

## 付録

以下に研究で使用した artisoc academic のプログラムの中で代表的なものを記す。  
変数の値だけが異なるモデルや大きく構造が変わらないモデルは省略する。

### パターン 1

```
Univ_Init{
//各変数の初期化、書き出しファイルの準備
Universe.field.waitingtime = 0
Universe.field.sales = 0
Universe.field.numperson = 0
Universe.field.servicetime = 0
Universe.field.time = 0
Universe.field.numkinyu = 0
OpenFileCSV("machi1p1.txt", 5, 3)
OpenFileCSV("ninzu1p1.txt", 8, 3)
OpenFileCSV("ninzuserver1p1.txt", 9, 3)
OpenFileCSV("ninzu2p1.txt", 10, 3)
OpenFileCSV("ninzuserver2p1.txt", 11, 3)
OpenFileCSV("machi2p1.txt", 12, 3)
Universe.field.numperson2 = 0
Universe.field.numkinyu2 = 0
}
```

```
Univ_Step_Begin{
Dim i As Integer
Dim one As Agt
Dim ii As Integer
Dim oneone As Agt
```

```
//客の到着（郵便のみ）
```

```
For i=0 to PoissonRnd(0.00694) -1
  one = CreateAgt(Universe.field.person)
  one.life = -118*Log(1-rnd())
  If one.life == 0 Then
    one.life = one.life +1
```

```

End if
one.wt = 0
one.kinyu = 0
one.kinyukeika = Int(319*2*rnd())
If Rnd() <= 0.305 Then
    AddAgt(Universe.field.kaiteru, one)
Else
    If CountAgtset(Universe.field.dservice) == 0 Then
        AddAgt(Universe.field.dservice, one)
        Universe.field.time = one.life
    ElseIf CountAgtSet(Universe.field.d2service) == 0 Then
        AddAgt(Universe.field.d2service, one)
        Universe.field.time2 = one.life
    Else
        AddAgt(Universe.field.gyoretsu, one)
    End if
End if
Next i

```

//客の到着（郵便以外）

```

If GetCountStep() <= 25200 Then
For ii=0 to PoissonRnd(0.00452) -1
    oneone = CreateAgt(Universe.field.person)
    oneone.life = -245*Log(1-rnd())
    If oneone.life == 0 Then
        oneone.life = oneone.life +1
    End if
    oneone.wt = 0
    oneone.kinyu = 0
    oneone.kinyukeika = Int(382*2*rnd())
    If Rnd() <= 0.266 Then
        AddAgt(Universe.field.kaiteru2, oneone)
    Else
        If CountAgtset(Universe.field.d3service) == 0 Then
            AddAgt(Universe.field.d3service, oneone)
            Universe.field.time3 = oneone.life
        ElseIf CountAgtSet(Universe.field.d4service) == 0 Then

```

```

        AddAgt(Universe.field.d4service, oneone)
        Universe.field.time4 = oneone.life
    ElseIf CountAgtSet(Universe.field.d5service) == 0 Then
        AddAgt(Universe.field.d5service, oneone)
        Universe.field.time5 = oneone.life
    Else
        AddAgt(Universe.field.gyoretsu2, oneone)
    End if
End if
Next ii
End if
}

```

```

Univ_Step_End{
Dim two As Agt
Dim three As Agt
Dim four As Agt
Dim templife As Integer
Dim two2 As Agt
Dim templife2 As Integer
Dim three2 As Agt
Dim five As Agt
Dim six As Agt
Dim tempkinyu As Integer
Dim five2 As Agt
Dim tempkinyu2 As Integer
Dim two3 As Agt
Dim templife3 As Integer
Dim two4 As Agt
Dim templife4 As Integer
Dim two5 As Agt
Dim templife5 As Integer
Dim three3 As Agt
Dim three4 As Agt
Dim three5 As Agt
Dim four2 As Agt
Dim tempnum As Double
Dim tempkinyukeika As Integer

```

Dim tempkinyukeika2 As Integer

//記入の再現

```
If CountAgtset(Universe.field.kaiteru) >= 1 Then
  For each five in Universe.field.kaiteru
    five.kinyu = five.kinyu + 1
    tempkinyu = five.kinyu
    tempkinyukeika = five.kinyukeika
    If tempkinyu >= tempkinyukeika Then
      AddAgt(Universe.field.gyoretsu, five)
    End if
  Next five
  DelAgtset(Universe.field.kaiteru, Universe.field.gyoretsu)
End if
```

```
If CountAgtset(Universe.field.kaiteru2) >= 1 Then
  For each five2 in Universe.field.kaiteru2
    five2.kinyu = five2.kinyu + 1
    tempkinyu2 = five2.kinyu
    tempkinyukeika2 = five2.kinyukeika
    If tempkinyu2 >= tempkinyukeika2 Then
      AddAgt(Universe.field.gyoretsu2, five2)
    End if
  Next five2
  DelAgtset(Universe.field.kaiteru2, Universe.field.gyoretsu2)
End if
```

//窓口でサービスを受ける

```
If CountAgtset(Universe.field.dservice) >= 1 Then
  Universe.field.servicetime = Universe.field.servicetime + 1
  two = GetAgt(Universe.field.dservice, 0)
  templife = two.life
  Universe.field.waitingtime = two.wt
  If Universe.field.servicetime == templife Then
    Universe.field.sales = Universe.field.sales + 1
    Universe.field.servicetime = 0
  End if
End if
```

```

tempnum = Rnd()
If tempnum <= 0.14 Then
    six = CreateAgt(Universe.field.person)
    six.life = -118*Log(1-rnd())
    If six.life == 0 Then
        six.life = six.life +1
    End if
    six.wt = two.wt
    six.kinyu = 0
    six.kinyukeika = Int(319*2*rnd())
    AddAgt(Universe.field.kaiteru, six)
Elseif tempnum > 0.14 and tempnum <= 0.15 Then
    six = CreateAgt(Universe.field.person)
    six.life = -118*Log(1-rnd())
    If six.life == 0 Then
        six.life = six.life +1
    End if
    six.wt = two.wt
    six.kinyu = 0
    AddAgt(Universe.field.gyoretsu, six)
Else
    WriteFileCSV(5, two.wt, False)
End if
DelAgt(two)
ClearAgtset(Universe.field.dservice)
End if
End if

If CountAgtset(Universe.field.d2service) >= 1 Then
    Universe.field.servicetime2 = Universe.field.servicetime2 +1
    two2 = GetAgt(Universe.field.d2service, 0)
    templife2 = two2.life
    Universe.field.waitingtime2 = two2.wt
    If Universe.field.servicetime2 == templife2 Then
        Universe.field.sales = Universe.field.sales +1
        Universe.field.servicetime2 = 0
        tempnum = Rnd()
        If tempnum <= 0.14 Then

```

```

    six = CreateAgt(Universe.field.person)
    six.life = -118*Log(1-rnd0)
    If six.life == 0 Then
        six.life = six.life +1
    End if
    six.wt = two2.wt
    six.kinyu = 0
    six.kinyukeika = Int(319*2*rnd0)
    AddAgt(Universe.field.kaiteru, six)
Elseif tempnum > 0.14 and tempnum <= 0.15 Then
    six = CreateAgt(Universe.field.person)
    six.life = -118*Log(1-rnd0)
    If six.life == 0 Then
        six.life = six.life +1
    End if
    six.wt = two2.wt
    six.kinyu = 0
    AddAgt(Universe.field.gyoretsu, six)
Else
    WriteFileCSV(5, two2.wt, False)
End if
DelAgt(two2)
ClearAgtset(Universe.field.d2service)
End if
End if

If CountAgtset(Universe.field.d3service) >= 1 Then
    Universe.field.servicetime3 = Universe.field.servicetime3 +1
    two3 = GetAgt(Universe.field.d3service, 0)
    templife3 = two3.life
    Universe.field.waitingtime3 = two3.wt
    If Universe.field.servicetime3 == templife3 Then
        Universe.field.sales = Universe.field.sales +1
        Universe.field.servicetime3 = 0
        tempnum = Rnd()
        If tempnum <= 0.107 Then
            six = CreateAgt(Universe.field.person)
            six.life = -245*Log(1-rnd0)

```

```

    If six.life == 0 Then
        six.life = six.life +1
    End if
    six.wt = two3.wt
    six.kinyu = 0
    six.kinyukeika = Int(382*2*rnd())
    AddAgt(Universe.field.kaiteru2, six)
Elseif tempnum > 0.107 and tempnum <= 0.128 Then
    six = CreateAgt(Universe.field.person)
    six.life = -245*Log(1-rnd())
    If six.life == 0 Then
        six.life = six.life +1
    End if
    six.wt = two3.wt
    six.kinyu = 0
    AddAgt(Universe.field.gyoretsu2, six)
Else
    WriteFileCSV(12, two3.wt, False)
End if
DelAgt(two3)
ClearAgtset(Universe.field.d3service)
End if
End if

If CountAgtset(Universe.field.d4service) >= 1 Then
    Universe.field.servicetime4 = Universe.field.servicetime4 +1
    two4 = GetAgt(Universe.field.d4service, 0)
    templife4 = two4.life
    Universe.field.waitingtime4 = two4.wt
    If Universe.field.servicetime4 == templife4 Then
        Universe.field.sales = Universe.field.sales +1
        Universe.field.servicetime4 = 0
        tempnum = Rnd()
        If tempnum <= 0.107 Then
            six = CreateAgt(Universe.field.person)
            six.life = -245*Log(1-rnd())
            If six.life == 0 Then
                six.life = six.life +1
            End if
        End if
    End if
End if

```

```

End if
six.wt = two4.wt
six.kinyu = 0
six.kinyukeika = Int(382*2*rnd())
AddAgt(Universe.field.kaiteru2, six)
Elseif tempnum > 0.107 and tempnum <= 0.128 Then
    six = CreateAgt(Universe.field.person)
    six.life = -245*Log(1-rnd())
    If six.life == 0 Then
        six.life = six.life +1
    End if
    six.wt = two4.wt
    six.kinyu = 0
    AddAgt(Universe.field.gyoretsu2, six)
Else
    WriteFileCSV(12, two4.wt, False)
End if
DelAgt(two4)
ClearAgtset(Universe.field.d4service)
End if
End if

If CountAgtset(Universe.field.d5service) >= 1 Then
    Universe.field.servicetime5 = Universe.field.servicetime5 +1
    two5 = GetAgt(Universe.field.d5service, 0)
    templife5 = two5.life
    Universe.field.waitingtime5 = two5.wt
    If Universe.field.servicetime5 == templife5 Then
        Universe.field.sales = Universe.field.sales +1
        Universe.field.servicetime5 = 0
        tempnum = Rnd()
        If tempnum <= 0.107 Then
            six = CreateAgt(Universe.field.person)
            six.life = -245*Log(1-rnd())
            If six.life == 0 Then
                six.life = six.life +1
            End if
            six.wt = two5.wt

```



```

    six.kinyu = 0
    six.kinyukeika = Int(382*2*rnd())
    AddAgt(Universe.field.kaiteru2, six)
Elseif tempnum > 0.107 and tempnum <= 0.128 Then
    six = CreateAgt(Universe.field.person)
    six.life = -245*Log(1-rnd())
    If six.life == 0 Then
        six.life = six.life +1
    End if
    six.wt = two5.wt
    six.kinyu = 0
    AddAgt(Universe.field.gyoretsu2, six)
Else
    WriteFileCSV(12, two5.wt, False)
End if
DelAgt(two5)
ClearAgtset(Universe.field.d5service)
End if
End if

```

//窓口が空いて行列ができていたら客は窓口へ移動する

```

If CountAgtset(Universe.field.dservice) == 0 and CountAgtset(Universe.field.gyoretsu) >= 1 Then
    three = GetAgt(Universe.field.gyoretsu,0)
    Universe.field.time = three.life
    AddAgt(Universe.field.dservice, three)
    DelAgtset(Universe.field.gyoretsu, Universe.field.dservice)
End if

```

```

If CountAgtset(Universe.field.d2service) == 0 and CountAgtset(Universe.field.gyoretsu) >= 1 Then
    three2 = GetAgt(Universe.field.gyoretsu,0)
    Universe.field.time2 = three2.life
    AddAgt(Universe.field.d2service, three2)
    DelAgtset(Universe.field.gyoretsu, Universe.field.d2service)
End if

```

```

If CountAgtset(Universe.field.d3service) == 0 and CountAgtset(Universe.field.gyoretsu2) >= 1 Then
    three3 = GetAgt(Universe.field.gyoretsu2,0)

```

```

Universe.field.time3 = three3.life
AddAgt(Universe.field.d3service, three3)
DelAgtset(Universe.field.gyoretsu2, Universe.field.d3service)
End if

If CountAgtset(Universe.field.d4service) == 0 and CountAgtset(Universe.field.gyoretsu2) >= 1 Then
    three4 = GetAgt(Universe.field.gyoretsu2,0)
    Universe.field.time4 = three4.life
    AddAgt(Universe.field.d4service, three4)
    DelAgtset(Universe.field.gyoretsu2, Universe.field.d4service)
End if

If CountAgtset(Universe.field.d5service) == 0 and CountAgtset(Universe.field.gyoretsu2) >= 1 Then
    three5 = GetAgt(Universe.field.gyoretsu2,0)
    Universe.field.time5 = three5.life
    AddAgt(Universe.field.d5service, three5)
    DelAgtset(Universe.field.gyoretsu2, Universe.field.d5service)
End if

//人数計算

Universe.field.numperson = CountAgtset(Universe.field.gyoretsu) + CountAgtset(Universe.field.dservice)
+ CountAgtset(Universe.field.d2service)
Universe.field.numperson2 = CountAgtset(Universe.field.gyoretsu2) +
CountAgtset(Universe.field.d3service) + CountAgtset(Universe.field.d4service) +
CountAgtset(Universe.field.d5service)
Universe.field.numkinyu = CountAgtset(Universe.field.kaiteru) + CountAgtset(Universe.field.gyoretsu) +
CountAgtset(Universe.field.dservice) + CountAgtset(Universe.field.d2service)
Universe.field.numkinyu2 = CountAgtset(Universe.field.kaiteru2) +
CountAgtset(Universe.field.gyoretsu2) + CountAgtset(Universe.field.d3service) +
CountAgtset(Universe.field.d4service) + CountAgtset(Universe.field.d5service)

//ファイル書き出し

WriteFileCSV(8, Universe.field.numkinyu, False)
WriteFileCSV(9, Universe.field.numperson, False)
WriteFileCSV(10, Universe.field.numkinyu2, False)
WriteFileCSV(11, Universe.field.numperson2, False)

```

```
//待ち時間の経過
```

```
For each four in Universe.field.gyoretsu
```

```
    four.wt = four.wt +1
```

```
Next four
```

```
For each four2 in Universe.field.gyoretsu2
```

```
    four2.wt = four2.wt +1
```

```
Next four2
```

```
//ファイル書き出しの調整
```

```
If GetCountStep() Mod 500 == 0 Then
```

```
WriteFileCSV(8, "", True)
```

```
WriteFileCSV(9, "", True)
```

```
WriteFileCSV(10, "", True)
```

```
WriteFileCSV(11, "", True)
```

```
End if
```

```
}
```

```
Univ_Finish{
```

```
WriteFileCSV(5, "", True)
```

```
WriteFileCSV(8, "", True)
```

```
WriteFileCSV(9, "", True)
```

```
WriteFileCSV(10, "", True)
```

```
WriteFileCSV(11, "", True)
```

```
WriteFileCSV(12, "", True)
```

```
CloseFileCSV(5)
```

```
CloseFileCSV(8)
```

```
CloseFileCSV(9)
```

```
CloseFileCSV(10)
```

```
CloseFileCSV(11)
```

```
CloseFileCSV(12)
```

```
}
```

パターン 1 6

パターン 1 の到着時間とサービス時間を外部ファイルから読み込んだモデル  
客の到着以降はパターン 1 と変わらないため省略

```
Univ_Init{
//各変数の初期化、書き出しファイルの準備
Universe.field.waitingtime = 0
Universe.field.sales = 0
Universe.field.numperson = 0
Universe.field.servicetime = 0
Universe.field.time = 0
Universe.field.numkinyu = 0
OpenFileCSV("machi1p16.txt", 5, 3)
OpenFileCSV("ninzu1p16.txt", 8, 3)
OpenFileCSV("ninzuserver1p16.txt", 9, 3)
OpenFileCSV("ninzu2p16.txt", 10, 3)
OpenFileCSV("ninzuserver2p16.txt", 11, 3)
OpenFileCSV("machi2p16.txt", 12, 3)
Universe.field.numperson2 = 0
Universe.field.numkinyu2 = 0
OpenFile("nomitotyaku0604.txt", 14, 1)
Universe.num = CInt(ReadFile(14))
OpenFile("igaitotyaku0604.txt", 15, 1)
Universe.num2 = CInt(ReadFile(15))
OpenFile("nomiservicetime0604.txt", 16, 1)
Universe.num3 = CInt(ReadFile(16))
OpenFile("igaiservicetime0604.txt", 17, 1)
Universe.num4 = CInt(ReadFile(17))
}
```

```
Univ_Step_Begin{
Dim i As Integer
Dim one As Agt
Dim ii As Integer
Dim oneone As Agt
```

```
//客の到着（郵便のみ）
```

```
If GetCountStep() == Universe.num Then
```

```

Universe.num = CInt(ReadFile(14))
one = CreateAgt(Universe.field.person)
one.life = Universe.num3
Universe.num3 = CInt(ReadFile(16))
one.wt = 0
one.kinyu = 0
one.kinyukeika = Int(319*2*rnd())
If Rnd() <= 0.305 Then
    AddAgt(Universe.field.kaiteru, one)
Else
    If CountAgtset(Universe.field.dservice) == 0 Then
        AddAgt(Universe.field.dservice, one)
        Universe.field.time = one.life
    ElseIf CountAgtSet(Universe.field.d2service) == 0 Then
        AddAgt(Universe.field.d2service, one)
        Universe.field.time2 = one.life
    Else
        AddAgt(Universe.field.gyoretsu, one)
    End if
End if
End if

```

//客の到着（郵便以外）

```

If GetCountStep() == Universe.num2 Then
    Universe.num2 = CInt(ReadFile(15))
    oneone = CreateAgt(Universe.field.person)
    oneone.life = Universe.num4
    Universe.num4 = CInt(ReadFile(17))
    oneone.wt = 0
    oneone.kinyu = 0
    oneone.kinyukeika = Int(382*2*rnd())
    If Rnd() <= 0.266 Then
        AddAgt(Universe.field.kaiteru2, oneone)
    Else
        If CountAgtset(Universe.field.d3service) == 0 Then
            AddAgt(Universe.field.d3service, oneone)
            Universe.field.time3 = oneone.life
        End if
    End if
End if

```

```
Elseif CountAgtSet(Universe.field.d4service) == 0 Then
    AddAgt(Universe.field.d4service, oneone)
    Universe.field.time4 = oneone.life
Elseif CountAgtSet(Universe.field.d5service) == 0 Then
    AddAgt(Universe.field.d5service, oneone)
    Universe.field.time5 = oneone.life
Else
    AddAgt(Universe.field.gyoretsu2, oneone)
End if
End if
End if
}
```