

Workshop on World Modeling • Workshop on Methods of Human Security Studies
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Lecture Nine: Establishing Conditions and Groups; Select and Handle Agents
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Today's Target:

This time, we will discuss how to dynamically change the color of an agent in accordance with its nature and condition. We will also learn the method to select individuals by their nature and condition and how to operate them. (In my former lecture we have learnt the method of selection, but with distance and types alone. This time we will select individuals by more detailed elements such as speed and condition.)

● How To Change The Color With Variables.

Variables are able to express various things; speed, pocket money, dead or alive, sex (male or female agent). Is the packman in an unbeatable mode? etc... If so, you may wish to:

- darken color with higher value
- change color with different type

In such cases, you need to create an integer variable right under the agent. You will include in that variable, a value to designate a color. For example make a variable `iro` and establish such; `my.iro = Color_Black`. On its own, a numerical value to make it black will be input. After this, select 「Variable Designation」 from 「Agent Color」 out of Map Element Setting in the Output Setting. If `my.iro` is designated, the color based on the numerical value in this variable will be displayed. The colors that can be designated are as follows:

```
Color_Red    red
Color_Green  green
Color_Blue   blue
Color_Yellow yellow
Color_Cyan   sky blue
Color_Magenta purple
```

```
Color_Black  black
```

```
Color_White  white
```

If you need to designate more detailed colors, use the function `RGB()`. The argument shows composition of second as red, second as green and third as blue. They will be designated by integer 0 to 255. For example, if it is designated as

```
my.iro = RGB(0, 0, 255)
```

This is blue.

`RGB (255, 255, 255)` would be white and `RGB (0, 0, 0)` would be black.

Example ①:

Let's place 1000 agents in the center of a space with a loop and proceed one at a time toward a random direction. Coloring is such that those in the right half of the space are blue, and those in the left half are black.

- First of all set Garbage Collection at 1 in the GC interval Run preferences.
- Now create space and agents. Having come this far, you'll be able to do it without my help.
- Also create integer type variable, `iro` right under the agent.
- Agent rules are written as below. Quite naturally, other ways are OK.

```
Agt_Init{
movetocenter()           ← Move to center of space.
my.Direction = 360*rnd() ← Face the random direction.
}
Agt_Step{
forward(1)               ← Move forward just 1.
if my.X < 25 then
    my.iro = color_black
else
    my.iro = color_blue
end if
}
```

If nothing moves, check to see if the output setting is properly done. Also if you want to color the right edge of the screen a bit blue and the left edges a bit black, instead of the former five lines, substitute the following;

my.iro = RGB(0,0,cint(my.X*5)) ← 0,0,0 is black,0,0,255 is blue. Space is 50×50 so the value of X is greater than 0 and less than 49. Therefore, my.X*5 is a real number, greater than 0 and less than 245. cint() is a function that changes a variable to a integer type. 5.5 would be rounded off as 5. In this case it will move without it but it would be thorough if you did.

● Works On Each And Every Subject

Last time, we worked by adding and subtracting from sets. This time, we will scrutinize and operate each agent. In order to do this, we will give each agent a variable type named 「Agt type」 In making it in the tree, we will select 「Agt type」 in the property. For a temporary declaration as a variable, we will write dim aite as agt at the front of the rule. Then by writing 「aite.x」 we can show the x value of the agent that entered the variable. Let's take a look at an example.

Example ②

Randomly place one hundred human agents (red) in a space with a loop and make them proceed one by one in a random direction. We will make one a vampire (black) The vampire takes two strides at a time and bites, when it comes in contact with a human. When bit, the human turns into a vampire himself.

·Now make a human agent and space. We will write the following in the rule of the human agent. (This is only an example)

```
Agt_Init{
my.X = rnd()*50 ← Designate X value to be a real number more than 0 and less
                than50.
my.Y = rnd()*50 ← Do the same with Y value.
my.Direction = 360*rnd() ← Designate direction.

if my.id == 0 then ← id begins from 0,so only one is vampire.
    my.iro = color_black ←Vampire is black.
else
    my.iro = color_red ← The rest are human.
```

```

end if
}
Agt_Step{
dim aite as agt          ← This is Agt type variable.
dim mawari as agtset    ← You'll observe the surrounding, so you'll need one AgtSet.

if my.iro == color_black then    ← What if you are a vampire?
    forward(2)                   ← You'll proceed two steps.
    makeallagtsetaround(mawari, 1, false) ←you'll look around.
    for each aite in mawari      ← At each aite inside mawari.
        if aite.iro == color_red then    ←And if aite is normal...
            aite.iro = color_black ← You'll bite him and turn him into a vampire.
        end if
    next aite                    ←You'll repeat the above rule to the next aite.
else                             ← If you're not a vampire...
    forward(1)                   ←You'll proceed only one step.
end if
}

```

* **for each** sentence

When you want to select and operate each agent separately, in the AgtSet, it is convenient to use the **for each** sentence.

```

for each 「Agt type variable」 in 「AgtSet variable」
    - content of command-
next 「Agt type variable」

```

With this you can execute rules per each agent.

* There are several ways to order the above 「content of command」 For example;

- Play with variable of the agent, 「aite.x = 10」 which is inside Agt type variable.
- Eliminate him as **killagt(aite)**.
- Add him to a different AgtSet variable as **addagt(nakama, aite)**.

With the last one, by using **if** sentence, you can create an AgtSet based on a much more detailed conditions than just distance and speed. You can even go and differentiate to select only the vampire, only the rich and only the fast drivers.

* (Advanced Level)(Bonus)If you want to select agents randomly...Try this.

```
dim hito as agtset
dim ninzuu as integer
dim aite as agt

makeagtset(hito, universe.syakai.ningen)
ninzuu = countagtset(hito)
if ninzuu >= 1 then
    aite = getagt(hito, cint(ninzuu*rnd()))
end if
```

In this case, `ningen` agent will be in the list for set of `hito`, and with `getagt()`, `ningen` of the order `cint(ninzuu*rnd())` will be stored inside `aite`. This comes in handy in dealing with just one agent of the subjects. But if you try to take out an agent from an empty `AgtSet`, that will lead to error. Make sure to check whether it is empty or not with the `if` sentence before you take it out. Furthermore, if you designate a number larger than the list in the second argument of `getagt()`, error will occur. For example, if there are only three, the list ends with 0, 1, 2. Make sure that 3 or 4 do not get in.

Assignment:

- ① Cover the space with agents. Designate the color of agents with `RGB0`. Make it possible to operate each composition of `RGB` through the control panel. It is quite difficult to create a color of your choice. Save the created file with a name.
- ② Let's add three gurus to the vampire model. A guru moves like a human. He holds a holy slip of paper which he attaches to every vampire he meets. Then the vampire turns yellow and becomes immobile.

—————Advance Level Assignment—————

- ③ Let's make it so that the vampire can bite only one agent at a time. The subjects are chosen at random.
- ④ Based on the specifications of your choice, I want you to create a model where people catch cold. When an infected agent comes into contact with another person, the person is infected with the cold and with time it naturally heals. It would be nice if there could be a setting for the time required to heal and the probability of being infected when coming into contact with someone.