Administrivia

1. Review of translator so far
2. Idioms
3. TCEs
4. Homework
5. Optional Homework
Bi-directional English grammar

declarative sentence

?- english:s(predarg(buy+past,john,book,decl),E,[]).
E = [john, bought, the, book] ;
E = [john, bought, the, books] ;
E = [john, bought, a, book] ;
false.

?- english:s(PA,[john,bought,a,book],[[]]).
PA = predarg(buy+past, john, book, decl) ;
false.
Bi-directional English grammar

object wh-question

?- english:sbarq(PA, [what, did, john, buy], []).  
PA = predarg(buy+past, john, what, wh); 
false.

?- english:sbarq(predarg(buy+past, john, what, wh), E, []).  
E = [what, did, john, buy]; 
false.
Bi-directional English grammar

subject wh-question

?- english:sbarq(predarg(buy+past, who, book, wh), E, []).  
E = [who, bought, the, book] ;
E = [who, bought, the, books] ;
E = [who, bought, a, book] ;
false.

?- english:sbarq(PA, [who, bought, a, book], []).  
PA = predarg(buy+past, who, book, wh) ;
false.
Bi-directional English grammar

```
?- english:sq(PA, [did, john, buy, a, book], []).  
PA = predarg(buy+past, john, book, yesno); 
false.

?- english:sq(PA, [did, john, buy, the, books], []).  
PA = predarg(buy+past, john, book, yesno); 
false.

?- english:sq(predarg(buy+past, john, book, yesno), E, []).  
E = [did, john, buy, the, book]; 
E = [did, john, buy, the, books]; 
E = [did, john, buy, a, book];  
false.
```
Bi-directional Japanese Grammar

phrase structure rules computing predarg(P,A1,A2,Type)

```prolog
:- module(japanese,[]).

s(PA) --> np(NP,notwh), nomcase(_), vp(PA,notwh), \{arg(2,PA,NP),arg(4,PA,decl)}.

s(PA) --> np(NP,Q1), nomcase(_), vp(PA,Q2), sf(Q1,Q2), \{arg(2,PA,NP), arg(4,PA,wh)}.

s(PA) --> np(NP,notwh), nomcase(\_), vp(PA,notwh), [ka], \{arg(2,PA,NP), arg(4,PA,yesno)}.

s(PA) --> np(NP,notwh), acccase(\_), s_scrambled(PA,notwh), \{arg(3,PA,NP), arg(4,PA,decl)}.

s(PA) --> np(NP,notwh), acccase(\_), s_scrambled(PA,notwh), [ka], \{arg(3,PA,NP), arg(4,PA,yesno)}.

s(PA) --> np(NP,Q2), acccase(\_), s_scrambled(PA,Q1), sf(Q1,Q2), \{arg(3,PA,NP), arg(4,PA,wh)}.

s(PA) --> np(NP,notwh), nomcase(\_), vp_passive(PA,notwh), \{arg(3,PA,NP), arg(4,PA,decl)}.

s(PA) --> np(NP,notwh), nomcase(\_), vp_passive(PA,notwh), [ka], \{arg(3,PA,NP), arg(4,PA,yesno)}.

s(PA) --> np(NP,Q2), nomcase(\_), vp_passive(PA,Q1), sf(Q1,Q2), \{arg(3,PA,NP), arg(4,PA,wh)}.

s_scrambled(PA,Q) --> np(NP,Q), nomcase(\_), vp_scrambled(PA), \{arg(2,PA,NP)}.

vp_scrambled(predarg(V,\_,\_,\_)) --> v(V).

vp(predarg(V,\_,NP,\_),Q) --> np(NP,Q), acccase(\_), v(V).

vp_passive(predarg(V,\_,\_,\_),notwh) --> v_passive(V).

vp_passive(predarg(V,NP,\_,\_),Q) --> np(NP,Q), datcase(\_), v_passive(V).
```
Bi-directional Japanese Grammar

lexical entries

% sentence-final particle
sf(wh,notwh) --> [ka].
sf(notwh,wh) --> [ka].
sf(wh,wh) --> [ka].

% Lexicon
nomcase(ga) --> [ga].
% nomcase(ga) --> ['が'].
acc-case(o) --> [o].
% acc-case(o) --> ['を'].
dat-case(ni) --> [ni].
% dat-case(ni) --> ['に'].

v(kau+formal+past) --> [kaimashita].
v(kau+past) --> [katta].
% v(kau+formal+past) --> ['買いました'].
% v(kau+past) --> ['かった'].

v_p passive(kau+passive+past) --> [kawareda].
% v_p passive(kau+passive+past) --> ['買われた'].
v_p passive(kau+passive+formal+past) --> [kawaremashita].
% v_p passive(kau+passive+formal+past) --> ['買われました'].

% np(Parse,{wh|notwh})
np(hon,notwh) --> [hon].
% np(hon,notwh) --> ['本'].
np(taroo,notwh) --> [taroo].
% np(taroo,notwh) --> ['太郎'].
np(np(nnp(john)),notwh) --> [john].
np(nani,wh) --> [nani].
% np(nani,wh) --> ['何'].
np(dare,wh) --> [dare].
% np(dare,wh) --> ['だれ'].
?- translate([taroog, ga, hon, o, kaimashita], E).
E = [john, bought, the, book];
E = [john, bought, the, books];
E = [john, bought, a, book];
false.

?- translate([taroog, ga, hon, o, kaimashita, ka], E).
E = [did, john, buy, the, book];
E = [did, john, buy, the, books];
E = [did, john, buy, a, book];
false.
?- translate([dare, ga, hon, o, kaimashita, ka], E).
  E = [who, bought, the, book] ;
  E = [who, bought, the, books] ;
  E = [who, bought, a, book] ;
  false.

?- translate([taroo, ga, nani, o, kaimashita, ka], E).
  E = [what, did, john, buy] ;
  false.
Translator

?- translate(J, [who, bought, a, book]).
J = [dare, ga, hon, o, kaimashita, ka] ;
J = [dare, ga, hon, o, katta, ka] ;
J = [hon, o, dare, ga, kaimashita, ka] ;
J = [hon, o, dare, ga, katta, ka] ;
false.

?- translate(J, [did, john, buy, a, book]).
J = [taroo, ga, hon, o, kaimashita, ka] ;
J = [taroo, ga, hon, o, katta, ka] ;
J = [hon, o, taroo, ga, kaimashita, ka] ;
J = [hon, o, taroo, ga, katta, ka] ;
false.

?- translate(J, [john, bought, a, book]).
J = [taroo, ga, hon, o, kaimashita] ;
J = [taroo, ga, hon, o, katta] ;
J = [hon, o, taroo, ga, kaimashita] ;
J = [hon, o, taroo, ga, katta] ;
false.
Milestone

- A programming milestone in this course has been reached...
- You know how to implement grammars for multiple languages
- We’ve seen techniques for implementing a variety of simple syntactic phenomena: basic declarative sentences, English passives, progressives, *wh*-questions, Japanese passives and *wh*-questions.
- Use of extra arguments: record a parse, agreement, pass information up the rule hierarchy
- Compute (*Stanford Parser style*) syntax trees
- Compute predicate-argument structures for the translator
English Idioms

• Consider the English sentence:
  – *John kicked the bucket*
  – Two possible interpretations:
    **Idiomatic**: “John died”
    **Literal**: *John kicked the bucket*

**idioms**: non-composition meaning
i.e. meaning of idiom “*die*” cannot be inferred from the
meaning of the constitutive words *kick* and *bucket*
• Let’s implement the idiomatic meaning first:
  – John kicked the bucket (fixed.. frozen VP expression)
  – #John kicked the buckets
  – #John kicked a bucket

PA representation
predarg(V,Subject,Object,Type)
predarg(die+past,john,none,decl)

\[
\begin{align*}
  s(PA) & \rightarrow np(NP,Person,Number,nom), \text{vp}(PA,Tag,Number), \\
  & \quad \{ \text{arg}(2,PA,NP), \text{check}(Person,Number,Tag) \}.
\end{align*}
\]

\[
\text{vp(predarg(die+past,_,none,decl),vbd,_) } \rightarrow [\text{kicked, the, bucket}].
\]
English Idioms

• Let’s implement the literal meaning next:
  – John kicked the bucket
  – John kicked the buckets
  – John kicked a bucket

We need to add the verb *kick* and the nouns *bucket* and *buckets* to the English grammar

Note: two parses! (*compare with next slide*)
English Idioms

• Let’s implement the literal meaning next:
  – John kicked the bucket
  – John kicked the buckets
  – John kicked a bucket

```
?- english:s(Parse,[john,kicked,a,bucket],[]).
Parse = predarg(kick+past, john, bucket, decl) ;
false.

?- english:s(Parse,[john,kicked,the,buckets],[]).
Parse = predarg(kick+past, john, buckets, decl) ;
false.
```

**Note**: one parse only!
English Idiom Translation

- Let’s modify the Japanese grammar (jg26.pl) to handle the following Japanese sentences:
  - *Taroo-ga baketsu-o ketta*
  - predarg(keru+past,taroo,baketsu,decl)
    - baketsu (バケツ) (bucket)
    - ketta = keru-past (kick)
    - kerimashita = keru+past (kick) formal
    - shibaita = shibaku+past (kick)
    - shibakimashita = shibaku+past (kick) formal
  - *Taroo-ga shinda*
  - predarg(shinu+past,taroo,none,decl)
    - shinda = shinu+past (die)

```prolog
?- japanese:s(Parse,[taroog,ga,baketsu,o,kerimashita],[]).
Parse = predarg(keru+past, taroo, baketsu, decl) ;
false.

?- japanese:s(Parse,[taroog,ga,shinda],[]).
Parse = predarg(shinu+past, taroo, none, decl) ;
false.
```
English Idiom Translation

• We will also need to modify the translation table to handle:
  • baketsu (バケツ) (bucket)
  • ketta = keru+past (kick)
  • kerimashita = keru+past (kick)
  • shinda = shinu+past (die)
Homework 6: Japanese Idioms

Examples

- taroo-ga sensei-ni goma-o sutta
- taroo-nom teacher-dat sesame-acc grinded
- “John flattered the teacher”
- taroo-ga Hanako-ni goma-o sutta
- taroo-nom Hanako-dat sesame-acc grinded
- “John flattered Mary”
- ni = (dat) dative Case marker
- odateta is the Japanese counterpart for flattered

Part 1: Modify j26.pl to implement the idiomatic meaning
  predarg(odateru+past,taro,sensei,decl)

Step 1: add sensei, hanako
Step 2: add VP rule for the idiom
Homework 6: Japanese Idioms

• Examples
  – taroo-ga sensei-ni goma-o sutta
  – taroo-nom teacher-dat sesame-acc grinded
  – “John flattered the teacher”
  – taroo-ga Hanako-ni goma-o sutta
  – taroo-nom Hanako-dat sesame-acc grinded
  – “John flattered Mary”
  – *ni* = (dat) dative Case marker
  – *odateta* is the Japanese counterpart for flattered

Part 2: Implement the English translation of the Japanese idiom idiomatic meaning

\[\text{predarg(odateru+past,taro,ensei,decl) = predarg(flatter+past,john,teacher,decl)}\]
John flattered the teacher
Optional Homework

• Implement translation of the following Japanese passive sentences:

```prolog
?- japanese:s(PA,[hon, ga, taroo, ni, kawaremashita],[]).
PA = predarg(kau+passive+formal+past, taroo, hon, decl); false.

?- english:s(PA,[the, book, was, bought, by, john],[]).
PA = predarg(buy+past, john, book); false.

?- japanese:s(PA,[hon, ga, kawaremashita],[]).
PA = predarg(kau+passive+formal+past, _G2244, hon, decl); false.

?- english:s(PA,[the, book, was, bought],[]).
PA = predarg(buy+past, _G2252, book); false.
```
Optional Homework

• Implement translation of the following Japanese passive sentences:

```
?- japanese:s(PA,[hon,ga,kawaremashita],[]).
PA = predarg(kau+passive+formal+past, _G2244, hon, decl); false.

?- english:s(PA,[the,book,was,bought],[]).
PA = predarg(buy+past, _G2252, book); false.
```

Problem: using a variable for the 2nd argument doesn't work for translation (see next slide)

Hint: make it 'none' and have translation of 'none' (Japanese) be 'none' English

```
vp_passive(predarg(V,_,_,_),notwh) --> v_passive(V).
vp_passive(predarg(V,NP,_,_),Q) --> np(NP,Q), datcase(_), v_passive(V).
```
Optional Homework

?- english:s(predarg(buy+past,_,book),E,[]).
E = [the, book, was, bought] ;
E = [the, book, is, bought] ;
E = [the, book, was, bought, by, me] ;
E = [the, book, was, bought, by, you] ;
E = [the, book, was, bought, by, him] ;
E = [the, book, was, bought, by, her] ;
E = [the, book, was, bought, by, it] ;
E = [the, book, was, bought, by, us] ;
E = [the, book, was, bought, by, them] ;
E = [the, book, was, bought, by, john] ;
E = [the, book, was, bought, by, mary] ;
E = [the, book, was, bought, by, the, book] ;
E = [the, book, was, bought, by, the, books] ;
E = [the, book, was, bought, by, the, sandwich] ;
E = [the, book, was, bought, by, the, sandwiches] ;
E = [the, book, was, bought, by, the, boy] ;
E = [the, book, was, bought, by, the, boys] ;
E = [the, book, was, bought, by, the, man] ;
E = [the, book, was, bought, by, the, men] ;

Overgeneration: variable as 2\textsuperscript{nd} argument allows anything to substitute
Instructions

• For both homeworks, submit your code.
• Submit the example runs.
• Explain your modifications to the code.
• Due date: next Monday (evening)
What do other systems do?

• Explore Google Translate
Japanese Idioms

• Example:
  – 太郎が先生にごまをすった
  – taroo-ga sensei-ni goma-o sutta
  – Taroo-NOM teacher-DAT sesame-ACC grind+PAST
  – Taroo flattered the teacher

• Note on input methods (MacOS X)
101 Japanese Idioms


- **Listen & Learn: 101 Japanese Idioms**
  - Michael Maynard

- Sample pages from book is available online
Sesame grinder: *gomasuri* (ごますり)

- *gomasuri* (ごますり)
Sesame grinder: *gomasuri* (ごますり)

- *gomasuri* (ごますり)

1. **“sesame grinding”**

(ingratiating oneself, apple-polishing, overtly flattering, toady, sucking up to one’s superiors)

When a person makes an overtly ingratiating remark, he or she is “grinding sesame seeds.” Others call attention to the *gomasuri* either by saying the word, by (nonverbally) making motions with the fist over the palm of the other hand (simulating the grinding of roasted sesame seeds with a pestle and mortar), or by doing both. Like the messy sesame seeds ground up in the mortar, the person seeking favor is sticking to everything (one).
Sesame grinder: gomasuri (ごますり)

- gomasuri (ごますり)

**Sample text:**
(Style: spoken/formal/male)

A: Kato-san iyo iyo kakarichoo ni shooshin rashii desu yo.
B: Yappari soo desu ka. Koko sannen kan zutto gomasuri o yatte kita n da kara, soro soro kakarichoo ni naru daroo to wa omotemashita kedo ne.

A: 加藤さんいよいよ係長に昇進らしいですよ。
B: やっぱりそうですか。ここ三年ずっとごますりをやってきただから、そろそろ係長になるだろうとは思ってましたけどね。

A: I hear Mr. Kato is finally going to be promoted to section chief.
B: Just as I thought. I was thinking he would make section chief soon since he’s been apple-polishing for the past three years.

you have to figure out how to enter Japanese examples...

you can use an online Japanese dictionary e.g.
http://jisho.org/