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PATH TO CLIMATE COOPERATION: AN UNDERSTANDING THROUGH A GAME-THEORETIC MODEL

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Abstract

This article tries to describe with example a simple game theory that is Prisoners' Dilemma & Free riding problem. It also describes how, and in what way, does the Prisoner's Dilemma & Free riding problems explain the interaction among usually rational agents, the formulation of hypotheses about their behaviour and the prediction of the results of each interaction. It consists of an individual paying a cost in order to benefit another individual. However, natural selection describes individuals as being selfish and in competition among themselves forgetting the environmental ethics.

Keywords*: Game theory, Prisoners' Dilemma, Free riding problem, Climate Cooperation,*

The biped animal human being is the best and finest creation on Earth.Humans are capable of abstract and rationale thought. Human communication is superior to that of all other animals. So we are superior in the sense that we have the sense to question our own apparent superiority, using technology that is clearly superior, being the dominant worldwide apex predator in every environmental niche.

Humans are also the only animal that feels a responsibility towards other animals. Humans have the greatest potential to display their plans and reason.And hence is this conference….. "Environmental Protection- An avenue for better future".

Many such conferences locally, nationally and globallyhave been organized so far to provide an integrated, quantitative and interdisciplinary approach to study the environmental systems and find solutions to resolve the problems associated with it for sustainability. Still why can't we bring meaningful changes? Why the process is not as expected? Why is it so slow? In this regard, what role can the teaching fraternity of the world that command the allegiance of vast millions, play?

Being a woman and a teacher educator, with deep concern for humanity and the Environment, carrying within me the seeds of "compassionate activism", I tried to find out answers to all the above mentioned questions. Along with these lines, this article throws some light on 'Why an ethical relationship between humankind and nature be developed and clarified?'

The reason to all these can best be understood through a 'Game theory" propounded by John Forbes Nash Jr., an American mathematician.The theory has become significant in almost all spheres of life where economic benefit is being countedlike ethics, biology, dating, and, more recently, in environmental management and policy.

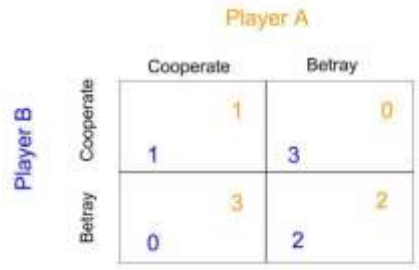
Game theory is a study of strategies involved in complex games. Almost every human interaction—politics, economics, law, and religion—can be modeled as a game. You are in a game if your fate is impacted by the actions of others.

Let's first understand the game theory.

Prisoners' Dilemma: Two people(A & B) have been arrested for a crime.The authorities have no other witnesses, and can only prove the case against them if they can convince at least one of the prisoners to betray his accomplice and testify to the crime.Each prisoner is placed in a separate cell and questioned separately.The prisoners cannot communicate with each other.

If A admits that B had done the crime, A will be set free and B will be imprisoned for 3 years. If A betrays, then for the crime will be imprisoned for 2 years. If A remains silent, he will be imprisoned for 1 year. (Vice versa).

The prisoner's dilemma presents a situation where two parties, separated and unable to communicate, must each choose between co-operating with the other or not. The highest reward for each party occurs when both parties choose to co-operate.



Free riding problem: Now let's consider the free riding problem. Here we have a bus passenger failing to buy a ticket. The passenger reasons that the bus will be travelling its designated route in any case, and no one is harmed by a single passenger failing to pay their fare.

If this is right, every passenger should reason along similar lines.

But then the bus system would have no paying passengers and would grind to a halt. The cooperative solution whereby everyone willingly pays their fare is unstable and is open to abuse from each and every passenger.

Many environmental problems can be understood in the same way.

For the most part, people are increasingly acknowledging the importance of protecting the environment, and that society would be better off as a whole if everybody were more

environmentally conscious (even if only to go so far as to not litter on the streets). Yet many people continue to pollute and not recycle, harming the planet despite the knowledge that Earth's resources won't last forever.

Using the example of pollution in Prisoners' Dilemma, the options of cooperate and not cooperate would become to not pollute and pollute, respectively. The optimal outcome would be for both players to cooperate and not pollute, resulting in a cleaner planet that benefits everybody. However, that option is not in equilibrium because one would be better off by not cooperating and letting other people "clean the world" for you. This is a result of the common attitude/idea that one person's actions don't make any difference, and is the reason that the final equilibrium is always the sub-optimal option (both players end up polluting).

	B not to pollute	B to pollute
A not to pollute	(not to pollute, not to pollute)	(not to pollute, pollute)
A to pollute	(pollute, not to pollute)	(pollute, pollute)

According to mathematician Peter Wood, an inherent prisoner's dilemma arises when addressing greenhouse gas emissions, because "every country wants global emission reductions, but would prefer that someone else take on the burden." If all nations involved in climate change negotiations worked together and committed to the end goal of reduction of emissions, they would always be better off in terms of long-term benefits. However, most negotiations either fall through or are not kept up because there are more short-term economic benefits for a country to simply allow other countries take on the work while not burdening themselves with the changes and regulations necessary to achieve the emissions reductions.

Escape from the Prisoner's Dilemma

Should both the players end up polluting the environment?

Definitely not.

But how?

By breaking the equilibrium-the mad mathematics of equilibrium. By following environmental ethics….

Over time, people have worked out a variety of solutions for the above mentioned question with the help of prisoner's dilemmas in order to overcome individual incentives in favor of the common good.

The players can choose strategies that reward co-operation or punish defection over time. People have developed formal institutional strategies to alter the incentives that individual decision makers face. Collective action(an international organization prepared to impose the costs of pollution upon Polluters) to enforce cooperative behavior through reputation, rules, laws, democratic or other collective decision making, and explicit social punishment for defections transforms many prisoner's dilemmas toward the more collectively beneficial cooperative outcomes.

What game theory brings to the debate is a systematic way of structuring such problems in order to illuminate the core issues.

Climate Cooperation the key to action.There are no easy solutions to the environmental problems we face.But whichever way we turn we will need to seek cooperative solutions and guard against undesirable unintended flow-on effects. On both counts, game theory is the tool of choice.

Forget about thinking outside the box; think game-theoretically, the world may just be a cooler and greener place for it.

References:

https://nyuelj.org/wp-content/uploads/2013/03/Hsu-Game-Theoretic-Model.pdf
https://phys.org/news/2011-01-greenhouse-gas-emissions-game-theory.html
https://blogs.cornell.edu/info2040/2011/09/26/using-game-theory-to-reduce-greenhouse-gas-emissions/
https://www.ncbi.nlm.nih.gov › pmc › articles › PMC3179105
Lorenzo Cioni, Game theory as a tool for the management of environmental problems and agreements,Department of Computer Science, University of Pisa Largo B. Pontecorvo 3, 56127 Pisa, Italy.
The Economics of Climate Change – C 175
Why Is the Nash Equilibrium So Important?,By QUORA CONTRIBUTOR
Iyyanki V. Muralikrishna, Valli Manickam, in Environmental Management, 2017
https://www.investopedia.com/terms/p/prisoners-dilemma.asp
https://www.tapatalk.com/groups/anthroscape/cyclists-don-t-help-the-western-economy-t88939.html
http://www.scientificamerican.com/article.cfm?id=game-theorist-predicts-failure-at-climate-talks
http://opim.wharton.upenn.edu/~clemons/blogs/prisonersblog.pd