

Analysis of Emergence of Cities

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ABSTRACT : Emergence is the creation of systems of greater dimension than the elements that create it. Emergence is a phenomenon which is intrinsic to the way systems grow and evolve. Since the dawn of civilization, humans have made cities to support their societies. These cities, although they have been the source of progress, have never been fully understood, relying on traditions and trial-and-error processes for their growth. The reason for this is because they occur in the emergent dimension, and later attempts to plan them and bring them under the control of a central planner have resulted not in ordered cities, but disordered emergence. In this paper, we have discussed different aspects of emergence of cities and its analysis.

Keywords: City, population, urban planning, urbanization, optimization.

I. INTRODUCTION

At present, the population and economic activities in the metropolitan area is over-intensive, and this creates enormous pressure on urban operation. Developing a new city to expand urban space, optimize its structure, ease urban pressure coming from the population growth, and enhance the urban competitiveness, has become one of the key issues in the field of urban planning and management. In the context of this reality, the forecast and plan on urban spatial structure is very important to the development of urban economy. In the globalization environment, economic model changes substantially leading to population and industries to concentrate in the urban area where information, resources, capital, and human resources exchange rapidly among cities. This change leads to competition, originally among nations, gradually among cities [1]. One cannot predict the outcome of a city, but only try to determine the processes by which the city evolves. Studying the rules that enable emergence will allow us to build the systems to deal with the complexity of the universe.

II. CONTEXT

New cities are born at stochastically determined times when existing cities are larger than their optimal sizes and unstable. Emergence of cities is affected by several attributes within different facets ranging from geography to economics to environment. These variables have direct influences in the final characteristics of the emergent city [2]. In this work, primary aim is to determine idea behind optimal emergence of a new city in order to develop a new town. Determining optimal emergence from an initial setup is often a NP-class problem where solution cannot be expressed by formulae or algorithms. This work utilizes Genetic Algorithm (GA) in an attempt to discover an optimal emergence from a given arbitrary initial setup.

Genetic algorithms belong to the larger class of evolutionary algorithms (EA), which generate solutions to optimization problems using techniques inspired by natural evolution, such as inheritance, mutation, selection, and crossover. Genetic algorithms were developed by John Holland at the University of Michigan in the early 1970's [3]. They operate on a population (a group of individuals) of potential solutions applying the principle of survival of the fittest to generate improved estimations to a solution. At each generation, a new set of approximations is created by the process of selecting individuals according to their level of fitness and breeding them together using genetic operators inspired by natural genetics. This process leads to the evolution of better populations than the previous populations [4].

III. PURPOSE

There are some researches examine city formation in a country whose urban population is growing steadily over time, with new cities required to accommodate this growth [6]. There once was a time when designing new cities was one of the most ambitious and urgent tasks for any urban designer and planner. The purpose of studying city formation theory is to regulate the usage and construction of land. When a plan is drawn up it includes plans of where for example residential areas, workplaces, park and garden areas and traffic will be placed in the city. Town planning is divided into different planning levels. The more general plan directs how the more precise levels can be planned

IV. SIGNIFICANCE

Strategic urban planning is very important in ensuring sustainable utilization of land available in urban areas. A good urban planning plan can help to promote development in an area as well as solve some of the problems that face urban areas such as high population and sanitation problems. One of the importances of urban planning is to enable correction of mistakes that had earlier being made in the design of urban areas. Effective urban planning takes into consideration all the demographic factors in the area to ensure that the population has access to all the basic necessities of life.

V. MOTIVATION

Last few decades witness a dramatic increase in city population worldwide associated with excessive urbanization rates. This raises the necessity to understand the dynamics of urban growth process for sustainable distribution of available resources.

In India, with controversies on migration to cities and increasing infrastructure problems in metros like Mumbai and Delhi, the topic of urbanization is forcing itself on to the public sphere. There is a strong view worldwide, that cities that are planned and developed by private enterprises are the solution to these problems. India is going to experience rapid urbanization involving around 300 million people within the next two to three decades. This means that they will either drift to existing cities, thus congesting them further, or move into new cities. If it is new cities, then they will have to be either cities that are planned, or cities that evolve, more or less in an unplanned manner [5]. According to "A Vision of Smarter Cities" published by IBM, 500 new cities are to be developed in the next 20 years. This is equivalent to an increase of seven new cities at the size of city New York worldwide. And by 2050, 70% of the world population is expected to live in the cities. Although rapid urbanization is an indication of economic and social progresses for emerging countries especially, the global infrastructure is required to become smarter to cope with the environmental changes [1].

VI. LITERATURE SURVEY

In order to motivate this approach, it is useful to see how the extant literature has addressed them. The development of smart city can be categorized into two types, emerging city and redeveloped city [1].

- **Emerging Cities:** This is mostly found in emerging countries. A typical example is the Masdar Initiative, a future green city, of the United Arab Emirates, to be completed in 2015. Masdar is a city under construction with an area of 6.4 km² accentuating the world's very first city with zero waste, zero carbon emission, and zero radiation. The entire city is designed to be a gigantic recycling system for all resources. All energies employed in the city are from renewable energies, including solar, wind power, hydrogen, and green buildings implementing the concept of a sustainable city.
- **Redeveloped Cities:** This is found mostly in developed countries and often referred to as urban planning. A representative city is the Amsterdam Smart City Project in the Netherlands. Although exploiting existing infrastructure in the city, the energy efficiency is improved with additional sensors and control equipments. The landscape doesn't seem to change much after the redevelopment; however, through smart energy-saving technologies, carbon dioxide emission and energy consumption have been reduced substantially leading to an improved quality of life and environment. An urban plan can take a variety of forms including strategic plans, comprehensive plans, neighborhood plans, regulatory and incentive strategies, or historic preservation plans. Urban planning (urban, city, and town planning) is a technical and political process concerned with the control of the use of land and design of the urban environment, including transportation networks, to guide and ensure the orderly development of settlements and communities. It concerns itself with research and analysis, strategic thinking, architecture, urban design, public consultation, policy recommendations, implementation and management [7].

This research work focuses on the first type, Emerging city and will help in understanding the process of formation of a city on a particular land.

1.1 What is a city?

A city is a mesh of relationships between spaces. It begins once a space is built to provide a specialized function that is not fulfilled by another existing space, and the two spaces are linked together by a communication system.

1.2 Development Strategy

In this work, following important aspects are considered in order to ensure how an effective city can be formed in a particular place [1].

1.2.1 **Smart Environment:** The purpose is to establish a comfortable zoning guideline to make the best of land and to contemplate lifestyle and safety in designing architectures. Urban zoning concept is incorporated in planning disaster precaution system, against fire and typhoon especially. The area is further divided into regions, communities, and architecture and block model for management purposes accordingly.

1.2.2 **Smart Transportation:** The purpose is to minimize the impact from traffic by promoting the mobility and accessibility of public transportation in the city.

1.2.3 **Smart Lifestyle:** The purpose is to provide smart lifestyle in order to ensure Hazard prevention, health caring, power saving and sustainability, smart and convenient, comfortable and convenient, and leisure standard of living, also to ensure the success rate of services and products.

1.2.2 **Smart Economy:** Economy plays vital role in emerging city. Developing industries will boost job opportunities which will help to improve economy of the city.

In order to implement this development strategy, this work can use products and services to be provided in a particular land so as to analyze whether a city can be emerged in a particular area or not.

1.3 Urban Structure

Urban structure is the arrangement of land use in urban areas. Sociologists, economists, and geographers have developed several models, explaining where different types of people and businesses tend to exist within the urban setting. Urban structure can also refer to the urban spatial structure, which concerns the arrangement of public and private space in cities and the degree of connectivity and accessibility.

1.4 Urbanism

Since the dawn of civilization, humans have made cities to support their societies. These cities, although they have been the source of progress, have never been fully understood, relying on traditions and trial-and-error processes for their growth. The reason for this is because they occur in the emergent dimension, and later attempts to plan them and bring them under the control of a central planner have resulted not in ordered cities, but disordered emergence. Urbanity is the cooperation and mutual-support of large numbers of people in close proximity. It is inevitably emergent and to understand the science of emergence is the key to inventing the first fully emergent urbanism, capable of resolving all the complexities of a 21st century, sustainable city.

Designing cities is possible. The means of designing cities are, by the fact of the emergent nature of cities, completely different from modern architectural practice. Understanding those means is what will enable us to carry out the will of the billions of urbanites of the world: to live in more enjoyable, more beautiful environments, and be free to transform these environments. And hence it becomes important to understand and develop theory that gives the possibility to build a city.

1.5 Real World Scenarios

An evolution or an emergence of a city can be a slow or a sudden quick process. It can depend upon multiple factors, considering the resources, potentialities in different fields of the nation as a whole. Most of the times emergence of a city is occurred when basically the, main city has been over crowded or a city is actually needed when the scope of particular industries or educational institution is more.

The main factors for emergence/evolution of cities can be:

- The scope for an industry or educational institutions is given importance, i.e. the scale of activities like business trade, commerce etc.
- The scale of socio economic and cultural activities has dramatically grown and the co activities has been affected and thus the need of a new sister city is required.

Considering above mentioned factors, some real world scenarios can be considered as follows:

- Jamshedpur can be pointed out as the example for the first point of city evolved from industrial use. The city had evolved from the vision of Jamsetji Tata, when he conceptualized his dream city, was built on the ideology that it would comprise not merely Asia's first fully integrated steel plant, but also embody a step towards building a new Nation[9].
- Between 1951 and 1961, the population of Mumbai rose by 50% and in the next decade by 80.8%. This rapid growth was due to the increasing industrial and commercial importance of the city. It resulted in a deteriorated quality of life for many of the city's inhabitants. Expansion of the city was limited by the physical location of the city on a long, narrow peninsula with few mainland connections. The goal was to shift population and commercial activities from Mumbai to Navi Mumbai, which would be sustainable physically, economically and environmentally. The new city was projected to gain two million people and 750,000 jobs from the 1970s through the 1990s [8].

1.6 Optimization

Optimization is a process that finds a best or optimal solution for a problem. The process of city / town planning can be considered as optimization problem. In this work, primary aim is to determine idea behind optimal emergence of a new city in order to develop a new town. Determining optimal emergence from an initial setup is often a NP-class problem where solution cannot be expressed by formulae or algorithms. This work can further be implemented by using Genetic Algorithm (GA) and can be an attempt to discover an optimal emergence from a given arbitrary initial setup.

VII. CONCLUSION

From this study of analysis of emergence of cities, it can be concluded that planning of a new city or redeveloping an existing city is the area fall into optimization category of problem solving where computational techniques can be applied in order to study them more clearly. Further research can be carried out in different facets and an approach for solving this optimization problem of emergence of cities, Genetic Algorithm can be proposed in future.

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