Event Programming in Prolog

- Events in our quagent Prolog API are just *list of strings*

```
%% print an event list
print_events([]) :- nl.
print_events([H|T]) :-
                    writeln(H),
                    print_events(T).
```

Compared to:

```
:- use_module(library(porter_stem)).

%% print an event list
print_events([]) :- nl.
print_events([H|T]) :-
                    tokenize_atom(H,TokenList),  % tokenize the string H
                    writeln(TokenList),
                    print_events(T).
```

Event Programming in Prolog

```
%% libraries and modules
:- consult('quagent.pro').
:- use_module(library(porter_stem)).

%% dispath event predicate
dispatch_event(Q,E) :-
                    member('STOPPED',E),
                    q_turn(Q,-30).

dispatch_event(Q,E) :-
                    member('rays',E),
                    nth1(9,E,X), % unify the 9th element of E with X, start counting at 1
                    nth1(10,E,Y), % unify the 10th element of E with Y
                    Dist is sqrt(abs(X)**2 + abs(Y)**2),
                    write('ray> '),write(' distance '),write(Dist),nl,
                    Dist =< 500,
                    q_turn(Q,-30).

dispatch_event(_,_). % return true if we are not interested in the event

%% handle events predicate
handle_events(_,[]).

handle_events(Q,[H|T]) :-
                    tokenize_atom(H,TokenList),  % tokenize the string H
                    dispatch_event(Q,TokenList),
                    handle_events(Q,T).
```

Event Programming in Prolog

Given the token list of the rays event:

[OK, (, ask, rays, 2,), 1, worldspawn, 0, -209.469, 0, 2, worldspawn, -9.15527e-005, 286.469, 0]

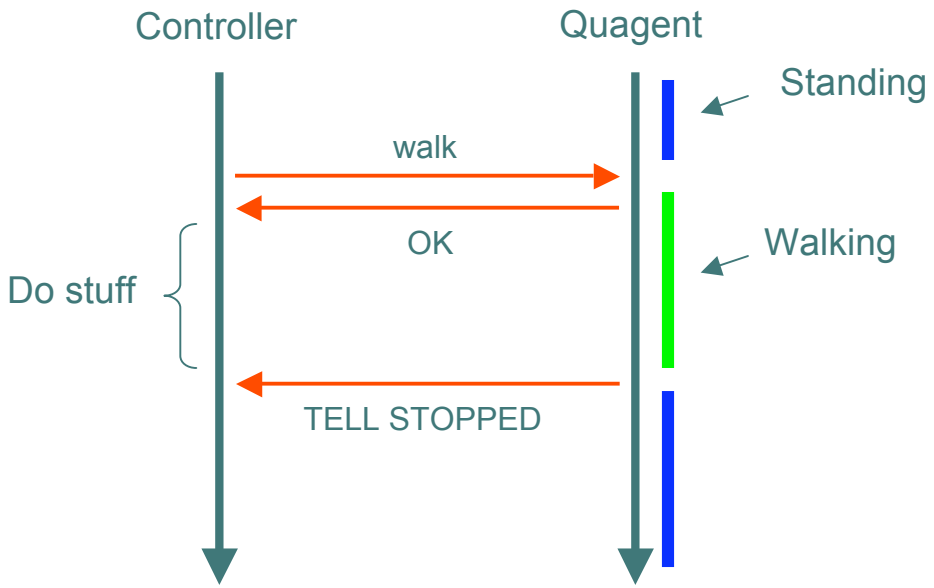
We want to extract the list of objects with their corresponding data.

```
% parse the rays command event token list, ignoring
% the first 6 tokens
q_parse_rays([_, _, _, _, _, _|TokenList], ObjList) :-
                    q_parse_tokenlist(TokenList,ObjList).

% parse the object token list and construct a list
% of object together with their corresponding data
q_parse_tokenlist([],[]).
q_parse_tokenlist([I,O,X,Y,Z|Next], [Object|Tail]) :-
                    Object = [I,O,X,Y,Z],
                    q_parse_tokenlist(Next,Tail).
```

Given the rays command event above, what does the constructed ObjList look like?

Asynchronous Quagent Programming in Prolog



Asynchronous Prolog

Idea: let's write a program that walks a quagent in a 100x100 square.
We want to make sure that it reaches each of the corners.

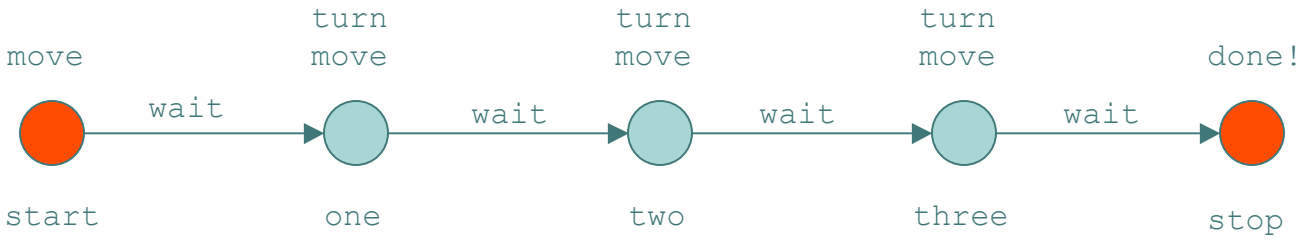
```
run :-
        q_connect(Q),
        q_walk(Q,100),
        wait_until_stopped(Q),
        q_turn(Q,-90),
        q_walk(Q,100),
        wait_until_stopped(Q),
        q_turn(Q,-90),
        q_walk(Q,100),
        wait_until_stopped(Q),
        q_turn(Q,-90),
        q_walk(Q,100),
        wait_until_stopped(Q),
        q_turn(Q,-90)
        q_close(Q).
```

```
% keep polling the events
% base case
wait_until_stopped(Q) :-
        % could be doing something smart here
         q_events(Q,E),
         parse_stopped_event(E).
% recursive step
wait_until_stopped(Q) :-
         % could be doing something smart here
         wait_until_stopped(Q).
```

```
% parse event list for stopped event
% base cases
parse_stopped_event([]) :- fail.
parse_stopped_event([H|_]) :-
          tokenize_atom(H,TokenList),
          member('STOPPED',TokenList).
% recursive step
parse_stopped_event([_|T]) :-
          parse_stopped_event(T).
```

Asynchronous Prolog

Idea: let's write a program that walks a quagent in a 100x100 square. We want to make sure that it reaches each of the corners but now we use a FSM to control the movements.



This is a Moore machine: actions on the states, conditions on the transitions.

Asynchronous Prolog

```
%%% define the machine
% initial and final states
initial(start).
final(stop).

% define the actions at the states
action(start,Q) :- writeln('start state'), q_walk(Q,100).
action(one,Q) :- writeln('state one'),q_turn(Q,-90),q_walk(Q,100).
action(two,Q) :- writeln('state two'),q_turn(Q,-90),q_walk(Q,100).
action(three,Q) :- writeln('state three'),q_turn(Q,-90),q_walk(Q,100).
action(stop,_) :- writeln('stop state: all done').

% define the edges
edge(start,wait_stopped,one).
edge(one,wait_stopped,two).
edge(two,wait_stopped,three).
edge(three,wait_stopped,stop).

% define the condition for the transitions
condition(wait_stopped,Q) :- wait_until_stopped(Q).
```

```
%%% main loop which uses the finite state machine
state_machine(State,Q) :-
                final(State),
                action(State,Q).

state_machine(State,Q) :-
                action(State,Q),
                edge(State,Label,NextState),
                condition(Label,Q),
                state_machine(NextState,Q).

%%% run the program
run :-
                q_connect(Q),
                state_machine(start,Q),
                q_close(Q).
```

Full implementation available on the course website.

Preview of Coming Attractions

- Form Teams of 2-4
- Team Assignments
  - Prolog assignment ‘Tofu Deathmatch’
  - Pick an article to present in ‘Game Programming Wisdom 4’ – each team will have to present one article -- each team should pick 3 articles and then we figure out which team presents what.
  - You should also start thinking about Projects
    - example projects: http://www.cs.rochester.edu/~brown/242/assts/assts.html
  - Deathmatch competition - Thursday 3/18

Tofu Positions

For the ‘Tofu Deathmatch’ assignment, add the following lines to your ‘quagent.config’ file (same folder as your empty and obstacle rooms):

```
tofu 288 288 128
tofu 384 64 128
tofu 256 128 128
tofu 192 448 128
```