GAME OF FIRMS

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Abstract

The simulation of competitive environment of firms was based on theory of Game of life. The theory was modified on the business environment and rules of Game of firms were set up.

1   Introduction

The simulation of competitive environment of firms was based on theory of Game of life. The theory was modified on the business environment and rules of Game of firms were set up.

2   Used Methods

The Game of firms rules were modified by following ones:

- each firm become extinct, if it is adjacent with 1 or any firms because of the inability to cooperate
- each firm continues into next step, if they are 2 or 3 firms in the neighbourhood, because of cooperation
- each firm become extinct, if they are in the neighbourhood more than 3 firms, because of competition fight
- new firm is created randomly, when the value generated by a random process with a normal distribution set up in the range of 0 - 1.

The program Game of firms was created for the simulation of competitive environment in MATLAB program. See Program 1.

```
% Game of firms by Dostal
n=25;
t=50;
U=rand(n);
p=0.25;
A=(U<p);
B=zeros(n);
for i=1:t
 for x=2:n-1
  for y=2:n-1
   sur=A(x-1,y-1)+A(x-1,y)+A(x-1,y+1)+A(x,y-1)+A(x,y+1)+A(x+1,y-1)+A(x+1,y)+A(x+1,y+1);
   if A(x,y)==1
    if sur==2 | sur==3
     B(x,y)=1;
    else
     B(x,y)=0;
    end
   else
     r=random('Uniform',0,1);
    if r>0.98
     B(x,y)=1;
    else
     B(x,y)=0;
```

```
     end
    end
   end
 end
 imshow (B)
pause(.01)
 A=B;
end
```

Program 1. Game of firms

3   Case studies

The program was used for simulation of firm's competitive environment, where constant n (size of grid) was set up to be 25, t (time of simulation) was set up to be 50 and p (density of spread of firms) was set up to be 0.75 and 0.25. Figure 1a presents a situation; where an initial condition was generated by high number of firms. During the process of simulation many firms become extinct, because of competitive fight. See Figure 1b.
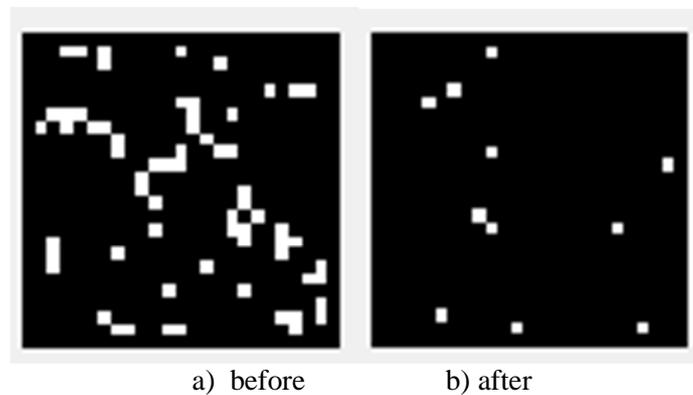

a) before   b) after

Figure 1: Placement of firms – extinction

Figure 2a presents a situation; where as an initial condition was generated small number of firms. During the process of simulation many firms was created because of lack of ones. See Figure 2b.
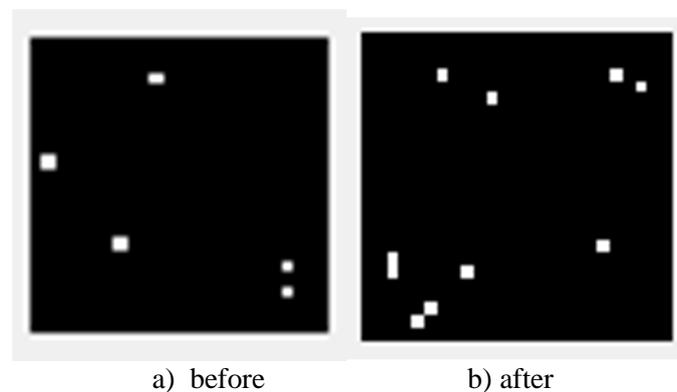

a) before   b) after

Figure 2: Placement of firms – creation

The dynamic equilibrium is generally represented by natural extinction, retention and creation of firms.

4   Conclusion

The presented simulation of firms could be used for simulation of firm's competitive environment. Some firms become extinct some remain in business and some are newly created. The presented article provides idea of possible simulation of existence of firms in business area. The work will be developed by search of practical application of simulation of competitive environment.

References

[1]   DOSTÁL, P. *Advanced Decision Making in Business and Public Services*. Brno: CERM Academic Publishing House, 2011. 168 p. ISBN: 978-80-7204-747-5.

[2]   DOSTÁL, P. *Pokročilé metody rozhodování v podnikatelství a veřejné správě*. CERM, Brno, 2012, ISBN 978-80-7204-799-4.

[3]   THE MATHWORKS. *MATLAB - User's Guide*. The MathWorks, Inc., 2010.

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