Workshop on World Modeling・Workshop on Methods of Human Security Studies
2005 Summer Semester

Presiding Professor: Susumu Yamakage
TA: Takuto Sakamoto,Kazutoshi Suzuki,Hiroyuki Hoshiro,Katsuma Mitsutsuji,
Kazuya Yamamoto

Lecture Eleven: Let Agents Have Conditions and Groups (July 5th)

Today's Target:
This time we will use a String (character variables) and learn how to give agents more detailed conditions and grouping such as culture, theology and genes. We will learn at the same time methods to operate a String and to write displays with Strings.

● How to Display Condition and Group using a String.

Whether it be a number, alphabet, kanji (Japanese character) or something else, a String is a variable that stores them as variables as they appear, i.e., as characters. This comes in handy in showing genes, culture and theology. (details will follow) In order to create the String in the tree, designate「String」in Properties. In case of temporary use of the rule, declare dim s as string. To store selected characters in a String, use quotation marks (“”).Let me show you an example:

s = “AGGCTGCTATCCTATCGAA”
s = “moji retu ha benri”
s = “0336042000”
s = “Hi, my name is Rika. Would you like to hear my story?”

Remember that these are「characters as they appear」, so even if they are numbers they have no meaning as numbers. For instance, an integer 0001 is the same as 1. But String 0001 is 0001and nothing else. Therefore, variables of a String can not be merged; can not be added. If you need to use String numbers to compute, you can use it as is or use cint(),cdbl() and such to convert them into an integer or a double. This will avoid confusion among variable types.

As integer	i = 0＋1＋2	i == 3
As string	s = “0” & “1” & “2”	s == “012”

cint(s) == 12　　cdbl(s) == 12.0

If you want to just use a section, use a function.

s = “0336042000”

sigai = left(s, 2)　← Pick out two characters from the left.

kyoku = mid(s, 3, 4)　← Pick out four characters from the third character.

matu = right(s, 4)　← Pick out four characters from the right.

In case of kanji and hiragana, one letter is counted as two. In case of “こんにちは” that would be ten letters. If you want to confirm if it is of the same string use StrComp().

if StrConp(s, t) == 0 then　← if s is the same as t･･･(value of equation is 0)

if StrConp(s, “あ”) <> 0 then　← if s is not「あ」･･･(value of equation is 1or -1)

Other than this, there is a function to change the length of the String or a function to locate a specific String. This is handy in models that need to change lengths of Strings and models that look for similar patterns. (A bit technical, so we’ll treat it as an assignment for the sophisticated. Look for the way to use it in that sample answer.)

Example:

We’ll make a Culture Propagation Model and study how to standardize the way culture propagates. This culture is displayed in a String of three lined numbers. Let’s say that each line represents a specific item. For example, in the case of an architectural design, each line will represent items such as: pillar shape, wall texture, ceiling formation etc. With every step, an agent will be influenced by one in the vicinity of 1(surrounding 8 cells),and mimic one of them. The color differs with different culture.

・ Please make a space of 10×10 that is looped with one hundred agents. Also create right under the agent, a String variable that indicates culture and an Integer variable for color.

・ Allocate the agents and give them initial state of culture.

Agt_Init{

my.X = my.id mod 10　← remainder of id÷10 (0～9).Space width of 10.

my.Y = my.id ＼ 10　← transaction of id÷10 (0～9).Space width of 10.

(In JAVA KK-MAS if toy hit「¥」it comes out as 「＼」)

my.cultura = cstr(cint(rnd()*10)) & cstr(cint(rnd()*10)) & cstr(cint(rnd()*10))

↑ Round off decimal points of digits that are more than 0 but less than 10 and make them into Double and convert them into a String. Do this three times and connect them with & .Then the numbers from 000 to 999 will become stored.

}

・For now let's do an output setting with a fixed color. Let's show culture with the Variable Information Chart. Coming this far, let's write a rule of movement for each step.

```
Agt_Step{
dim mawari as agtset
dim kazu as integer
dim aite as agt
dim r as double

makeallagtsetaroundown(mawari, 1, false) ← make set of vicinity 1 other than self
kazu = countagtset(mawari)                ← count the number of agents included in this
aite = getagt(mawari, cint(kazu*rnd()))   ← store in aite, a randomly selected one out of this

if StrComp(my.cultura, aite.cultura) <> 0 then    ← if  the culture of aite is different from self・・・
  r = rnd()*3                  ←make a random number more than 1 and less than 3
    if r <1 then               ← if it is less than 1,
      my.cultura = mid(aite.cultura, 1, 1) & mid(my.cultura, 2, 1) & mid(my.cultura, 3, 1)
          ↑ replace only the first line with, the first line of aite,keep the other as culture of self
    elseif r <2 then           ← if it is less than 2,
      my.cultura = mid(my.cultura, 1, 1) & mid(aite.cultura, 2, 1) & mid(my.cultura, 3, 1)
          ↑ replace only the second line
    else                       ← if it is other than this (more than 2 and less than 3)
      my.cultura = mid(my.cultura, 1, 1) & mid(my.cultura, 2, 1) & mid(aite.cultura, 3, 1)
          ↑ replace the third line
    end if
end if
```

With //RGB(),we will color; line 1×25,line 2×25 and such.

```
my.iro = RGB(cint(mid(my.cultura, 1, 1))*25, cint(mid(my.cultura, 2, 1))*25, cint(mid(my.cultura, 3, 1))*25)
```

}

Assignment:

① Let's rewrite the mid part of the above example with left() and right().

② In the Universe, we will make a variable that shows the total of changes that fit that step and if the changes stop, a message informing us of this will appear:「It has stopped;終了しました.」There are many ways to display a String. Go ahead and try them.

・ Don't forget to output console screen output message at the end of every step with print()

・ Designate message in argument of exitsimulationmsg() . (A display will appear to announce the end of the trial.)

・ Make a String variable. Output the numerical screen → and store the String in it's center

Somewhat sophisticated but…(I am sure you can do it!)

③ In the type of model we've learnt this time, we can let each line hold a meaning. For example, if we consider culture as a doctrine of faith, depending on the numbers on each line we can show the strength of a feature such as 「duty of spreading faith」 and「exclusiveness towards other religions; religious intolerance」We can use this to change the actions of the agents with respect to the doctrine it believes in. Try to make a model with line 1 as「exclusiveness towards other religions」Tolerance comes in the scale of 0 to 9. After coming into contact with a partner, if the agent is 9, he will accept any item of the doctrine of his partner with the probability of 100%. If it is 0, the probability is 10%.

Extremely difficult (Would be wonderful if you can do it without the hints given below.)

④ Using InStr() and Len() output time series graph of the number of cultures without duplication. On your own, look for arguments and such with the use of Help. (This will do you good.)

Hint for ④:

This is just one example but, it might be easier if you could add one letter of no significance in the line of culture. Make a String variable →Take in all agents → If the culture of that agent is not included in the variable, add the culture of that agent to the end of that variable →123_332_153_347_968_465_･･･ in this manner, a long list

without any duplication can be made → Count that in the long list and divide → And display the result. This is one way to do it. We'll approach it in a sample answer too, please refer to this too.