

Application of games theory on International relations

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Abstract:

The object of this article is to demonstrate the possibilities of games theory as an instrument for study of international relations. The approach to be used describe elementary games theoretic models as an integral part of international relations with a collection of example to understand subject better. This paper addressed to theoreticians and practitioners of international relations not particularly versed in games theory, rather than to Those who are fluent in its mathematical language and intricacies.

Introduction:

Look on content and scope of international relations. We know study of international relations means the analysis of interactions among nation states. Those interactions involve interdependent goal – directed activities. Interdependency means that achievement of the goals of any nation- state dose not only upon its own nation –state.

International relations runs to becoming an applied branch of game theory just as microeconomic theory has sometimes been said to be applied branch of calculus. Distinctive characteristics of the international relations approach to analysis of interactions among nations –states include the attention given to their motivation and power they use to influence each other. We know security and economies are two main issues considered in the theory and practice of international relations. Other important issues include education, environment, human right and international law. A separate dimension of the study of international relations is based on the fact that the interactions that constitute them generally proceed along well –defined lines not usually encountered in interactions among individuals, private institution and different levels of government within nation- state. Specially, diplomacy is the regular channel for international relations.

The following examples present a simplified application of game theory. This section provides an opportunity to describe the main steps needed to construct a game theoretical model of real events, and also to elaborate on some of the contributions that game theory can make to the study of international relations. Reader must know that the target of this article is to avoid complex mathematical calculation and with a large number of examples help reader to be skilled to give numbers to international events. I hope that I am successful in reaching to this target. In some examples I used numbers without digits and I used variables but with some order to show that we can use variables but with some order. Reader must practice to give numbers to international relations depending on conditions.

Example -1

Two socially maladjusted attempts to demonstrate their courage. At the last possible instant each is faced with a terrible dilemma:

If neither swerves, both will surely be killed. On the other hand, whoever swerves will be ostracized and humiliated, whereas the other will gain in social status. If both swerve the outcome will be less dire, but neither will enjoy the benefit of prevailing in the dispute.

Group 2

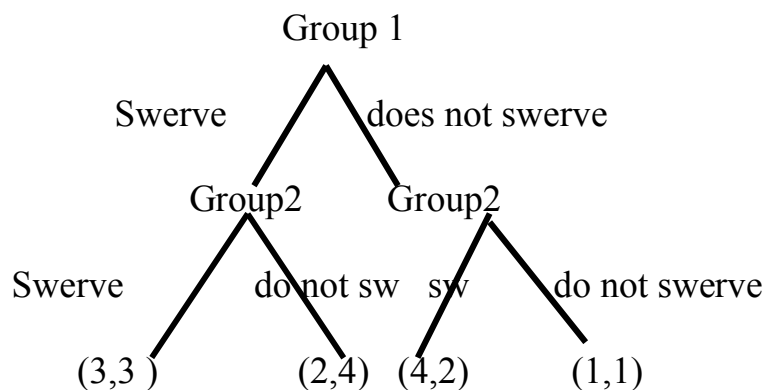
Normal form

		Swerve	does not swerve
Group 1	swerve	3, 3	2, 4
	Do not swerve	4, 2	1, 1

Nash equ

Extensive form

Nash equ, No dominated strategy



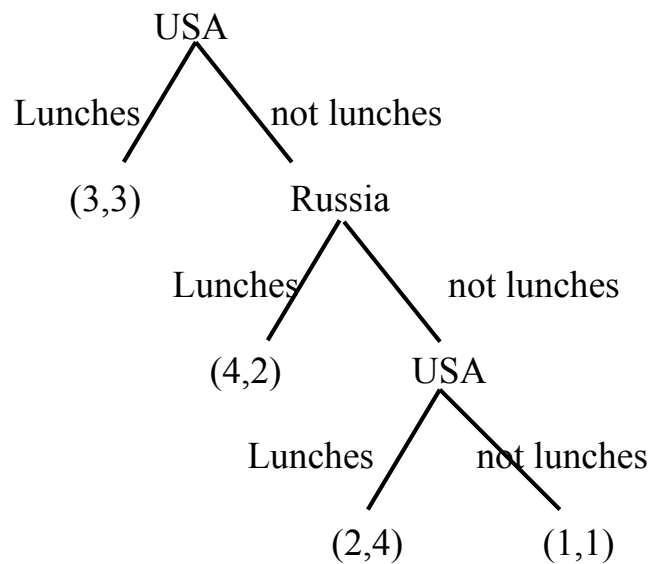
Example-2 :

How one nuclear power thinks about launching conventional attack against another? If it launches the attack and the other does not respond with nuclear strike against its military forces. It will gain an advantage, however if the defender responds with tactical nuclear weapons, the attacker will face the unpalatable choice of retreating with heavy losses or initiating a full-scale thermonuclear war. It is not a model in which simultaneous choice.

Sequential game

		Russia		Nash Equ
		Lunches	not lunches	
USA	Lunches	3,3	2, 4	↑
	Not lunches	4, 2	1,1	

Nash Equ ←



Example -3: Egypt – Isreal conflict

1948 → 1967 → 1973

C : cooperation
 1948
 D: not cooperation
 Egypt

		C	D
Isreal	C	3, (4)	1, 2
	D	(4), 3	(2), 1

Nash equ

1967

Egypt

		C	D
Israel	C	(4), 3	1, (4)
	D	2, 1	(3), (2)

1973

Egypt

Nash Equ

		C	D
Israel	C	3, (4)	1, 3
	D	(4), (2)	(2), 1

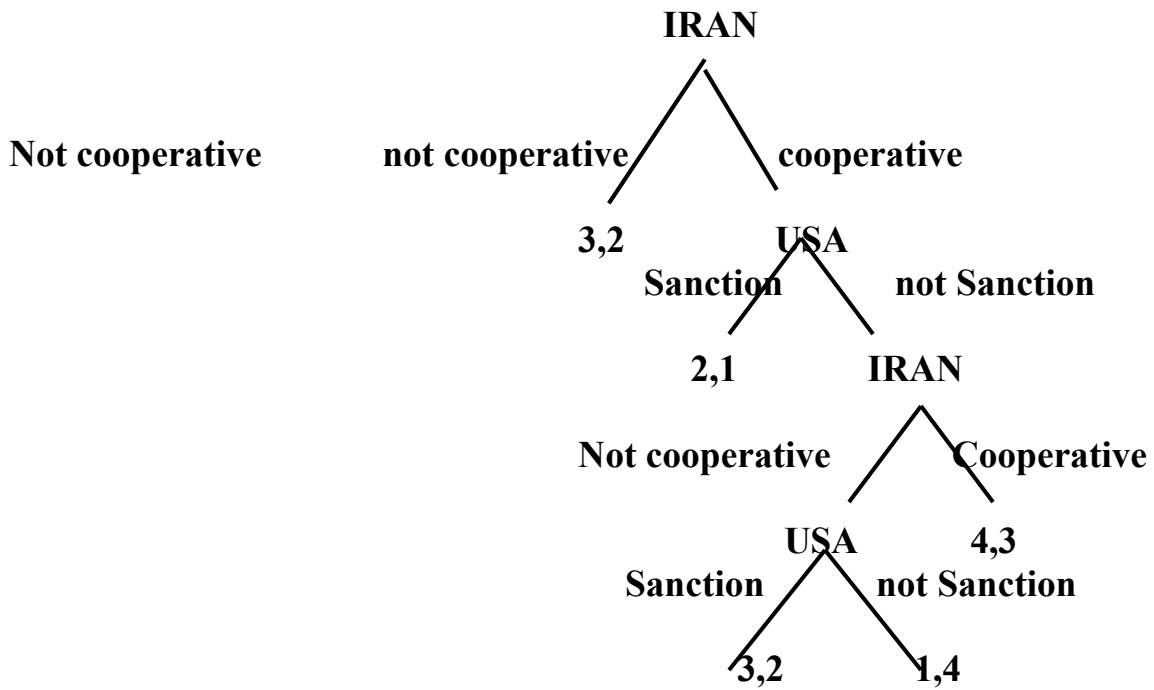
Nash Equ



**Example-4 : Economics Sanction:
Normal Form**

		IRAN	
		Cooperative	Not cooperative
USA	NOT sanction	4,3	1,4
	Sanction	2,1	3,2

Nash Equ



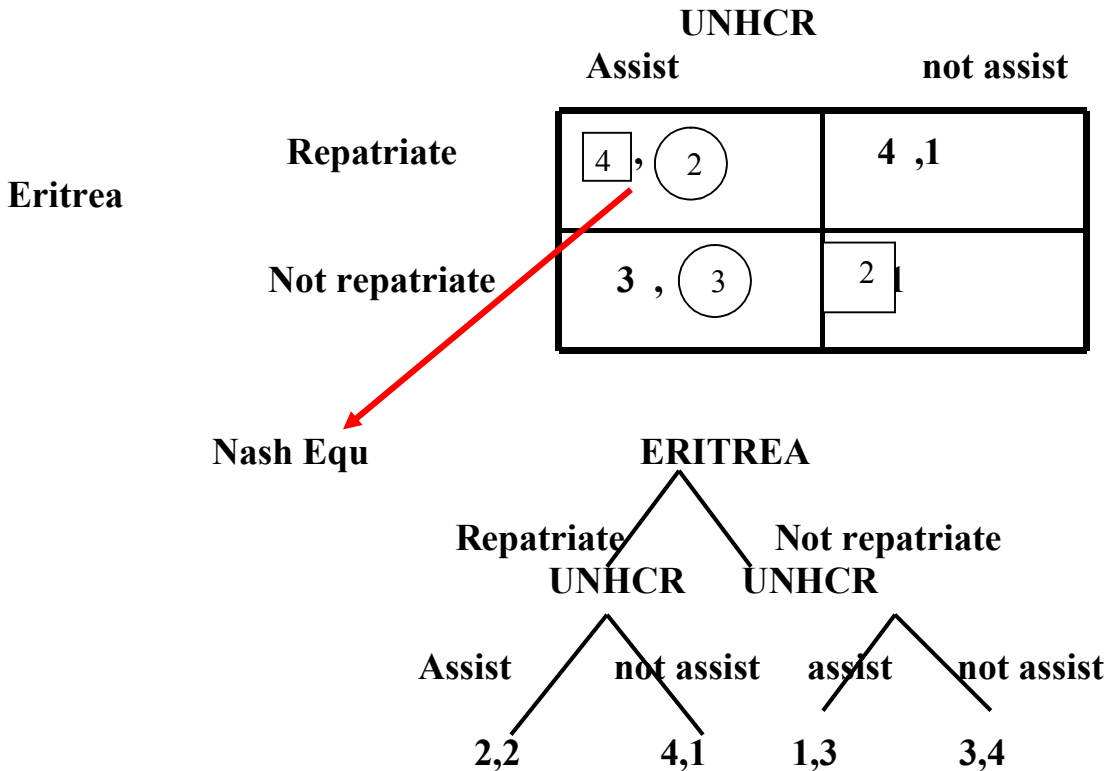
Example -5 : Israel and Palestine conflict

		Palestinian strategy	
		Cooperation	Confrontation
Israel	cooperation	3,3	1, (4)
	Confrontation	(4), 1	(2), (2)

Nash equ

Example -6: Repatriation of refugees:

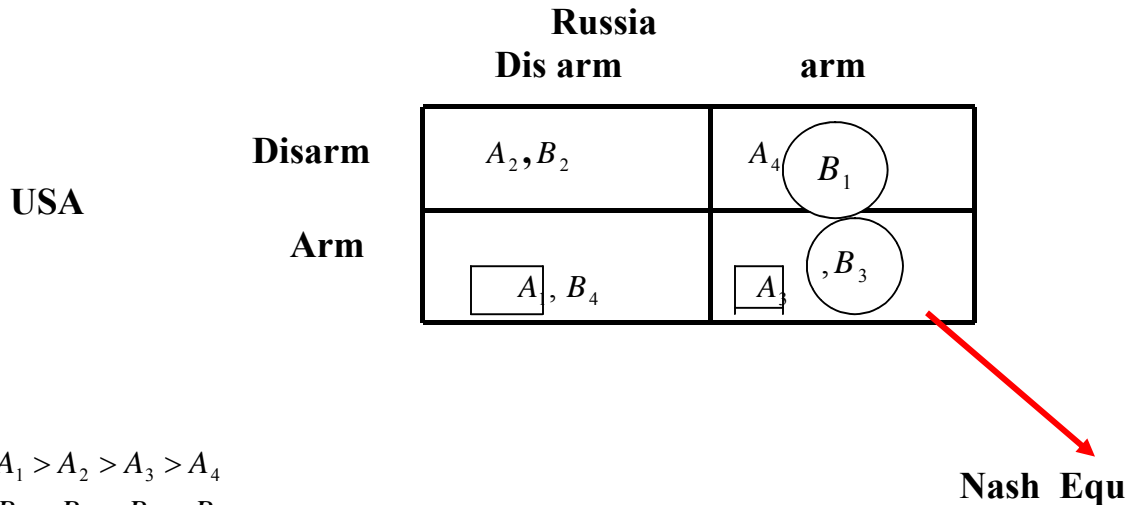
This example is between Eritrea and UNHCR, which Eritrea's choice are a high or low demand for international aid in return for resettlement, the UNHCR choose to accept or reject Eritrea's proposal



Example -7 :

Nuclear arm race

The nuclear arms race between the united state and Russia has proved one of most interesting problem .Since the benefits and costs of the arms race to each nation are dependent on what both nations do it is helpful to think of the arm race as a game :



$$A_1 > A_2 > A_3 > A_4$$

$$B_1 > B_2 > B_3 > B_4$$

In mixed form P_A = probability that A can detect B's strategy choice
In the first stage.

P_B =Probability that B can detect A's strategy
Choice in the first stage.

$$0 \leq P_A, P_B \leq 1$$

Expected payoff in the second stage

$$E(A) = A_2 P_A P_B + A_1 (1 - P_A) P_B + A_4 P_A (1 - P_B) + A_3 (1 - P_A) (1 - P_B)$$

Example-8 Terrorist Hunt

Two agencies the FBI and CIA are responsible for investigation and apprehending terror suspects:

		CIA	
		Kingpin	operative
FBI	Kingpin	<div style="border: 1px solid black; display: inline-block; padding: 2px;">2</div> , 2	0,1
	Operative	1,0	<div style="border: 1px solid black; display: inline-block; padding: 2px;">1</div> , 1

Nash equ

Nash equ

Example -9 IRAN –USA conflict:

		IRAN	
		A	R
USA	A	<div style="border: 1px solid black; display: inline-block; padding: 2px;">b</div> , b-c	<div style="border: 1px solid black; display: inline-block; padding: 2px;">0</div> , b
	R	b-p, -c-d	-p , -d

Nash Equ

- A : acquiesce R: rebel
- d : Iran refuse US vessels and US retaliates 9/8/2011 9/8/2011 action
- b-c: remaining in the alliance and not allowing vessels
- b: both nations acquiesces
- b-p : Iran allow us vessels US punish Iran
- 0: Iran rebels us acquiesces.
- p: us punish Iran
- c-d : Iran allow US vessels enter and us punishes
- C : cost
- IRAN : $b > b-c > -d > -c-d$
- USA: $b > b-p > 0 > -p$

Refernces:

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