

AN OVERVIEW FUZZY GAME THEORY FOR DECISION ANALYSIS

JOTHIMANLIK

Research Scholar, Dept of Mathematics, Mother Teresa Women's University, Kodaikanal-624101

ABSTARCT:

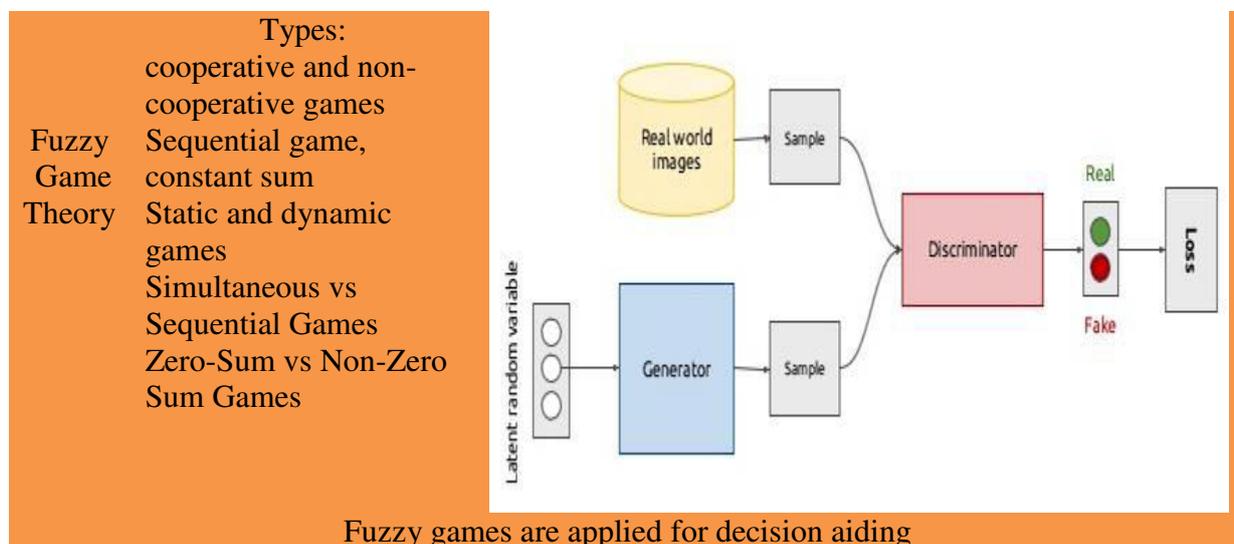
Decision analysis is a methodical, quantitative, and visual approach to address and evaluating the important choices that businesses sometimes face. Most of the decisions are task oriented involves complex behaviour, to proceed further it requires step-by step approach by using decisions criteria. The rationale of this paper is to highlight an overview of "Fuzzy Game Theory" and how it mathematical are applied to solve business day-to-day complex decisions involving so many constrains with various applications. It is branch of maths subject and this model to find "strategic interaction" among players with pre-determined rules.

Keywords: Mathematical modelling, Decision analysis, Business applications

1.1. INTRODUCTION

Game theory is one of the topics of Artificial Intelligence and is used as a numerical analysis. This applies the concept of "optimization of utilities" profit maximisation principle. This decision will be arrived by noting down with all alternatives available and expected results. The decision analysis is applied by big corporates for the problem related to management, marketing, capital fund analysis and strategic decision.

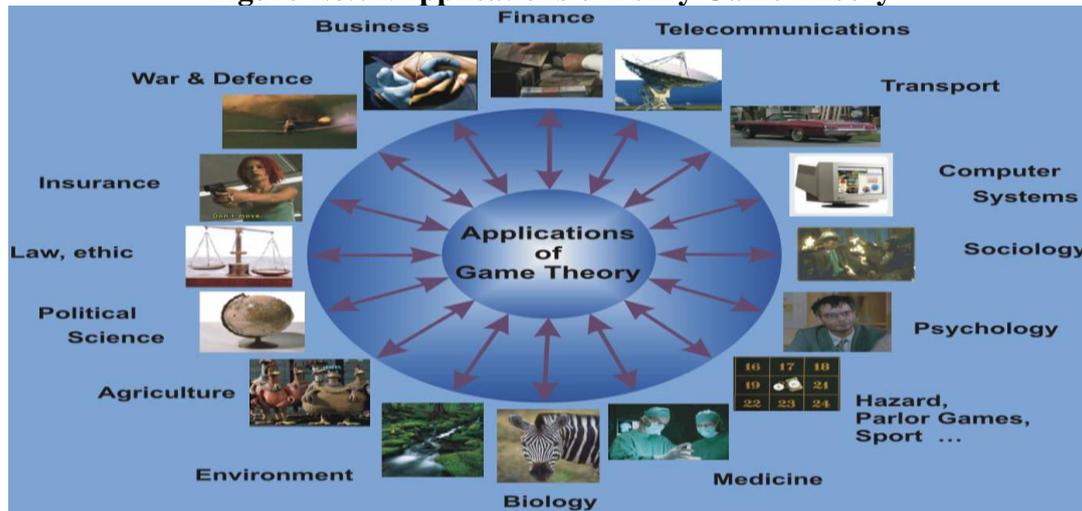
Figure No.01 Application of Fuzzy game theory



If we look at the development of game theory and decision analysis one can understand the growth path over the period of time. It has started more five decades of its applications including in the field of social science (Lim,1999). Turocy (2001) defined game theory as "formal study of decision making in which other while players take decision potentially affects others interests". This theory first introduced by Cournt in Duopoly in economics by the years 1838. Camerer (2003) discovered matter came for discussion. Klemperer (1999) views a game-theory based model as a mathematical oriented game which represents with set of players cum strategy with each player combination different strategies. Lim (1999) introduced by Von Neumann applying competitive process between players. John Forbes

(1949) concept of equilibrium .ie Nash Equilibrium. Stengel (2001) elaborated that the end of players case of players with fully opposed interests is underlined the so called class of two player zero-sum games. Camerer (2001) says that players take decisions based on belief and analysis also made it clear that sometime player may not make rational choice. And they believe best alternative decisions. Camerer (2003) shared that this game theory is practical in various fields (such as economics, biology, political science and psychology). Osborne (2002) shared that group and individual make decision.

Figure No.02.Applications of Fuzzy Game Theory

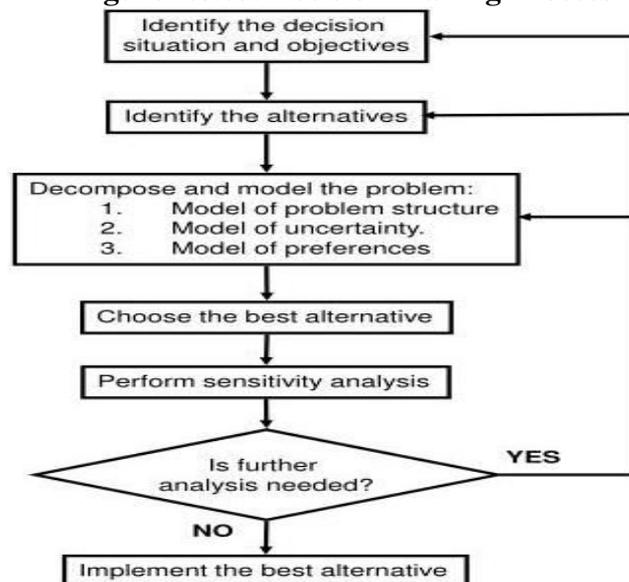


(Source: <https://towardsdatascience.com>)

1.2. DECISION ANALYSIS AND MAKING PROCESS AND BUSINESS APPLICATIONS

Decision analysis with the help of mathematical modelling is important and crucial for business decisions. Making decisions plays and it is significant role of that task of manager. The following figure illustrates the decision-making method in order to solve multiple and complicated risk-oriented problems step by step approach.

Figure No.03. Decision Making Process



It highlights the decision-analysis routing process by using decision criteria with varying quality information. This process of elements helps the decision making process with alternatives and choices available matching goal which guides decision-making. The main issues are involved here are decision making preference with decision criteria for choice, coupled with together risk assessment.

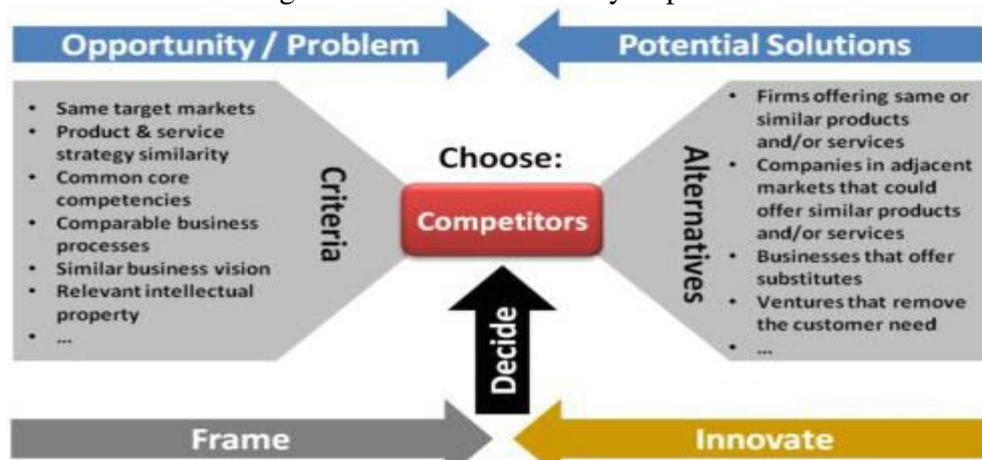
What is Decision Analysis?

Decision analysis is a systematic process of documenting and weighing alternative scenarios in terms of their respective costs, probabilities of success or failure, and benefits.

The Six Steps in Decision Analysis

1. Clearly defined problem
2. Availability all possible choice
3. Spot out all possible results
4. Pay-off of alternatives and outcomes
5. Choose best mathematical models
6. Application of suitable model

Figure No.04. Decision analysis process



(Source: Decision innovation inc -2009-2011)

- Decision analysis lead to analysis paralysis and, due to information overload, the inability to make any decisions at all.
- Decision analysis is a systematic, quantitative, making strategic business decisions.
- Decision approach make uses tools with consideration psychology, management techniques, and economics.
- For the purpose of analysis Decision trees and influence diagrams are used visual representations.
- Risk, capital investments, and strategic business decisions are areas where decision analysis can be applied.

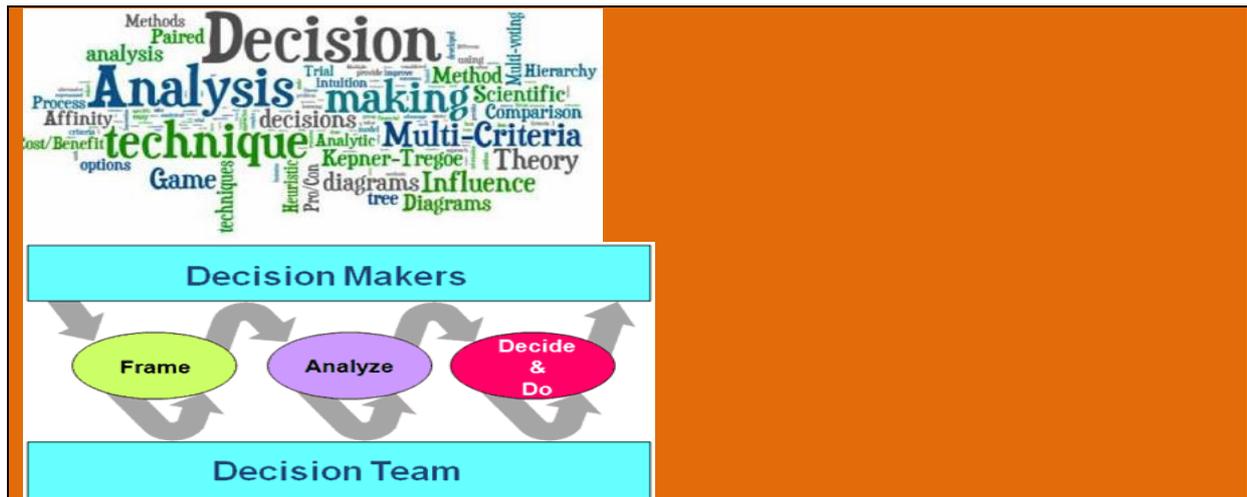


Figure no.05. Decision Tools, Analysis and Framework

SUMMARY

*"It is change, continuing change, inevitable change,
that is the dominant factor in society today.
No sensible decision can be made any longer without
taking into account not only the world as it is,
but the world as it will be."*

- Isaac Asimov (1920 - 1992), Science Fiction Author

- Mathematical models go beyond experiments and observation. Different constraints you can have different solutions
- Mathematics modelling saves time, money and efforts of performing results in laboratory with experimental tools
- There are many problems that can't be conducted in laboratory for instance business application like sales trend
- Experimental study is used for analysis physical quantities

REFERENCE

- Avinash, D. & Nalebuff, B., 1991. Thinking Strategically. New York: Norton & Co.
- Billot, Antoine (1998). "Elements of Fuzzy Game Theory". The Handbooks of Fuzzy Sets Series. **1**. Boston, MA: Springer US. pp. 137–176. doi:10.1007/978-1-4615-5645-9_5. ISBN 9781461375838.
- Binmore, K., 2007. Playing For Real: A Text On Game Theory. New York: Oxford University Press.
- Brook, T., 2007. Computing the Mixed Strategy Nash Equilibria for Zero-Sum Games. Bath, U.K.: University of Bath.
- Camerer, C., 2003. Behavioral Game Theory. New Jersey: Princeton University Press.
- David Brown, Tennis Environment — Multi-Agent Reinforcement Learning. Accessed at: <https://github.com/david-wb/marl>
- Davis, M., 1997. Game Theory: A Non-Technical Introduction. New York: Dover Books.
- Gipin, A. & Sandholm, T., 2007. Lossless abstraction of imperfect information games. Journal of the ACM, 54(5), pp.2-29.
- Hyksova, M., n.d. SEVERAL MILESTONES IN THE HISTORY.

- Nvidia AI Generates Fake Faces Based On Real Celebs - Geek.com. Accessed at: <https://www.geek.com/tech/nvidia-ai-generates-fake-faces-based-on-real-celebs-1721216/>
- Overview: Generative Adversarial Networks — When Deep Learning Meets Game Theory. AHMED HANI IBRAHIM. Accessed at: <https://ahmedhanibrahim.wordpress.com/2017/01/17/generative-adversarial-networks-when-deep-learning-meets-game-theory/comment-page-1/>Quantum Probabilistic Models Revisited: The Case of Disjunction Effects in Cognition. Catarina Moreira, et al.
- <https://www.researchgate.net/publication/304577699> Quantum Probabilistic Model <https://www.coursehero.com/file/32307980/Week-10-Journaldocx/>
- <https://www.researchgate.net/publication/305694793> A method for evaluating <https://www.researchgate.net/publication/328761774> PRIVACY ISSUES IN SMART <https://pdfs.semanticscholar.org/ca9b/34b5984e30985ccd6c876a8bbca7f2212f09.pdf>
- https://www.researchgate.net/profile/Wayne_Hoy/publication/44826496 Toward a
- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4970053/>
- <https://www.springboard.com/blog/artificial-intelligence-questions/>
- <https://www.facebook.com/malawianvacancies/posts/1143919132608535>
- <https://www.termwarehouse.com/essay-on/Game-Theory/389503>
- <https://www.slideshare.net/gauthamreddy39/bidding-strategies-in-deregulated->
- <https://www.researchgate.net/publication/256473555> A REVIEW OF GAME THEORY OR
- <http://home.ubalt.edu/ntsbarsh/Business-stat/opre/partIX.htm>
- <http://home.ubalt.edu/ntsbarsh/opre640a/PartIX.htm>
- <http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.465.7616>
- <http://www.sci.brooklyn.cuny.edu/~dzhu/busn3430/Chapter03.pdf>
- <https://www.coursehero.com/file/p5bbgpo/List-the-possible-ALTERNATIVES-3->
- <https://issuu.com/danihasan/docs/352735322-rsh-qam11-tif-03-doc>
- <https://www.investopedia.com/terms/d/decision-analysis.asp>
- <http://www.stat.cmu.edu/~hseltman/309/Book/Book.pdf>
- https://link.springer.com/chapter/10.1007/978-1-4615-5645-9_9
- https://en.wikipedia.org/wiki/Zero-sum_game
- <https://ustpaul.ca/upload->
- <https://ahmedhanibrahim.wordpress.com/2017/01/17/generative-adversarial-networks-when-deep-learning-meets-game-theory/comment-page-1/>
- <https://www.researchgate.net/publication/304577699> Quantum Probabilistic Models