

# Game Theory

## Basic ideas and examples

Why the game theory may be useful for you?

- Because you play games all the time!
  - with your parents
  - with your siblings
  - with your friends and foes
  - with your professors
- Because the others play games with you all the time!
  - sellers, employers, politicians

# Game Theory

## Basic ideas and examples

Why the game theory may be useful for you?

- Because you will play games!
  - with your children
  - with your spouse
  - with your employer
  - with your employees
- Because games are played!
  - in business
  - in politics
  - during wars

# Game Theory

## Basic ideas and examples

Games involve:

- chance
- skill
- strategy

# Game Theory

## Basic ideas and examples

Game theory: the science of rational behavior in interactive situations

# Game Theory

## Basic ideas and examples

### Strategy

**Strategic thinking** is essentially about your interactions with the others

**Game theory** is about interactive decision making

# Game Theory

## Basic ideas and examples

### Some examples of the games

- Rock, paper, scissors (mixed strategy)  
<http://www.gametheory.net/media/Princess.wmv>
- Non-studying cartel (prisoners' dilemma)
- "Flat tire" (backward reasoning, focal point)
- High demands, no concessions (commitments, reputation)
- "War of attrition" (chicken game, brinkmanship)
- The dating game (signaling and screening)
- Dziennik vs. GW (entry and exit games)

# Game Theory

## Basic ideas and examples

It is high time to play a game  
*(this time however dogs will play it)*

# Game Theory

## Basic ideas and examples

*Case Study* approach vs. *Theory*

*The player who knows **how** will usually draw, the player who knows **why** will usually win*

Tom Wiswell – A world champion of checkers

Focus on theory but build it up through cases



# Game Theory Terminology

## Decisions vs. games

Decision – I decide without concern for your reaction or response

Game – mutual awareness of the cross-effects actions

I know, that you know, that I know that you know.....

# Game Theory Terminology

## Classifying games

- Sequential vs. Simultaneous (first/second mover advantage)
- Total conflict vs. some commonality (zero-sum games, constant-sum games; usually non zero sum - war example and Pyrrhic victory (Heraclea 280 B.C. „*Another such victory and we are lost!*”))
- One shot vs. repeated (with the same or changing opponents) (One shot: simpler – no future, but more complicated at the same time – lack of knowledge about the others.)

# Game Theory Terminology

## Classifying games

- Full vs. equal information (external and strategic uncertainty; games of perfect and imperfect information) (incomplete (asymmetric) information: signals and signaling; screening and screening devices)
- Fixed vs. Manipulable rules of game (game and pregame)
- Enforceable vs nonenforceable agreements to cooperate (cooperative vs noncooperative games)

# Game Theory Terminology

Basic concepts and assumptions

- Players
- Moves (actions)
- Strategies (complete plan of action)
- Payoff, also expected payoff (including everything)
- Rationality (complete knowledge, perfect calculator)
- Equilibrium (outcome of the players' best strategies)
- Common knowledge of rules (list of players; strategies available to each; payoffs, assumption about rationality)

# Game Theory Terminology

Basic concepts and assumptions

- Dynamics and evolutionary games
- Observation and Experiment

# Game Theory Terminology

The use of GT

Explanation (why did it happen?)

Prediction

Advice or prescription

# Game Theory Introduction

It is high time to play a game again

## **21 flags**

- sequential, zero-sum,
- 2 players
- 21 flags (coins, bricks)
- Each player can remove 1, 2 or 3 flags
- The player to remove last flag is a winner

# Game Theory Introduction

It is high time to play a game again

**21 flags**

Homework

Find the winning strategy



# Game Theory Introduction

It is high time to play a game again

**All pay auction**