Report on **Bachelor Thesis**

Institute of Economic Studies, Faculty of Social Sciences, Charles University in Prague

Student:	**Dominik Vach**
Advisor:	**RNDr. Martin Gregor, Ph.D.**
Title of the thesis:	**Spatial agent-based models of common pool resources**

OVERALL ASSESSMENT *(provided in English, Czech, or Slovak):*

The thesis focuses on spatial approach to game-theoretical model of agents competing for a common natural resource. The thesis considers spatial problems in 1D and also in 2D and the author takes into consideration several special cases. Throughout the thesis, the analysis is viewed from the static point of view and the major focus is payed to establishing, where possible, explicit analytical solutions in the closed form.

In my opinion, the significant portion of the text goes too deep into detail and focuses on non-essential derivation of various solutions. Quite early in the text, one can lose a global perspective and motivation behind the analysis. Speaking of motivation, I find the introductory part a bit too short with respect to the analytical parts of the thesis (chapters 3 and 4). Also, there are little to no links to the source problems in this lengthy part of the thesis. These links would very much help the reader to understand why the author spends so much effort on establishing certain results. Also, when the results are established, I would welcome some sort of basic comparison with both the common sense of whether it is an expected result or something completely surprising and new; and with previously established results in the literature. Beyond chapter 2, the author does no use a single reference to books or papers. Due to this fact, it is quite difficult to tell apart the authors original results to those already established by previous authors. Moreover, I did not quite get what purpose the derived formulas of explicit solution would serve to someone trying to solve a particular problem with real life data. That is, I would welcome some sort of discussion about the posed assumptions, how close the model is to a real application, which restrictive assumptions could be eliminated by generalizing the model and in which kind of practical situations one would be interested in applying certain particular considered cases of spatial distribution.

In the context of the language used, the author commands very good English, although tends to long sentences and repeated arguments which become quite early in the text tiresome and instead of illuminating the discussed matter serve rather the opposite purpose. Also, I would rather see some easy-to-understand parts significantly shortened and left for the reader to think of. On occasions, the author uses rather cloddish inovative formulations instead of using already established terminology. E.g., page 17, instead of „in the interior which is circumscribed by points of zero density“, one would simply say „in the interior of the support (of the distribution)“. Similarly, in mathematics we refer to „single-peaked“ distributions as to „unimodal“. Also, when f is a real-valued function then $f(x)$ is an image of x, that is a real number, not a function itself.

I got puzzled on page 34 by counting of tiles. There is a possibility that I do not understand the term „tile“. However, if you „discretize“ interval [0,1] using a steplength of 0.01, you shall obtain 100 equally long pieces, characterized by 99 nodes, 101 if counting end points of [0,1] as well. This means, that doing the same in two dimesions, you shall stratify the square [0,1] x [0,1] to 10000 smaller squares of with side length of 0.01. How did you arrive at number 101*101?

In various parts of mathematics, whenever one intends to solve a (continuous) problem via certain type of discretization, one also accompanies the analysis by stating assumptions for establishing convergence of solutions to the discretized problems to that of the original one, along with conditions guaranteeing certain basic properties of the limiting solution. What kind of conditions would guarantee convergence of the solutions of the discretized problems (that you consider in chapter 4) to the original (non-discretized) problem?

I will finish my report with another question which could be discussed during the defense. In the framework of the 2D model that is considered in the thesis, would it be possible to go beyond the few

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considered topological objects (triangle, square, hexagon, circle)? Can one consider an abritrary 2D object for which one can provide formula of its boundary? One, that could be, in the case of the fishing application, e.g. the topological map of an island, a continent, or sea borders between countries?

SUMMARY OF POINTS AWARDED *(for details, see below):*

CATEGORY		**POINTS**
Literature	*(max. 20 points)*	17
Methods	*(max. 30 points)*	20
Contribution	*(max. 30 points)*	20
Manuscript Form	*(max. 20 points)*	15
TOTAL POINTS	*(max. 100 points)*	**72**
GRADE	**(1 – 2 – 3 – 4)**	**2**

NAME OF THE REFEREE: Michal Červinka

DATE OF EVALUATION: June 7, 2016

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Referee Signature

EXPLANATION OF CATEGORIES AND SCALE:

LITERATURE REVIEW: *The thesis demonstrates author's full understanding and command of recent literature. The author quotes relevant literature in a proper way.*

Strong	*Average*	*Weak*
20	*10*	*0*

METHODS: *The tools used are relevant to the research question being investigated, and adequate to the author's level of studies. The thesis topic is comprehensively analyzed.*

Strong	*Average*	*Weak*
30	*15*	*0*

CONTRIBUTION: *The author presents original ideas on the topic demonstrating critical thinking and ability to draw conclusions based on the knowledge of relevant theory and empirics. There is a distinct value added of the thesis.*

Strong	*Average*	*Weak*
30	*15*	*0*

MANUSCRIPT FORM: *The thesis is well structured. The student uses appropriate language and style, including academic format for graphs and tables. The text effectively refers to graphs and tables and disposes with a complete bibliography.*

Strong	*Average*	*Weak*
20	*10*	*0*

Overall grading:

TOTAL POINTS	**GRADE**		
81 – 100	**1**	= excellent	= výborně
61 – 80	**2**	= good	= velmi dobře
41 – 60	**3**	= satisfactory	= dobře
0 – 40	**4**	= fail	= nedoporučuji k obhajobě