LITERATURE REVIEW CHICAGO FORMAT EXAMPLE

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Though the theory of evolution in biology is scientifically formed only in the 19th century, ideas of the Creationist concept of the world are emerging in the mid-18th century. Thus, on the one hand, C. Linné in his work The Nature System (Systema naturae)[1] strictly advocates the principle: "The kind has as much as it was originally created", while Mr. Buffon in the work of Prirodopis (Histoire naturelle)[2] gradual change of species. His theory, based on the study of a large number of more sophisticated plants and animals, and extensive paleontological material, claims that "all animals come from an animal that by the time changed and perfected and produced all animal genera." Zoologist B. Lacépède interprets similarities between organisms commonly in the past, while mutual differences are the result of changeable environmental impacts[3]. He also mentions the survival of "better-endowed" species, approaching Darwin's theory of evolution. The Leibnitz philosophy of continuity (the "law of continuity") influenced naturalists in the 18th century, according to which nature does not make jumps, but is all linked to a series of gradual transitions. The first complete evolutionary theory was elaborated by J. B. Lamarck. For the first time the idea of a common origin of the organisms and their gradual development comes from the System of Animals without Spine (Système des animaux sans vertèbres),[4] while in his famous work Philosophie zoologique,[5] elaborates on a comprehensive evolutionary theory. The basis of Lamarck's theory is the slow and continuous process of transformation of species into nature. The process of change of species is conditioned by changes in the environment, changing the needs of the animal, so it acquires new habits. According to acquired habits, the animal uses certain organs, which are therefore stronger, while the unused organs weaken and disappear (e.g., the eyes in the mole). Changes arise due to the will of the animal, and its perseverance to satisfy their needs and habits, and are always in harmony with the environment, and animals are transmitted to offspring. For the development of his (historically most famous) theory of evolution in the mid-19th century, Darwin had a much more favorable terrain, because at that time, biology has a large number of facts that corroborate the theory of evolution of the living world. Significant results in comparative anatomy, comparative embryology (K. E. Baer, found similarities to vertebrate embryos) were achieved. T. Schwann in 1839 reveals the unity of the cellular structure of all living beings, and establishes the science of cells- cytology[6]. Ch. Lyell, in his work Principles of Geology, describes the gradual changes of the Earth by the slow and continuous action of natural factors (sun, wind, water, etc.).[7]

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1 Linnè Ch. *A General System of Nature*. Vol. I. (London: Lackington, Allen & Co., 1806)

2 Buffon G. L. L. *Histoire naturelle, générale et particulière, avec la description du cabinet du roy*. (Paris: L'Imprimerie Royale, 1749)

3 LaCépède M. le comte de (Bernard Germain Etienne de La Ville sur Illon). *Histoire naturelle de Lacépède* (Bruxelles: Bruylant-Christophe, 1856)

4 Lamarck Jean-Baptiste Pierre Antoine de Monet de. *Systême des animaux sans vertèbres; ou, Tableau général des classes, des classes, des orres et des genres de ces animaux*. (Paris: L'Auteur, 1801)

5 Lamarck Jean-Baptiste Pierre Antoine de Monet de. *Philosophie zoologique* , Paris: Museum d'Histoire Naturelle, 1809)

6 Schwann T. *Microscopical Researches into the Accordance in the Structure and Growth of Animals and Plants*, (London: Sydenham Society, 1839)

7 Lyell C. *Principles of geology, being an attempt to explain the former changes of the Earth's surface, by reference to causes now in operation*. (London: John Murray, 1833)

His theory of evolution primarily relies on natural selection, selection, which supports individuals better adapted to the environment, while the poorly tailored individuals die. The factor influencing the selection process Darwin divides on external (environment) and internal (later referred to as genetics). Darwin also proved that evolution has an adaptive character, and that the characteristics of organisms are conditioned by the development of environmental conditions throughout history. Contemporary evolutionary theories rely for the most part on Darwinism, with minor changes as a result of recent research.

Basic evolutionary processes take place within a particular species population. The evolution process begins when the genetic balance within the population is impaired, due to changes in the environment or within the population itself. The basic forces of evolution today are divided into three groups: mutation, natural selection and genetic drift. Mutation changes inherited factors in the population, and four basic sources differ: gene mutations, chromosome mutations, gene recombination, and chromosome recombination. Genomic mutation and chromosome mutation (change in number or chromosome structure) broadens the genetic diversity of the population. Recombination of genes is the crossing between two types of homozygous parents and the creation of heterozygous offspring, while chromosome recombination occurs during meiosis and is known as crossing-over. The second force of evolution, selection, is a natural choice between individuals - the bearers of various valuable hereditary information within the framework of the environment. It is precisely the principle of selection that Darwin's greatest contribution to the theory of evolution is the survival of the fittest to survive among individual organisms within the population. Contemporary theories consider natural selection as a force that affects the whole population (Darwin's selection is applied to the individual) and is considered to be the basic force that causes changes in the genetic balance and is influenced by environmental factors (temperature, precipitation, natural enemies, competition about food and living space, etc.). Genetic drift, as the third basic force of evolution, acts on small populations and causes the emergence of neutral or nonadoptive properties. As an example of this phenomenon, Darwin's flocks are taken on the Galápagos Island: in the small area live 13 different types of bream, with a large variety of shapes and sizes of beaks, depending on the eating habits of a particular species.

Evolution of a population can be seen as a process of optimization: a search for the one that best suits the conditions that govern in the environment. Species with higher genetic characteristics (that are passed on to genes) in the struggle for survival have a higher chance of creating offspring than the weaker individuals. In this way, a better genetic material dominates in the population, while the worse it suffers. Furthermore, reproducing genetic material is interrupted by parents, and children share the characteristics of their parents. In this way, each generation receives a new set of genetic material, where some individuals are better and some are worse than those of the previous generation, but the overall quality of the genetic material of the population as well as the quality of the best individuals grow. The genetic algorithm was developed by J. Holland as a simplified imitation of natural evolution that takes place on abstract entities, with the main idea of exploring the robustness of artificial systems.[9]

[9] Holland J. H. *Adaptation in natural and artificial systems: An introductory analysis with applications to biology, control, and artificial intelligence*. (Oxford: Michigan Press, 1975)

The robustness of artificial systems is quite significant: a set of adaptations and changes to such systems should be performed less frequently or can be completely eliminated; adaptive systems can make their job longer and more reliable. And as the best example of robustness, biological systems can be taken: self-sufficiency, self-sufficiency, redundancy, and reproduction are just some of the qualities that exist in nature, while the same are only traces of artificial systems. Genetic algorithms imitate the evolving processes of natural evolution: the problem that is solved is the environment in which a population of individuals lives. All individuals (usually called chromosomes) of some populations are represented by a particular data structure (number, sequence, matrix, tree, etc.), which represents a coded potentially solution to the problem that is analogous to the genetic information of the living organism. Each chromosome assigns a measure of quality to show how much that chromosome is close to the required solution. This quality measure is called fitness, and the function of determining goodness is called the function of goodness. After that, a new one is created from the old population so that the process of imitating natural selection selects the surviving survivors. New generation geneticists are then deployed to genetic agents that work on the genetic material of a chromosome and on higher order operators that create new chromosomes by combining several older chromosomes ("parents"). The whole procedure (chromosome quality assessment, selection and application of genetic operators) is repeated until the algorithm is stopped. At the initialization of the genetic algorithm, the initial population of individuals is also created. Chromosomes are usually created by random selection from the problem domain. As already mentioned, the genetic algorithm is executed until the condition of stopping is met. The stop condition is determined depending on the problem being solved and the conditions under which the problem is solved. Thus the condition of stopping may be that the goodness of 95% of individuals does not deviate from some ε, the expiration of the given time interval, a number of generations, or finding the correct solution. When implementing the genetic algorithm, the main problem is the proper selection of the chromosome presentation, the way of decoding the chromosome, thus obtaining inputs for the function of goodness and determining the very function of goodness.

The chromosome represents one potential solution of the problem that is solved, encoded in a certain way, and contains all the data that characterize a single entity. Since the coding method can greatly influence the genetic algorithm's effectiveness, the proper choice of data structure to be used is a very important step in the implementation of the genetic algorithm. For the chosen method of displaying the solution, it is also necessary to define genetic operators, where it is important that the operators do not create new ones that represent impossible solutions, because they lose much of the efficiency of the algorithm. There are many different views that are used in genetic algorithms to solve different problems. In the optimization of functions are usually used binary (chromosome is represented by bits of bits) and displayed in real numbers, in various combinatorial problems are used series of numbers, fields, binary trees, etc. The role of the selection process in the genetic algorithm is to preserve and transfer the good properties of the individuals into the new population. Selecting (imitating natural selection) selects good individuals who will play a part in reproduction in the new generation, keeping good genetic material, transferred to a new population, and bad genetic material is lost.

First, obviously, how the selection could be realized would be that the individuals in the current population are sorted by goodness, to select the N - M9 of the best individuals to be transferred to the new population, and which will produce the M descendants by reproduction. In practice it has been shown that such a selection process results in a fast convergence algorithm - the optimization process finishes in only a few iterations, and there is a risk of "jamming" the process into a local optimum. The reason for this lies in the fact that even bad individuals can possess quality parts of genetic information. It is therefore necessary to ensure a selection process that will give poor individuals a chance (of course, smaller than the good ones) to survive and participate in the reproduction.

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