

VIENNA UNIVERSITY OF TECHNOLOGY

105.625 PR ADVANCED ECONOMICS PROJECT

Double Sided Matching

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Contents

1	Introduction	2
1.1	The problem	2
1.2	The aim	2
1.3	Structure	2
2	Theory	4
2.1	The Double Sided Matching Problem	4
2.2	Gale and Shapley Algorithm	4
2.3	Relevance to Game Theory	4
3	Prototype	5
3.1	Subsection	5
4	Prototype Evaluation: College Applications in Austria	6
4.1	Subsection	6
5	Prototype Evaluation: Labor Market in the European Union	7
5.1	Subsection	7
6	Summary	8
6.1	Subsection	8
7	Example	9
7.1	Heading on level 2 (subsection)	10
7.1.1	Heading on level 3 (subsubsection)	10
7.2	Example for list (3*itemize)	10
7.3	Example for list (enumerate)	11
	List of Figures	12
	List of Tables	13
	References	14

Introduction

This paper deals with the investigation of the double sided matching along with its application in economics.

Add more
introduc-
tion text

The problem

In many daily live expierences there is an hidden double sided matching. For example But we don't have the time or energy to find the perfect or optimal solution. Whereas in some field this could be done more easily or because this is mandatory, like in the universities in germany. They have an admission restriction for the students. Only the students with the best grandes in high school can go on the best universities in germany. But these universitites can only take a limited amount of students.

Find a
good ex-
ample

Is this
true?

Define the
problem a
bit better

The aim

The aim of the paper is to develop a prototype, which could solve the previous discussed problem and similar ones. With this software we could solve questions like: What would be an optimal solution for the german students and universities?

Add more
questions

Structure

The seconds chapter deals with the theory overview and background of the double sided matching problem. We will take a closer look at the Gale and Shapley Algorithm and what this has to do with game theory.

The third chapter describes our prototype, which implements the previous discussed theory into practice.

In the fourth chapter we use data from Austria with our prototype to make an statment over the college applications.

rework
shortly
before
we are
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because
structure
changes
most time

add dy-
namic
linking to
chapters

Chaper five deals deals with the labor market in the european union. Our prototype will get this data and we will discuss the results of it.

In the summary we will sum up the important findings and compare the outputs of our prototype.

Theory

The Double Sided Matching Problem

Clemens & Flo will be here!

The double sided matching problem...

The stable matching problem refers to the problem of finding a matching between two sets of elements which may be equally sized. In [1, p. 9] this problem is firstly described based on an example of college admission: a college is considering a set of n applicants of which it can admit only a quota of q .

The assignment of students and colleges is not allowed to be unstable, i.e. there are two applicants α and β who are assigned to colleges A and B although β prefers A to B and A prefers α to β . If this does not occur, the assignment is called *stable*. In case there is more than one stable solution the *optimal* one is of particular interest. In the previously mentioned college example a stable assignment is called *optimal* if every applicant is at least well off as it would be under any other stable assignment [1, p. 10]. In Economics this is also known as pareto efficiency [2, p. 46].

Gale and Shapley Algorithm

Clemens & Flo will be here!

Relevance to Game Theory

"Game theory is about what happens when people - or genes, or nations - interact". An important aspect for participating parties is to anticipate how the opposite party will react on certain actions. Mathematics shall help to analyze, understand and estimate outcomes of such games. Depending on the information participants have, they choose how to act basing on rules contained in their strategy. Game theory is widely applied in economics. Companies use game theory to estimate e.g. reactions of competitors or behavior of employees. The major advantages of game theory are its precision and that it can be applied to

analyze all kind of games. [3, p. 1ff]

Prototype

Subsection

Text...

Prototype Evaluation: College Applications in Austria

Subsection

Text...

Prototype Evaluation: Labor Market in the European Union

Subsection

Text...

Summary

Subsection

Text...

Example

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$$\begin{aligned}(x+y)^3 &= (x+y)^2(x+y) \\ &= (x^2 + 2xy + y^2)(x+y) \\ &= (x^3 + 2x^2y + xy^2) + (x^2y + 2xy^2 + y^3) \\ &= x^3 + 3x^2y + 3xy^2 + y^3\end{aligned}\tag{7.1}$$

Phasellus viverra nulla ut metus varius laoreet. Quisque rutrum. Aenean imperdiet. Etiam ultricies nisi vel augue. Curabitur ullamcorper ultricies

Figure 7.1: One angry bird.



Heading on level 2 (subsection)

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Example for list (3*itemize)

- First item in a list
 - First item in a list
 - * First item in a list
 - * Second item in a list
 - Second item in a list
- Second item in a list

Example for list (enumerate)

1. First item in a list
2. Second item in a list
3. Third item in a list

List of Figures

7.1 One angry bird. 9

List of Tables

References

- [1] D. Gale and L. S. Shapley. College admissions and the stability of marriage. *The American Mathematical Monthly*, 69(1):9–15, 1962.
- [2] Nicholas Barr. *Economics of the Welfare State*. Oxford University Press, 2012.