architecture from school history and from recent reading of children's history books.

20. bartizan - tall cathedral-like building - "with small empty windows and murder-holes and archer-slits looking inward upon blackness", I thought the description depicts a tall structure of some sort.
21. The only word I didn't recognise was 'bartizan' - I would guess that it is another name for a gatehouse/entry passageway, used for defence. This was taken from:
 'it's crest was overshadowed' - this either means that the bartizan is on top of the house (literally, over the crest of the roof), or that there is some form of family crest showing on the walls which the bartizan is above. If there is a crest, generally it is on/over the main entry to the house. The bartizan, then, could either be just above the family crest, or it could be a separate building large enough to cast a shadow over the front door.
 'murder-holes and archer-slits' - obviously the bartizan is here for close-range defense (murder-holes = boiling oil) - less likely for it to be on top of the house.
 'looking inwards upon blackness' - this implies that people can stand outside/on top of the bartizan and shoot inwards. Again, this implies that it is a separate building rather than an attachment to the main house.
22. Bartizan – simply no idea of this word, a tower or greater arch or higher part or something like that... because otherwise the rest makes no sense.
23. I am unfamiliar with the word bartizan. I believe it to be a turret or tower-like structure. If it is overshadowing another building, then it must be tall and once you add the description of various windows, holes and slits, then it is easy to picture such a structure overlooking the building...

24. Bartizan seems to be some sort of architectural structure, quite possibly a tower or a wall. I assume this from the description that it has windows.
25. bartizan
- From context, I believe it is part of a castle/keep. Specifically, a tower of sorts because of the overshadowing. I'm really not that sure about that part though.
26. **Bartizan**
I'm not familiar with this word, but I assume it is a medieval architectural term, used to describe the style of the façade. The entire passage uses the flowery language of the period, and bartizan is nestled within the context of *ancient fortification*, *buttresses*, and *courtyard*.
27. ---bartizan---I think this is something like a cupola, perhaps one that overlooks a point of ingress. The crest is overshadowed, so the bartizan must be higher than it, and it has different types of windows which are used primarily for defence in a siege (murder-holes, in particular, must be over an entryway).
28. Bartizan: Considering the bartizan overshadows the crest of the weathered fortification and was speckled with small empty windows, I assume bartizan would be a tower in a fortress that contains small windows for archers, etc. I'm having trouble coming up with the right words for it, but I can picture the towers that I'm talking about in my head...which doesn't do a lot of good here :-/.
29. "bartizan"
I suspect that this is a type of tower...mostly because of what I am familiar with in terms of medieval type castles (which is suggested by this "murder-holes and archer-slits")
30. **bartizan** - from the context I assume this means the highest point of a tower. My clues were "overshadowed" (which implies it is higher than everything else), "angular" (which implies it is man-made), and "speckled with small empty windows" (which implies it is part of the building).
31. bartizan - wall? "small empty windows and murder-holes and archer-slits" are often found in walls.
32. The only word I didn't know was bartizan. Based on the passage, I would guess it's a structural term. Because the part right before it says overshadow, I would guess it's something that hangs off a building.
33. Bartizan- Towers, because it has A. murder-holes, B. archer-slits, and C. Windows.
34. The only word in your paragraph that I was not familiar with was "bartizan." Based off of context clues (angular, and the surrounding description of the buildings), I assume that it is some sort of achitectural term, perhaps some sort of entry way, since that's where murder holes usually are found.
35. BARTIZAN.
From context, I would guess that it's an outer tower of a castle/fortress, maybe near the gates.

36. My vocabulary is fairly large but I have no idea what a bartizan is.

From the context I suspect it is a particular type of building (perhaps ancient) or a large part or section of some man-made construction.

Clearly a bartizan is a solid object. It is angular and has windows, and has therefore been constructed or modified by man.

It overshadows the fortification, so it could be a separate entity in its own right, but it seems likely that it is part of or joined to the fortification. Overshadowing implies that the bartizan is sited above the fortification, although it could also be placed behind (in addition).

It seems likely that the bartizan is part of the fortification, placed near the top and protruding from it, casting it into shadow.

37. bartizan: some sort of building component; i'm guessing a wall that juts out, and it must be large enough to contain the windows, slits, holes, etc that are in it.

I've never seen this word before in my life, so I'm creating a meaning entirely from the context explained above.

38. bartizan: Clearly this is some kind of fortification, because it has archer slits and murder-holes. And it must be a tall fortification to be able to overshadow Daumard's crest. Perhaps it's the type of tower that's interspersed along a defensive wall. (But if it's along the outer wall rather than being a structure within the courtyard, I'm perplexed as to why the archer slits and murder holes would be looking inward. Maybe the builders expected the defenses to be easily breached, or perhaps this used to be a prison.)

39. bartizan- I think that this is a specific part of the fortifications of a castle. In particular, I think that it is probably a guard tower or the keep proper of the castle. I think this because I recognize the other things named in conjunction with it (murder-holes and archer-slits) as fixtures used by defenders to repel attackers which would require it to be in a location likely to be assaulted and I also noticed that it had windows which means that it is a structure which is meant to contain people. I used my background knowledge about the words associated with this one to come up with a guess about the meaning.

40. It sounded like a bartizan is some manner of enclosed watchroom - I'm thinking the room over a gate. It is the mention of murder-holes and archer-slits - common features of medieval castle architecture, designed for shooting/attacking intruders - plus the aforementioned statement that this is an old fortification.

41. I read the passage and was familiar with all the words except 'bartizan'.
I suspect that it means a sort of tower.
The bartizan is mentioned in the context of describing medieval structures ('ancient fortification'). We're told that the bartizan overshadows the crest - the fact that it has "small empty windows and murder-holes and archer-slits" suggests that it is a significant structure and that the 'crest' referred to is the top of a building rather than a coat of arms. The fact that it has a dark interior tells us that this is a three-dimensional structure and it wouldn't make sense for archer slits to exist in something that was not large enough for an archer to stand behind or within.
From primary school history and having visited various castles around the country, I'm aware that murder holes are used to drop stones, oil and various other nasty things on attackers from a height. So yes, a tower; a structure that's familiar within this medieval context, can fit archers inside, has significant height from which to drop things and also maybe a mental link I make between 'bartizan' and 'barbican'.
42. bartizan was a new one. I believe it refers to a turret or tower overlooking the courtyard (and likely jutting out somewhat) based on the reference to murder holes, which would need to be above any invaders.
43. Bartizan) I believe it is a castle, mainly because of the phrase "with small empty windows and murder-holes and archer-slits". murder-holes are normally found in castles, where people drop burning oil or large boulders on enemy's. Archer-slits are little slits that are hard to hit, whilst archers inside the would-be castle would fire their arrows. These two things are normally found in castles.
44. the only word in the passage with which I am unfamiliar is "bartizan." I believe, from context, that a bartizan would most likely be a guardpost (probably a small, enclosed room); I base this conclusion on it being on the top of a fortified location, and having various holes and slits that were for shooting arrows through.
45. bartizan: I am assuming this is some sort of a part of wall or building, the name of perhaps something that we don't build anymore as we don't have buttresses and such. In my head I see something that resembles almost a castle wall type structure that angles outwards toward the top in a manner. This one was harder for me to figure out definite words for, but the picture was in my head from the wording of the passage.
46. Bartizan: Tower? Or, some kind of defensive structure at least. The fact that there are murder-holes and archer-slits give the idea of a place to defend. Probably a tower since the fact that it overshadows something gives the idea of height.
47. the only word (besides the french ones) that threw me was bartizan. from context, i'm assuming it's an architectural feature at the top of a castle or large house. it seems like a belfry. the clues i used were also in the description of the house: "ancient fortification" and "crumbling buttresses." the rest of the clues came from the medieval mentions, like arrow-slits and murder-holes and gargoyles.
48. I am unfamiliar with the term "bartizan", but since it overshadows the crest of the home, I assume it is some type of tower that is part of the fortifications around the home. This is supported by the fact that it contains windows, murder-holes, and archer slits, so it is obviously something that can be occupied and is at least partially enclosed.

49. bartizan

- Some type of building, definitely from medieval times.
- It was speckled with windows and had gargoyles.

50. 'bartizan' - context suggests that this is some sort of building structure/architecture, as the topic from "At last they arrived..." to the end is purely descriptive of this, and specifically the bartizan is said to have "small empty windows and murder-holes and archer-slits"

51. I didn't recognise one word - bartizan.

I assume it means a small tower room atop the corner of a wall.

The surrounding sentence and type of movies I watch have led me to that conclusion.

I originally thought it may be a walkway over an arched entrance, but then changed my mind when I re-read that it was on a **corner**. **Crest** and **overshadowed** implies a position of some height at the top of the structure. I have seen **windows, murder-holes** and **archer-slits** in medieval movies, in structures that seem to match the description in the passage.

52. bartizan - something that stands out from the castle (with small empty windows)(first i thought it was a weapon until i read more)

53. bartizan - It must be a wall of some type, probably one that was used for defense in medieval times. I deduced this from the fact that it had, well, windows, murder-holes, and archer-slits.

54. I do not know only one word: bartizan. I have visited castles, and I know about murder holes, etc. So my guess is that a bartizan is something that juts out of a castle wall, much like a bay window. That is my contribution to vocabulary.