OPTIMISATION APPROACH AND MATHEMATICAL MODELLING FOR SOLVING TWO PERSON GAME THEORY

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ABSTRACT:

Game theory is said to be best the logical analysis involving certain kind of situations of divergence and collaboration. Theory of games was suggested by the great mathematician E. Borel (1921), and later introduced by John Von Neumann in a "theory of parlor games" in 1928. Game theory can be defined "rational decision in conflict situations". Game theory is mathematical tool applied in various fields like economics, mathematics and other subjects. These papers briefly explain an overview game theory and its contribution business applications. Thus, game theory means is the "study of how players should rationally play games". Each player would like to the game to end in an outcome which gives him as large a payoff as possible. He has ability to predict the exact outcome since his choice of strategy will influence it. There is a set of players and compete each other. It is well known that every person's move is calculated and it is played well with set of rules and regulations with constraints. The optimisation principle helps to the get the result from strategies among opponent team. It is like game between two team players or two-person game or two competitive situations. This paper outlines how to take decision making with different conditions with optimal output and result. **Keywords:** Game theory, optimisation, uncertainty, decision making.

INTRODUCTION

The complete set of rules resembles a game. A play is an instance of the game. When player takes decisions then it is called "action" or "Move". The strategy means a set of actions or plan of action and they move or possibly choose every possible position. The concept of "Rationality" is applied here and moreover it is believed that everyone takes decisions based on their belief and expected payoff. It is assumed that everyone wants to optimise their profits. This theory is applied and to find out and create more ethically or normative behaviour. This kind of application is more in economics, philosophy by scholars using to help in the understanding of rational behaviour.

KEY DEFINITIONS TERMS USED IN GAME THEORY

- Game means "Any set of state of affairs that has a result dependent on the actions of two of more decision-makers.
- Players are defined as "A strategic decision-maker within the context of the game".
- Strategy refers "A complete course of action a performer will take given the set of situations that might arise within the game".
- Payoff defined as "The payout a player particular outcome it can be in the form of quantifiable form, from dollars to utility".
- Information set means "The term information refers always at a given point, information set the game has a in order component".
- Equilibrium refers "Equal balance position in a game, both players making their decisions and expected an outcome is reached"

UNDERSTANDING GAME THEORY AND ITS APPLICATIONS

"Life is zero-sum game" –unknown

- It was observed in 1949 when John Forbes
- Turocy & von Stengel (2001) define game theory "as a formal study of decision-making where several players must make choices that potentially affect the interests of other players".
- Antoine Cournt (1838), first presented on the study of duopoly as cournt model
- J. Waldegrave (1713) available in the form of letter written
- John von Nuemann in 1928 in a study of "theory of polar games".
- Lim (1999) elaborated Neumann and Morgenstern in economic application and it is used in social science
- Camerer (2003) started Appling economics, political science, and psychology, as well as logic and biology.
- Osborne (2002) this model used arrive both single person or group of people.
- Camerer et al., (2001) outlined the varied assumptions and rational situations
- Osborne & Rubinstein (1994) applied strategic positions for optimum decision.
- Turocy (2001) spells out that when game is played with only one player then it is called "decision problem".
- Game theory provides a base for language in turn helps to formulate structure, analyze, and strategic options.
- Osborne (2002) elaborated game as a strategic interaction and their interest.
- Kelly (2003), final result are inter-dependent.
- Bicchieri and Sillari, (2005) pay-off depends on depends on assigned value and their preference.
- Game theory outcome consists well known rules, players' interactions, feasible choices, their preferences over outcomes.
- According to Hotz (2006), it is scientific oriented, it studies confronting each one between the agents and their decisions.
- Geckil (2010), Real- world games are rarely zero-sum game.
- It is also called constant-sun games. Innon-zero-sum games, all players could win or loss together. Most of the games in our real life and the business world are non-zero-sum game. For example, price wars between firms are non-zero-sum games.
- Geckil (2010), the 'game' is the object of studying in game theory. The complete set of rules describes a game.
- A play is an instance of the game. Most games played for fun, entertainment and leisure. When someone over reacts, we sometimes say 'it's just a game'.
- Players are defined by particular set of decision making.
- **Strategies:** Available to each player, courses of action which is chosen.
- **Outcome of the game**: The possible outcomes.
- Act as economic tool to analyze economic competition, economic phenomena such as bargaining, mechanism design, auctions, voting theory; experimental economics, political economy, behavioural economics etc.
- Explained to understand the rational behaviour.
- Helps to plan both short-run and long run.

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- In business situations with strategic interaction among firms, households, governments or others.
- It analyse two or more parties, who interact in an arena such as a market, choose actions or strategies that jointly affect all participants.
- It assists to decide competitor position (Anderson, 2010).
- It helps to solve business problems.
- It is applied to develop theories of ethical or normative behaviour.
- It is Mathematical economics and business for modelling find real time solutions.
- It is model helps to arrive business decisions.
- Strategic behavior occurs regularly among executives, manager and investors in business world. They must decide to enter into new markets, launch new products, invest now or lose the opportunity to invest and make pricing and purchasing decisions.
- The uses of game theory are as follows: economics, business, biology, computer science, political science, psychology and philosophy.

WHY OPTIMISATION MODEL IS USED?

Optimization methods are techniques that enable us to solve optimization problems. For this, it is necessary to optimize the working of a system, minimizing or maximizing one of its many objectives or performance criteria. Different types of optimisation are used are:

- 1. Bound Constrained Optimization
- 2. Constrained Optimization
- 3. Continuous Optimization
- 4. Derivative-Free Optimization
- 5. Discrete Optimization
- 6. Global Optimization
- 7. Linear Programming and
- 8. Nondifferentiable Optimization

It is being used to predict, describe, and learn behaviour also in develop theories ethical and normative behavioural aspects game theory.

EXAMPLE

A / B	Heads	Tails
Heads	(a) +1, -1	(b) -1, +1
Tails	(c) -1, +1	(d) +1, -1

Game involving 2 players (i.e A&B), playing simultaneously placing a penny. Resulting the payoff depends on whether the pennies match or not. If both pennies are heads or tails, Player A wins and keeps Player B's penny; if they do not match, then Player B wins and keeps Player A's penny. A zero-sum two person game is called a win –lose game (Either player A or B wins). That there is no chance for them to tie. Game theory describes the situations involving conflict in which the payoff is affected by the actions and counter-actions of intelligent opponents.

Fields of	Techniques	Application in specific	Mathematical models
Application			used
 Health science Management science Space planning Risk management Financial planning Logistical planning 	Heuristics algorithm Problem Through Computational Intelligence Operation research	 Applications: Engineering Logistics Marketing Transportation planning Computing ICT Data mining Quality prediction 	 Linear programme Non-linear program Quadratic program Unconstrained optimisation

MATHEMATICAL MODELLING TECHNIQUES FOR SOLVING INDUSTRY PROBLEMS:

Many practical optimisation problems uses mathematical models to enumerate so called real world issues. Many practical optimization problems involved mathematical models of complex real-world phenomena

MATHEMATICAL OPTIMIZATION IN THE "REAL WORLD"

This modelling is used controller design; the algorithm is used decision variables; in reality zero-sum games like chess, poker, financial tools options, and futures. The pay-off of one player increases means at the cost of other which is decreased by other. It is applied mathematical optimisation includes production, inventory, scheduling, Networks, Economics, Financing and marketing.

There are two kinds of people: eaters and bakers. Eaters think the world is a zero-sum game: what someone else eats, they cannot eat. Bakers do not believe that the world is a zero-sum game because they can bake more and bigger pies.

WHY MATHEMATICAL OPTIMIZATION IS IMPORTANT?

- Mathematical Optimization works better than traditional "guess-and-check" methods
- M. O. is a lot less expensive than building and testing
- In the modern world, pennies matter, microseconds matter, microns matter.

CONCLUSION

Game theory is mathematical science provides optimal solutions it may not give accuracy and clear mapping but it gives more of insight about the outcome of the game. The zero-sum characteristic runs through a number of interactions, and it can be a valuable tool in understanding aggregations of human contestants, like markets. It is applied greatly almost all the management organizations functions.

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