Natural Language Processing in Prolog

Part III: Miscellaneous Topics

CSCI 315: Artificial Intelligence

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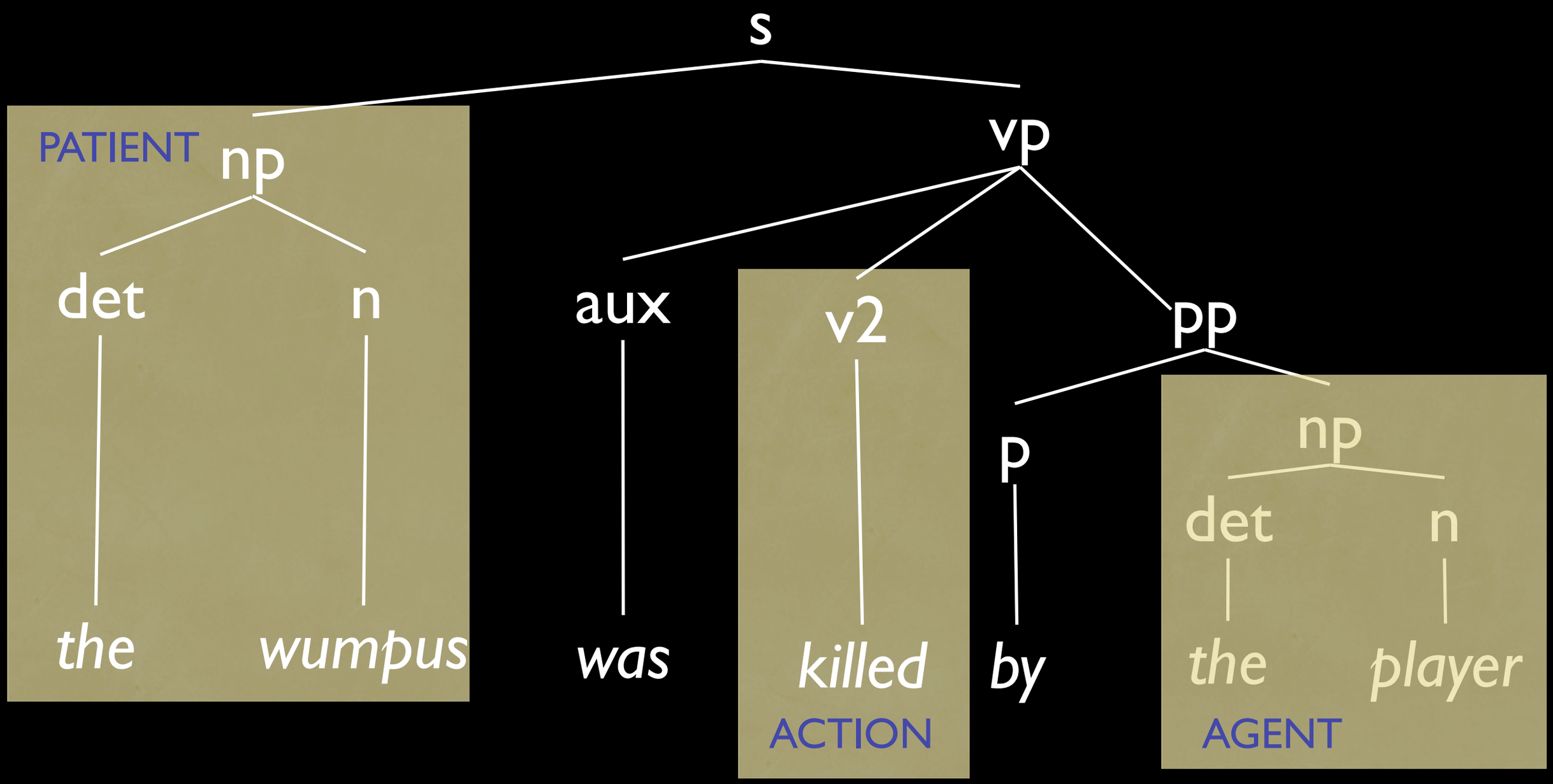
Style: Many-To-One Words-To-Meaning



A Little More Grammar

```
vp(vp(Aux, V2, PP)) --> aux(Aux), v2(V2), pp(PP).

aux(aux(be)) --> [was].

pp(pp(P, NP)) --> p(P), np(NP).

p(p(by)) --> [by].

v2(v2(killed)) --> [killed]. % c.f. saw/seen
```

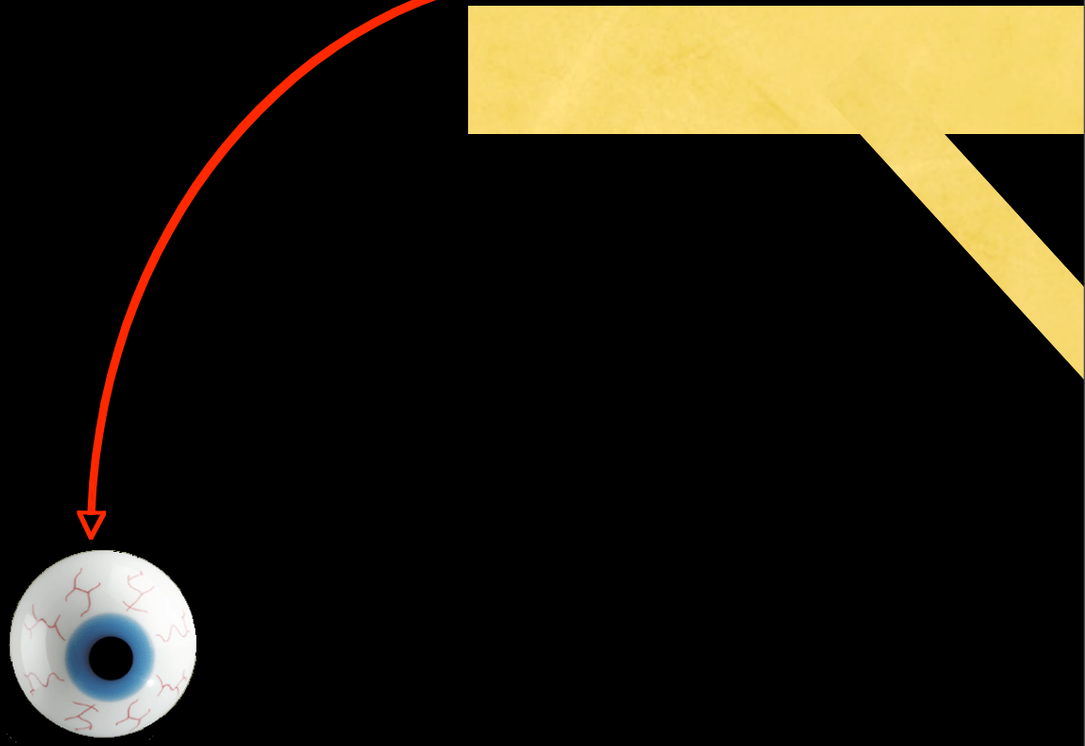
Plus a Parsing Rule

```
parse2meaning(s(np(_, n(N1)),
                vp(aux(_),
                   v2(V),
                   pp(_, np(_, n(N2))))),
    event(action(V), agent(N2), patient(N1))).
```

```
| ?- parse(P,
[the,wumpus,was,killed,by,the,player]),
parse2meaning(P, M).


P = s(np(det(the),n(wumpus)),vp(aux(be),v2(kill),
pp(p(by),np(det(the),n(player)))))

M = event(action(killed),agent(n(player)),patient
(wumpus))


yes
```

Ambiguity: Many-to-One Meanings To Words

Eye drops off shelf



Ambiguity: Many-to-One Meanings To Words

```
s(s(N, PP)) --> n(N), pp(PP).
s(s(N, VP)) --> n(N), vp(VP).
pp(pp(P, N)) --> p(P), n(N).
vp(vp(V, PP)) --> v(V), pp(PP).
n(n(eyedrops)) --> [eye, drops].
n(n(shelf)) --> [shelf].
p(p(off)) --> [off].
n(n(eye)) --> [eye].
v(v(drops)) --> [drops].
```

Ambiguity: Many-to-One Meanings To Words

```
| ?- consult(grammar6).
[grammar6 loaded]

yes
| ?- parse(P, [eye,drops,off,shelf]).

P = s(n(eyedrops),pp(p(off),n(shelf)));

P = s(n(eye),vp(v(drops),pp(p(off),n(shelf))))

yes
```

Machine Translation

```
english2japanese(E, J) :-
  eparse(M, E),
  jparse(M, J).

eparse(P, L) :- es(P, L, []).

jparse(P, L) :- js(P, L, []).
```

Machine Translation

```
es(event(action(Action), agent(Agent), patient(Patient)))
     -->  enp(Agent), ev(Action), enp(Patient).
enp(Entity) --> det, en(Entity).
det --> [the].
det --> [a].
en(wumpus) --> [wumpus].
en(player) --> [player].
ev(kill) --> [kills].
```

Machine Translation

```
js(event(action(Action), agent(Agent), patient(Patient)))
      -->  jnp(Agent), [ga], jnp(Patient), [o], jv(Action).

jnp(Entity) --> jn(Entity).

jn(wumpus) --> [wumpusu].

jn(player) --> [puraya].

jv(kill) --> [uchitorimasu].
```

Machine Translation

```
| ?- consult(grammar9).
[grammar9 loaded]

yes
| ?- english2japanese([the,player,kills,the,wumpus], J).

J = [puraya,ga,wumpusu,o,uchitorimasu]

yes
| ?- english2japanese(E, [wumpusu, ga, puraya, o, uchitorimasu]).

E = [the,wumpus,kills,the,player]

yes
```