

ELEC-E7810

PATTERNS IN COMMUNICATIONS ECOSYSTEMS

Mixed strategy – The Difficulty of Randomness

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Mixed Strategy

- » A method of playing a game in which the player attaches a weight to each option and then chooses among the options with probabilities proportional to the corresponding weights
 - In zero-sum games random (but systematic) behavior is optimal

» Implications

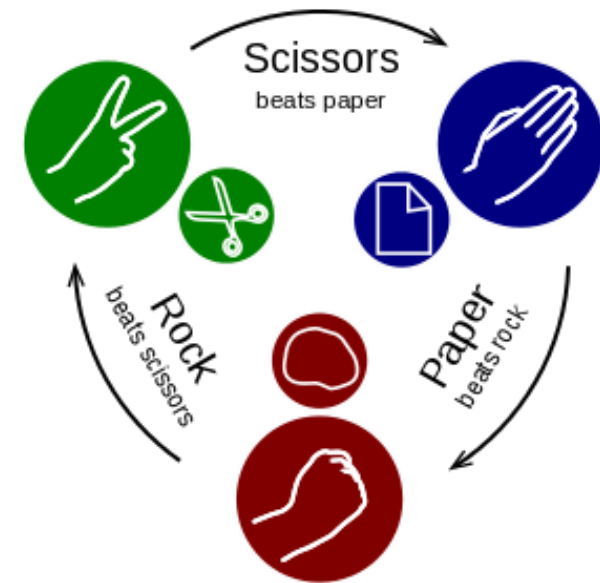
- We can calculate optimal systematically random behavior
 - kind of opposite to Prisoner's dilemma
- Zero-sum games lead to unpredictability
 - Stock market!

A \ B	Rock	Paper	Scissors
Rock	0 \ 0	-1 \ +1	+1 \ -1
Paper	+1 \ -1	0 \ 0	-1 \ +1
Scissors	-1 \ +1	+1 \ -1	0 \ 0

Pattern

1. In a Zero-sum game between players Alice and Bob, Alice starts with a random pattern
2. Alice observes a (real or imaginary) pattern in Bob's behavior
3. Alice decides to utilize the observed pattern and plays (supposedly) in an optimal way against the pattern
4. Bob observes the pattern produced by Alice and starts to play optimally against it
5. And so on....
 - » What would be the final outcome?
 - » Mixed strategy

Scissors-Paper-Rock



- » It is too difficult to play as an online game
- » Instead, we make an experiment about the randomness of behavior
 - Randomness is essential when playing a mixed strategy game
 - If you are playing randomly, your opponent cannot invent any better strategy than random strategy
- » But, you may try to deduce whether your opponent is playing randomly

➔ The Experiment is about

- Generation of random behavior
- Identification of non-random behavior

The First Phase

Fill the following 30 cells using letters **s**, **p**, and **r** as randomly as possible.



Every gray cell shall contain either s, p, or r
Do not use capital letters (S, P, R)

You should fill the cells manually.
Do not use any random number generator!

Like this:

s
p
r
r
s
r
p
s



The Second Phase

- » Try to distinguish human-generated lists from random lists!
 - Random lists generated by Excel (probabilities of s, r, and p are 1/3)

- Guess for each column (list) whether it is made by human (H) or randomly (R)

List code (do not change)							
Fill the green row H = human list, R = random list							

- » Your results depends on how well
 1. Others are able to guess that your list is made by a human participant
 2. You are able to distinguish lists made by participants from random lists

The Third Phase: Reflection essay

- » Submission deadline 21.4. 23:59
- » Up to 3 points based on your reflections (1 page)
 - What did you learn?
 - Is it difficult to generate a random list?
 - Relationship with other patterns, etc.
- » + up to 2 points based on a special task
 - Design an algorithm that is able to discern human lists from random lists (at least in the case of this experiment)
 - A good algorithm is simple, efficient (high share of right guesses) and (possibly) applicable in general (not only with the lists in this experiment)

Experiment - Juggling

» Task

- Train juggling skills with three balls
- » You 1 point if you **demonstrate** your skills on Monday 27.4. in Zoom session (whatsoever your skills are) and
- » You get 1 extra point if you can juggle at least half of minute with three balls!



Other issues

- » Long Tail Assignment
 - Some additional advices will be available later today (20.4.)
- » Updated points will be available on Wednesday (22.4.)

Extra points

- » A possibility to replace some missing points by two exercises open in MyCourses
 - Tuesday 28.4 from 12:00 – 14:00
 - Wednesday 29.4. from 12:00 – 14:00
- » You can **replace** missing points or **upgrade** low points from any of the experiments (one exercise ↔ one experiment):
 - 20.3. Point lottery
 - 27.3. Prisoner's dilemma
 - 17.4. Network Effect
 - 20.4. Mixed strategy
 - Maximum number of points in both exercises is 5
 - Replacement will be done automatically
 - In a way that maximizes your points
- » These exercises are totally voluntary

Modified Schedule

Monday: Information about new assignments (at noon)	Friday 10:15 – 12:00 Online (MyCo)
16.3. - - - -	20.3. Bad is stronger than good Online experiment
23.3. Personal assignment (A1) (3 good deeds)	27.3. Prisoner's dilemma \Rightarrow Tit for Tat Online experiment
30.3. Personal assignment (A2) (Patterns P4, P5, and P6)	3.4. Group work I results Group work II info
6.4. Personal assignment (A3) Long tail (P16)	10.4. - - - (Eastern) - - -
13.4. - - - (Eastern) - - -	17.4. Network effect Online experiment
20.4. Mixed strategy - Randomness Online experiment!	24.4. Group work II results Assessment of the results
27.4. Final remarks – Online	-----