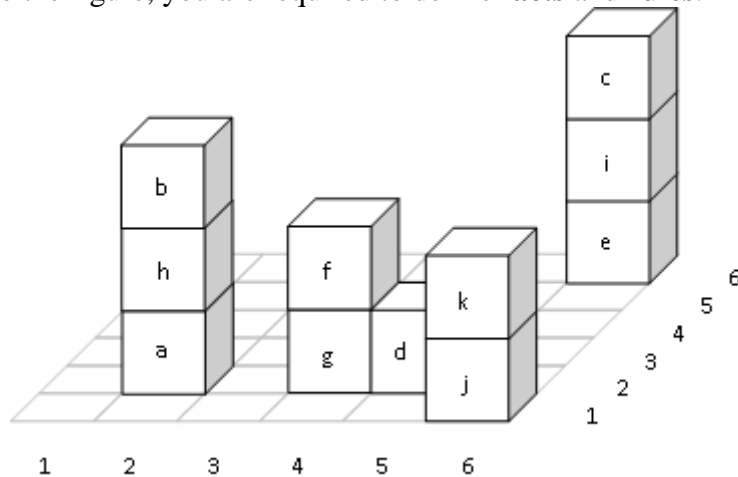# National Taipei University of Technology
Artificial Intelligence (spring, 2014)

Homework #1
(Due: Friday, March 7)

According to the figure, you are required to define **facts** and **rules**.

(1) (15%) Define the *facts* **see(Block, X, Y)**. Block is observed by camera at coordinates X and Y. For example:

?- see(B, X, Y).
B = b, X = Y, Y = 2;
B = c, X = Y, Y = 6;
B = d, X = 5, Y = 2;
B = f, X = 4, Y = 2;
B = k, X = 6, Y = 1.

(2) (15%) Define the *facts* **on(Block, Object)**. Block is standing on Object. For example:

?- on(B, O).
B = a, O = table ;
B = b, O = h ;
B = c, O = i ;
B = d, O = table ;
B = e, O = table ;
B = f, O = g ;
B = g, O = table ;
B = h, O = a ;
B = i, O = e ;
B = j, O = table ;
B = k, O = j.

(3) (15%) Define the relation **under(Block1, Block2)** using **on** and **under** relation.
Block1 is under the Block2. For example:

?- under(B1, B2).
B1 = table, B2 = a ;
B1 = h, B2 = b ;
B1 = i, B2 = c ;
B1 = table, B2 = d ;
B1 = table, B2 = e ;
B1 = g, B2 = f ;
B1 = table, B2 = g ;
B1 = a, B2 = h ;
B1 = e, B2 = i ;
B1 = table, B2 = j ;
B1 = j, B2 = k ;
B1 = a, B2 = b ;
B1 = table, B2 = b ;
B1 = e, B2 = c ;
B1 = table, B2 = c ;
B1 = table, B2 = f ;
B1 = table, B2 = h ;
B1 = table, B2 = i ;
B1 = table, B2 = k ;
false.

(4) (15%) Define the *rule* **x(Block, X)**. For example:

?- x(B, X).
B = b, X = 2 ;
B = c, X = 6 ;
B = d, X = 5 ;
B = f, X = 4 ;
B = k, X = 6 ;
B = h, X = 2 ;
B = i, X = 6 ;
B = g, X = 4 ;
B = a, X = 2 ;
B = e, X = 6 ;
B = j, X = 6 ;
false.

(5) (15%) Define the *rule* **y(Block, Y)**. For example:

?- y(B, Y).
B = b, Y = 2 ;
B = c, Y = 6 ;
B = d, Y = 2 ;
B = f, Y = 2 ;
B = k, Y = 1 ;
B = h, Y = 2 ;
B = i, Y = 6 ;
B = g, Y = 2 ;
B = a, Y = 2 ;
B = e, Y = 6 ;
B = j, Y = 1 ;
false.

(6) (15%) Define thr *rule* **xyz(Block, X, Y, Z)**. For example:

?- xyz(B, X, Y, Z).
B = b, X = Y, Y = Z, Z = 2 ;
B = c, X = Y, Y = 6, Z = 2 ;
B = d, X = 5, Y = 2, Z = 0 ;
B = f, X = 4, Y = 2, Z = 1 ;
B = k, X = 6, Y = Z, Z = 1 ;
B = h, X = Y, Y = 2, Z = 1 ;
B = i, X = Y, Y = 6, Z = 1 ;
B = g, X = 4, Y = 2, Z = 0 ;
B = a, X = Y, Y = 2, Z = 0 ;
B = e, X = Y, Y = 6, Z = 0 ;
B = j, X = 6, Y = 1, Z = 0 ;
false.

(7) (10%) Formulate in Prolog the following questions:

1. (5%) What blocks with location x = 6?
    Using relation **x(Block, X)**. Prolog may answer like below:
    Block = c ;
    Block = k ;
    Block = i ;
    Block = e ;
    Block = j ;
    false.

2. (5%) What blocks with location y = 2?
    Using relation **y(Block, Y)**. Prolog may answer like below:
    Block = b ;
    Block = d ;
    Block = f ;
    Block = h ;
    Block = g ;
    Block = a ;
    false.

Note:
■   The programs must be runnable in SWI-Prolog.
■   You must package your programs in a single zip file named XXX_hw1.zip,
    where XXX is your student identity number.
    Submit the whole file to open cyber classroom. The first-time Login ID and
    password are student number.
■   A penalty will be applied if predicate name, program name or zip file name is not
    defined as above.