Application of Operations Research in Movies

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Abstract- **The movie industry prides itself in being one of the most renowned and technologically advanced industry across the globe. Management Science and Movies have seen a fair share of collaboration whilst producing movies from certain genres. Operations Research in seen under various overheads and has been observed to follow various psychological as well as scientific theories and disciplines. This research has been undertaken to analyse and interpret the use of technology used for simulations, illusions and projections in a movie. This research paper discloses the different types of technologies shown in movies and its relevance to the modern world where we see predictions made in the past years, come to life in the present. Through our findings, we have understood the basis of Operations Research and have concluded that its advent was a boon and that it will always play a crucial role in shaping the way we see movies in the future.**

Index terms- Operations Research, Movies, Artificial Intelligence, Robotics, Sci-Fi

INTRODUCTION

When compared with other modes of applications, Operation Research is a relatively new model of scientifically solving and improving end solutions as well as the basic construction of a subject. The movie industry portrays Operation Research in various aspects of its operations. The core of a movie is based on two aspects, the content and the visual dynamics. The visual dynamics which are formulated to stimulate and create an illusion in movies, particularly the genres of action and thrillers highlight the use of Operation Research. It is observed that the same kind of number analysis that has reshaped areas like politics and online marketing is increasingly being used by the entertainment industry. As the stakes of making movies become ever higher, the big shot movie industries like Hollywood lean ever harder on research to minimize guesswork. (The New York Times, 2003)

Today one of the most prospering industries is that of Movies, approximately a $136 billion-dollar industry, which has a foothold in every remote part of the world and advocates the most preferred medium of entertainment. Movies are and always have captured the entertainment industry because it is closest to the reality of what people are facing in their day to day lives. The emotional and personal relativity to a movie is what makes the movie industry what it is today.

We observe management sciences in every field as a medium of application relative of every business and venture. Similarly, in the movie business, management sciences foster the analytical aspects of the entire venture. Management Science can be defined as the discipline of using mathematical modeling and other analytical methods, to help make better business management decisions. In the business world, management science is used for forecasting through available data, research analysis in qualitative and quantitative measure, estimation, hypothesis development and the like.

Operations Research used in the Movies are used to develop illusions, foster simulations and create visual dynamics to enthrall the audience. It has been used on multiple occasions and has always left an individual viewing the final piece in awe of the projection. This research paper aims to understand its application and the basis under which Operations Research adopts such forces.

OVERVIEW OF THE INDUSTRY

The Movie Industry is one of most exciting and informative businesses in the world, a business where the revenue of a single feature film (such as Titanic), can approach or exceed $1 billion. There are thousands of screenplays rolling out at each moment as the clock ticks by and this industry attracts maximum level of fresh talent from all nooks and cranies of the world.

Every country, today, has its own specific entertainment industry which broadcasts regional

films, whilst there exists Hollywood and Bollywood, movies of which are enjoyed universally. Industry statistics reveal that the past ten years have marked an overall increase of at least 30% in average consumption and with the advent of the new computer-based technologies, cable markets and direct digital-delivery of motion pictures via satellite as well as the Internet, the figures are expected to increase dramatically over the next five years, creating an accelerated demand for original and re-run motion pictures.

Some of the greatest milestones seen by the movie industry include that of silent movies becoming audio friendly, black and white to colour and off lately, the improvement in technology for production of movies. The cost of production has also increased ten-fold today and the industry continues to flourish under the ever-growing demand of good content and dynamic visuals.

RESEARCH OBJECTIVES

- To understand the Application of Operations Research used for simulation and illusion creation in movies.
- To find the application of Operations Research under different umbrellas in filmography.
- To elaborate on the semblance between the reality and the advancements of technology and artificial intelligence.
- To outline the relevance of technology showcased in movies and its impact on the common man.
- To describe the workings, functions and the applications of Operation Research in movies based out of thrillers, fantasy and sci-fi.

RESEARCH METHODOLOGY

This research paper is qualitative in nature and is based out of past published research papers, news articles and the course material provided. The following research has been made based on the findings through the viewing of various movies which highlight the topic and showcase the applications of various theories and models. The secondary nature of our sources forms the basis of this research paper and the findings have been derived through them as primary data source was not imperative in nature to be conjured for the chosen field of study.

LITERATURE REVIEW

The movie industry is one of the oldest in the world, with the first filming of a movie being in Paris by Lumière brothers in the year 1895. This movie was based on the prototype of a Kinetoscope which enabled the individual to view a moving motion picture, one person at a time, showing the advent of science in the core operations form right in the first movie ever made. (National Science and Media Museum, 2011) Since then, the movie industry has gone through rapid transformations. With various genres coming up, the application of different methodologies studies different fields of management and operations the movie business. Right from the creation of the script to the shooting, the special effects added in through editing up till the release of the film, the entire timeline undergoes various operations which are timed efficiently, keeping in mind the patterns of the market forces and consumer behaviour.

While understanding the application of operations research in the field of movies, it is crucial to understand that the simulation and creation of illusions are backed by the application of various theories. Conceptual Metaphor Theory, which is the understanding of one idea in terms of another for example, the illusion created in terms of reality (Spiderman: Far from Home) and Embodied Simulation comprising of space and objects (Interstellar) are two such theories that govern the basis of the projections and illusions created. They tap the sensory-motor system of the mind and enhance the fictional subjectivity of the movie (Coëgnarts, 2017) The visual effects that are portrayed in the movies normally focus on the augmentation or modification of live action. Previsualisation, 2D to 3D conversion and computer graphics are used extensively in movies to enhance the visual effects (Squires, 2012)

It was almost a hundred years ago when operations research first showed its advent in the form of Artificial Intelligence on the silver screen, and the technology's prevalence has only grown since then. The relationship between humans and artificial intelligence in movies is often deemed to be

complicated as the operations research that form its basis are complex in nature. Throughout the years, we've seen film representations of AI that range from benevolent companions seeking to help their human counterparts to hostile machines bent on the total destruction of humankind (Tomlinson, 2018).

Another area of operations research is observed that in prediction and forecasting of the future through movies. The models used to create robots which showcase them in the earliest of films, (Metropolis, 1927 & I-Robot, 2004) show the relevance of such kind of existence in the modern world. It is commendable to see how the predictions made years ago, now portray relevance to the actual technological advances made.

The illusions created in movies are done using various techniques under the overhead of operations research. The Hypnotic Circle created by a white backdrop and beams is used effectively to create swirly projections in the background and the scene is shot at one crucial moment in order to capture the effect at its best. The Time Tunnel of Operation Tic-Toc, created an illusion of 'The infinite corridors of time' much more realistically along with the concept of forced perspective, which refers to an object appearing larger or smaller, closer or farther away and is involved with most of the natural optical illusions seen in fantasy and sci-fi films (Tuttle, 2018)

Human-Robot Interaction, another field of study supports the use of operations research while making of films that involve plots around robots. The algorithm of Wizard-of-Oz is predominantly used in making such kinds of films wherein an experimenter observes the interaction from a hidden location and remotely controls the robot accordingly (Bartneck, 2013). This technique aims at maximising the flow of movements in the most minimum of time and also tries to show the quick stimuli of a robot as opposed to a human. However, while doing so it shows that the robot is shown to have much more intelligence in the movie as opposed to reality.

In many movies, robots are portrayed as wanting to be human, despite their superiority in many aspects, such as strength or computational power. Steven Spielberg's movie "A.I" accepts the main premise that robots lack emotions, and hence Professor Allen Hobby, the main character, builds the robot 'David' that does possess the ability to love. Rational

problem-solving and calculations have been the prime focus of the development of computers and hence it comes as no surprise that Sci-Fi authors consider emotions to be a feature that all robots would lack. Such movies are made using computer programs by implementing the "OCC Model of Emotions" which distinguishes emotions involving a focus on events from those focused-on actions to those focused on objects (Ortony, Clore, & Collins, 1988)

Based on the application of Operations Research in movies, there have been various schools of thoughts that have been developed and different theories have been advocated over the due course of time. Our findings highlight the important aspects noticed while researching the chosen field of study.

FINDINGS

Operations Research highlighted through artificial intelligence in simple words means the technology using which the machines start to relate to the things around them in a setting with traits similar to that of a human being. The future of the technology today is that of Artificial Intelligence. We can already see robots coming up and taking over in various fields like manufacturing, assisted driving, services provided and the like.

AI is a major element in depiction of Operations Research in movies. The first movie to showcase artificial intelligence as core of the plot was Metropolis, 1927, directed by Fritz Lang, which was released in the German cinema. The trend then took on and the subsequent years saw the release of many other movies based on the artificial intelligence like the day the earth stood still, Wall-E, Star Wars, Star Trek & Tron.

Today, the Marvel Cinematic Universe (MCU) who is the leader in making blockbuster films that are globally acclaimed showcase plots which primarily revolve only around artificial intelligence. These movies drive the audience's desires in wanting the level of technology showcased in the movies at their disposal. Often these movies are projections of what the technology might become in the coming years and sometimes its matches the reality.

A very significant role of the MCU was that of JARVIS (Just A Rather Very Intelligent System). It is a natural-language user interface computer system

showcased in almost every other movie produced by the umbrella brand. The presence of this hypothetical user interface computer system can be felt today in the real world where we have devices like Amazon's Alexa, Google Home, Siri and Google Voice Assistant.

Similarly, the movie I, Robot (2004) showcased an environment in which the humans and the robots co-existed. Later in the year, 2016 a social humanoid robot was developed by Hong Kong based company Hanson Robotics which was a benchmark in the history of technology. Later in October 2017, Sophia the robot became the first robot citizen of any country and was given a title in the United Nations. On such similar grounds it is not wrong to say that the movies we see today which depict the progress in the field of technology may be reality someday.

Another great example from MCU is showcased in the movie Captain America: The Winter Soldier, in a scene with Jasper Sitwell (Maximiliano Hernández) where he explains the algorithm of Dr. Zola (Toby Jones) to Captain Steve Rogers (Chris Evans). The explanation given is that the 21st century is a digital book and the algorithm collects each person's data such as bank records, medical histories, voting patterns, e-mail ID's, phone calls and even SAT scores. Zola's algorithm evaluates people's past to predict their future and makes a list of the people who are now or will be a threat to Hydra in the future. The point brought up in this part is very real and relatable because nowadays everything is in digital form and everyone is connected to the internet in one way or the other and they share data without knowing its consequences. This data is being accessed by organisations that study human behaviour and sell this data to big production and manufacturing companies for setting up their plans and targeting customers. At times, this data is highly confidential and if it lands in the hands of wrong people then it could hamper with the country's security.

Recently, the social media conglomerate, Facebook faced allegations for sharing private and confidential data of its users to other companies and took a hit because of its actions. But today it is not difficult to access data of a person as all of it is available in one place or the other and it is not wrong to say that it is not far enough in the future that soon this type of assessment of such data may be carried out by agencies in matters of national security.

CONCLUSION

Often the portrayal in majority of the Sci-Fi movies is not that far from reality and there is a high possibility of such things happening in the near future as the technology is progressing at such a high rate that new forms of technology and its improved versions are emerging at a much faster rate. Many researchers and optimists have conducted studies which show that in the next 15-20 years, there are high possibilities that Artificial Intelligence will take over. Soon there will come a time when robots with AI will be scattered all over the face of the Earth and co-exist with humans. The gap between robots and humans is reducing day by day as scientists and researchers are dedicated to take technology to heights never achieved before. All of this has been possible because of the advent of Operations Research which although does not seem in the forefront, forms the backbone of many developments and ideologies. The years of research and progress in technology is on the verge of a major shift as economies are now looking to grow exponentially solely based on advancements in technology. Imaginary user interface computer systems, robotic humanoids and other machines may soon become a part of our reality and there will come a time when Operations Research will take a back seat only when it has advocated itself to the fullest, bearing fruits and advancement in the way we see our reality of today.

LIMITATIONS

- While carrying out our research, there was no concrete and elaborate data based on operations research in movies. This limited our analysis and interpretations. Majority of the data available was based on the storyline and other aspects of the movie, however the application of operations research was overlooked. With more resources our research paper would've been more concise and cohesive in nature.
- As there was no perfectly structured bias, the research objectives were formulated very broadly.

- Biases may have played into the conclusions of previous research papers forming our source for data.
- Since secondary resources are being used, the authenticity of information on the internet is questionable. Consideration of resources chosen is thus imperative.
- There are chances of attribution, exaggeration in prior research studies which hampers the credibility of our research papers, however, the information provided by us thus far, is true and to the best of our knowledge as it has been picked up from verified sources.

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