1. Genetic engineering involves manipulating an organism's genes using biotechnology to change its genetic makeup.
2. New DNA is acquired by isolating and copying genetic material through recombinant DNA approaches or artificial manufacturing.
3. The term "genetic engineering" was first coined by Jack Williamson in his 1951 science fiction novel Dragon's Island.
4. Genentech, established in 1976, was the first genetic engineering company, producing the first genetically engineered human protein (somatostatin) in E. coli.
5. Genetic engineering has the potential to replace imperfect genes with functioning ones, addressing severe genetic disorders in humans.
6. Genetic engineering is a crucial tool in research, enabling the study of specific gene functions and traits.
7. Genetically modified organisms (GMOs) are engineered to produce drugs, vaccines, and other products.
8. Crops are genetically engineered to improve food safety, increase yield, nutritional value, and withstand environmental pressures.
9. They are called genetically modified organisms (GMOs).
10. Genetic engineering makes insect and weed management easier in crops, indirectly increasing crop yield.
11. The first commercialized genetically modified food was a tomato with late-ripening, extending its shelf life.
12. Transposable elements like Minos, Hermes, piggyBac, and Mos1 are used to genetically transform agriculturally important insect species.
13. Genetic engineering, like the EnviropigTM, can reduce agricultural pollution by producing animals that breakdown dietary phosphorus in their manure.
14. Intellectual property concerns arise from the patenting of genetically engineered animals and the methods used to create them.
15. Ethical considerations in genetic engineering include concerns over animal welfare, privacy, and community concerns.
16. Genetic engineering in human enhancement could lead to biomedical interventions improving human form or functioning beyond health restoration.
17. Biomedical interventions have improved human lives by attempting to restore deficient functions such as vision, hearing, or mobility.
18. Recent advances include inserting artificial retinas to give blind patients partial sight.
19. Researchers have linked the brain of a paralyzed man to a computer chip, restoring partial movement to nonresponsive limbs.
20. Synthetic blood substitutes, developed through genetic engineering, could be used in human patients in the future.
21. The primary goal is to manipulate an organism's genes to bring about specific changes.
22. New DNA is acquired through recombinant DNA approaches or artificial manufacturing.
23. The term was coined by Jack Williamson in 1951, pre-dating the recognition of DNA's role in inheritance.
24. Genentech, established in 1976, was the first genetic engineering company, producing the first genetically engineered human protein.
25. It can replace imperfect genes with functioning ones to correct genetic disorders.
26. It allows for the study of specific genes and their functions.
27. Drugs, vaccines, and other products can be harvested from genetically modified organisms (GMOs).
28. They improve food safety, increase yield, nutritional value, and withstand environmental pressures.
29. They are called genetically modified organisms (GMOs).
30. To make insect and weed management easier and indirectly increase crop yield.
31. The first was a tomato with late-ripening, extending its shelf life.
32. Transposable elements like Minos, Hermes, piggyBac, and Mos1 are used for genetic transformation.
33. It produces animals like the EnviropigTM that break down dietary phosphorus, reducing pollution.
34. Concerns arise due to the patenting of genetically engineered animals and methods.
35. Ethical considerations include concerns over animal welfare, privacy, and community opinions.
36. It has applications in biomedical interventions to enhance human form or functioning.
37. Technology has improved lives by restoring deficient functions, such as vision, hearing, or mobility.
38. Advances include inserting artificial retinas to provide partial sight to blind patients.
39. Linking a paralyzed person's brain to a computer chip can restore partial movement to nonresponsive limbs.
40. Synthetic blood substitutes, developed through genetic engineering, could be used in human patients in the future.
41. They include strictly phenotypic involvement, somatic non-heritable genetic intervention, and germline heritable genetic intervention.
42. Genome editing is considered more accurate, efficient, cost-effective, and has greater potential for applications in human health.
43. Concerns arise due to the potential heritability of genetic modifications in future generations.
44. It is assumed to have become minimized, indicating that humans are at a potential 'end-point' of evolution.
45. They could address environmental, ecological, and social challenges, ensuring human adaptation.
46. It could be crucial for human survival and well-being, addressing challenges that traditional evolution may be too slow to adapt to.
47. Bacteriophages are viruses that infect bacteria. They were independently discovered by Frederick Twort and Felix d‘Herelle in the early 20th century.
48. Research on phage therapy lagged due to the broader efficacy of antibiotics, but the rise of antibiotic-resistant bacteria renewed interest.
49. Phages can contribute to prophylaxis and therapy, treating bacterial infections and potentially serving as vaccine platforms.
50. Phages, as natural viruses, can stimulate immune responses, making them potential scaffolds for developing vaccine stages.
51. Genetic enhancements in humans include drugs, model animals for research, and gene therapy.
52. Human insulin was initially manufactured in bacteria through genetic engineering.
53. Gene therapy involves replacing defective genes with effective ones in humans, addressing diseases at the genetic level.
54. It became the first gene therapy treatment accepted for clinical use in 2012.
55. It can introduce biological pathways in microalgal cells to directly produce fuel products with minimal processing.
56. Efforts focus on improved pre-processing, processing efficiency, and developing less recalcitrant feedstocks.
57. Maize and sugarcane are major biofuel-producing grasses, contributing to ~85 billion liters of bioethanol in 2016.
58. The delayed onset of stress, induced by depletion of water reserves, is a key trait indicating drought resilience in plants.
59. Research, particularly in Arabidopsis thaliana, has identified candidate genes likely to confer drought resistance in crop species.
60. While mechanisms are essential, considering the entire system is important for developing crops unaffected by drought.
61. They include strictly phenotypic involvement, somatic non-heritable genetic intervention, and germline heritable genetic intervention.
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79. Research, particularly in Arabidopsis thaliana, has identified candidate genes likely to confer drought resistance in crop species.
80. While mechanisms are essential, considering the entire system is important for developing crops unaffected by drought.
81. Genetic engineering is any intervention aimed at improving human characteristics, capacities, or well-being, even without pathology.
82. Phenotypic interventions have limited societal influences, while genetic interventions, especially heritable ones, have broader implications.
83. Genome editing is radical due to its efficiency, reduced cost, and time. It has applications in preventing and treating diseases.
84. The assumption is that within the human species, the force of natural selection has been minimized, potentially reaching an 'end-point' of evolution.
85. Phages can contribute to preventing and treating bacterial infections, and they can stimulate an immune response.
86. The revenue reached US$ 112.2 billion.
87. R&D expenses jumped 14% over the year 2015, reaching about US$ 38.8 billion.
88. They represent nearly three quarters of the US biotech revenue and over half of total biotech revenue worldwide.
89. The pioneer and largest major area is therapeutic purposes on humans.
90. It has led to advancements like the Human Genome Project, revealing crucial information about the human genome.
91. Only 1.1% of the genome is spanned by exons.
92. It led to the discovery of 1800 disease genes, over 2000 genetic tests, and various biotech products applied in clinical trials.
93. It aimed to map and understand common patterns of human genetic variation, providing valuable data for genetic studies.
94. NGS has made WGS of an individual more accessible and is no longer a difficult challenge for scientific research.
95. It aims to identify and catalogue all genetic abnormalities found in 50 different types of cancer, contributing to cancer prevention and treatment.
96. It launched the largest cohort study, sequencing the whole genomes of one million volunteers, paving the way for personalized care.
97. It aims to alter genetic mutations, either gain-of-function or loss-of-function, to restore normal function and treat diseases.
98. It was successful in treating tyrosinemia disease due to Fah mutations in hepatocytes.
99. Improving specificity is crucial to avoid unwanted genomic modifications, and methods like Cas9 nickase and shorter guide RNA are used.
100. It interacts accurately with target genes, improving specificity in multiple human cell lines.
101. It was approved in June 2016, marking a significant step in applying gene editing technologies in clinical settings.
102. It aimed to treat advanced stages of myeloma, sarcoma, and melanoma by removing specific genes and introducing therapeutic ones.
103. Combining CRISPR/Cas9 with other technologies is expected to enhance the effectiveness of cancer treatment.
104. Ensuring the technique is safe is crucial, and the trial aimed to demonstrate safety, especially concerning breakage site accuracy.
105. It is expected to lead the molecular diagnostics market with a projected growth to US$ 4.2 billion by 2023.
106. It forms a small segment globally but is projected to have the fastest growth rate.
107. It is expected to focus on infectious diseases, cancer, pharmacogenomics, and screening for inherited diseases.
108. It has made rapid progress, with genetically modified (GM) maize acres growing rapidly, and GM soybean acres anticipated to expand.
109. Studies aim to increase biotech products and address problems related to environmental pollution.
110. It introduces biological pathways in microalgal cells for direct production of fuel products, reducing processing requirements.
111. Efforts focus on improved pre-processing, processing efficiency, and developing less recalcitrant feedstocks.
112. They remain the world‘s largest biofuel-producing feedstocks, contributing to ~85 billion liters of bioethanol in 2016.
113. It explores altering or introducing genes, including gene promoters and transcription factors, to enhance drought resilience.
114. The delayed onset of stress induced by depletion of water reserves is a key measurable trait indicating drought resilience.
115. Revenue increased by a significant 14% from 2015 to reach US$ 112.2 billion in 2016.
116. They represented nearly three quarters of the US biotech revenue, securing over half of the total biotech revenue worldwide.
117. Therapeutic applications on humans are considered pioneering and the largest major area in biotechnology.
118. The project primarily used the hierarchical shotgun sequencing method, revealing that only 1.1% of the genome is spanned by exons.
119. It led to the discovery of 1800 disease genes, over 2000 genetic tests, and various biotech products applied in clinical trials.
120. The project aimed to map and understand common patterns of human genetic variation, accelerating the understanding of genetic variants affecting health.
121. NGS has made WGS more accessible, with rapid advancements in technology, enabling efficient analyses of multiple genes.
122. TCGA aimed to identify and catalogue genetic abnormalities in 50 cancer types, contributing to improved diagnostics, treatment standards, and cancer prevention.
123. PMI, through a large cohort study, aims to sequence the whole genomes of one million volunteers, providing insights into individual differences for personalized medicine.
124. The goal is to alter genetic mutations, either gain-of-function or loss-of-function, to restore normal function and treat diseases.
125. It was successful in treating tyrosinemia disease due to Fah mutations in hepatocytes, demonstrating its therapeutic potential.
126. Improving specificity is essential to avoid unintended genomic modifications, and methods like Cas9 nickase and shorter guide RNA are utilized.
127. The variant interacts accurately with target genes, significantly improving specificity in multiple human cell lines.
128. It marked the approval for applying CRISPR/Cas9 technology in human cell trials, paving the way for clinical applications.
129. The trial focused on treating advanced stages of myeloma, sarcoma, and melanoma by removing genes encoding PD-1 protein and introducing therapeutic ones.
130. Combining technologies is expected to synergize and improve the effectiveness of cancer treatment.
131. Ensuring safety is crucial to address concerns about accuracy, and the first trial aimed to demonstrate safety, especially regarding breakage site accuracy.
132. The market is projected to reach US$ 4.2 billion by 2023, being the fastest-growing segment due to its rapid advancements.
133. The sector has rapidly progressed, with GM maize acres growing and GM soybean acres anticipated to expand in the coming years.
134. Studies aim to increase biotech products and address environmental pollution problems related to genetic engineering.
135. It introduces biological pathways in microalgal cells for direct fuel production, with a focus on improving pre-processing and feedstock development.
136. Maize and sugarcane are major contributors, accounting for ~85 billion liters of bioethanol production in 2016.
137. It explores altering or introducing genes, including promoters and transcription factors, to enhance drought resilience, with a focus on the delayed onset of stress.
138. TCGA aimed to identify genetic abnormalities in 50 different types of cancer, characterizing the genomic landscape of 33 cancer types.
139. It marks a crucial step in applying gene editing technologies to human cell trials, opening doors for potential clinical applications.
140. An increase in chronic disorders, an aging population, and a trend toward personalized medicine.
141. They detect and identify disease-associated DNA or RNA sequences with high precision.
142. PCR and its advanced variants are highly efficient, constituting over 75% of the market share.
143. Screening and detecting infectious diseases, genetic disorders, and cancer at the early stage.
144. They yield 100% sensitivity for detecting influenza A subtypes H1N1, H3N2, and H5N1.
145. To monitor HIV-1-infected patients and assess transmitted drug resistance, contributing to better patient care.
146. Quantification uses RT-PCR, NASBA, or branched chain DNA, while genotyping employs TruGene and ViroSeq systems.
147. Tests, such as VERSANT and COBAS, quantify viral DNA, aiding in the screening and drug response measurement.
148. It provides more accurate results for detecting bacterial infections in vaginal specimens.
149. It treats or reduces diseases by transferring genes, gene fragments, or oligonucleotides into patient cells.
150. In vivo gene therapy directly approaches target cells using viral or non-viral vectors for gene transfer.
151. Ex vivo gene therapy selects cells from the patient, cultures them, genetically modifies them, and then returns them to the patient's body.
152. The US has been at the forefront, representing 62.9% of global gene therapy clinical trials.
153. It contributed over 95% (around US$ 235 million) in 2015 and is expected to grow substantially in the next 7 years.
154. Modern genetic techniques aid in vaccine design by detecting antigens, inducing immune responses, and generating T cell vaccines.
155. It involves mimicking the binding sites of broadly neutralizing antibodies to create antigens for vaccine development.
156. CARs enhance immune response, and they are designed to express specific receptors for antigens to eliminate abnormal cells.
157. DNA vaccines, well-tolerated and cost-effective, are used to stimulate immune responses and can be combined with molecular adjuvants.
158. The US has been a leader since 1996, commercializing various GM crops such as maize, soybean, cotton, and others.
159. Bt corn variants, with events like MIR604 and SmartStax, provided high levels of protection against corn rootworm and European corn borer.
160. Advancements in biotechnology and changes in intellectual property rights make seed selection a profitable research direction.
161. The genetic event and promoter influence the amount, type, and location of endotoxin production, impacting the hybrid's protection.
162. Cisgenesis, CRISPR/Cas9, zinc finger nuclease technology, synthetic genomics, and others.
163. It contains events expressing multiple endotoxins (Cry1A.105, Cry2Ab2, Cry1F, Cry3Bb1, Cry34Ab1, and Cry35Ab1) for broad pest resistance.
164. DNA vaccines are well-tolerated, safe, low-cost, and stimulate a high potential for immune system activation, making them promising for cancer immunotherapy.
165. Early-stage cancer detection is crucial for better prognosis, and molecular diagnostic tests focus on screening and identifying cancer at its early stages.
166. NGS, microarray, and FISH methods contribute to disease detection in various scenarios, offering versatility in infectious diseases, genetic disorders, and cancer.
167. Viral RNA quantitative assays monitor HIV-1 viral load, aiding in treatment decisions and assessing transmitted drug resistance.
168. Quantifying HBV DNA is vital for assessing infection severity, and commercial kits like VERSANT and COBAS are commonly used for high sensitivity.
169. Multiplex-PCR allows the identification of Neisseria meningitidis, Streptococcus pneumoniae, and Haemophilus influenzae type B, which are common causes of bacterial meningitis.
170. The challenge lies in microbial resistance, and rapid detection methods, like PCR, help in timely identification of antibiotic-resistant strains.
171. The COBAS AmpliPrep/COBAS TaqMan HIV-1 test quantitates HIV-1 viral load with a detection range of 50-1,000,000 copies/ml.
172. Gene therapy addresses genetic disorders like ADA deficiency, infectious diseases like HIV, and various cancers, showcasing its broad applications.
173. Directly transferring genes into target cells aims to change cell phenotypes temporarily or permanently, leading to apoptosis or recovery of healthy cellular functions.
174. CRISPR/Cas9 and synthetic genomics overcome limitations in conventional breeding, allowing precise genetic modifications in plant biotechnology.
175. The US has been a leader in commercializing GM crops since 1996, and factors like advancements in biotechnology and changes in intellectual property rights have fueled rapid growth.
176. Seed selection is crucial for profits, and changes in intellectual property rights influence research directions by enabling companies to earn profits from developed seeds.
177. CRISPR/Cas9 enables precise genetic modifications in plants, providing benefits like targeted gene editing and overcoming limitations of conventional methods.
178. SmartStax hybrid uses multiple events expressing different endotoxins to provide broad protection against pests, addressing challenges in pest resistance management.
179. Reverse vaccinology and monoclonal antibody techniques contribute to designing vaccines by mimicking binding sites, with success seen in preventing diseases like RSV.
180. Roundup Ready Corn is a glyphosate-resistant corn variety, first commercialized by Monsanto in 1996.
181. Liberty Link Corn, developed by Bayer CropScience, is resistant to glufosinate herbicides.
182. Pioneer HiBred used chimeric RNA/DNA oligonucleotides for targeted gene modification, showing its applicability in crop improvement.
183. Oligonucleotide-mediated gene manipulation is advantageous as it modifies genes within the chromosomal context, avoiding issues like position effects and transgene silencing.
184. MON 87419 had stacked tolerance to glufosinate and dicamba, while MZIR098 had glufosinate-resistance and stacked insect resistance, providing growers with more herbicide options.
185. Glyphosate-resistant weeds led to the development of crops resistant to multiple herbicides, providing growers with diverse options and modes of action.
186. The trait, provided by the insertion of the gene for "cold shock protein B," enhances drought tolerance and conserves soil moisture, reducing yield loss under drought conditions.
187. DroughtGard maize hybrids offer improved hydro efficiency, and their planted hectares increased by 45% from 2015 to 2016.
188. US regulators approved 44 single maize events since 1996, with traits including insect resistance, herbicide tolerance, drought tolerance, and stacks thereof.
189. The majority of US soybeans come from genetically modified seeds, with Roundup Ready® soybeans expressing a glyphosate-tolerant trait.
190. RReady2YieldTM represented a new generation of herbicide-tolerant soybeans, and 24 GM soybean events were approved by 2016.
191. Scientists inserted a plasmid with EPSPS and related elements, including an enhanced 35S promoter and a nopaline synthase transcriptional termination element, using a gene gun.
192. Glyphosate-resistant weeds prompted the development of crops resistant to multiple herbicides, ensuring prolonged effectiveness and weed management strategies.
193. Downregulation of FAD2-1A and -1B genes increased oleic and stearic soybean oils, achieved through seed-specific expression of posttranscriptional gene-silencing elements.
194. Low phytic acid mutations improved nutrient absorption and reduced phosphorus pollution in animal feed.
195. Flax, papaya, potatoes, radicchio, canola, rice, squash, alfalfa, sugar beets, and tomatoes are among the crops approved for commercialization, with various traits introduced.
196. GM crops face concerns about risks to human health, prompting the US government to implement strict ethical regulations and invest in research to ensure safety.
197. New biotech apples and potatoes are expected to move quickly through the regulatory pipeline, featuring disease resistance or nutrition enhancement.
198. CRISPR/Cas9 technology was used to remove base pairs in the mushroom's genome, reducing polyphenol oxidase activity and preventing browning, making it the first CRISPR-edited organism approved.
199. CRISPR/Cas9 technology has been used to develop new varieties of crops, providing benefits like disease resistance and improved characteristics.
200. CRISPR/Cas9 enables cisgenic breeding without inserting foreign genes, leading to lower regulatory hurdles compared to transgenics.
201. CRISPR/Cas9 was used to manipulate the CD163 gene, conferring PRRSV-resistance in pigs, providing a practical means to eliminate a major source of economic hardship.
202. Roundup Ready Corn is a glyphosate-resistant corn variety, commercially launched by Monsanto in 1996.
203. Liberty Link Corn is resistant to glufosinate herbicides and differs in its herbicide resistance trait compared to Roundup Ready Corn.
204. Pioneer HiBred used chimeric RNA/DNA oligonucleotides to confer imidazolinone herbicide resistance, showcasing its applicability in crop improvement.
205. Oligonucleotide-mediated gene manipulation is advantageous as it modifies genes within their normal chromosomal context, avoiding issues like position effects and transgene silencing.
206. MON 87419 had stacked tolerance to glufosinate and dicamba, while MZIR098 had glufosinate-resistance and stacked insect resistance, providing growers with versatile herbicide options.
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216. Low phytic acid mutations improved human absorption of iron and zinc, while also reducing phosphorus pollution in animal feed.
217. Flax, papaya, potatoes, radicchio, canola, rice, squash, alfalfa, sugar beets, and tomatoes received commercialization approval, featuring various introduced traits.
218. GA is an optimization algorithm inspired by natural selection, employing survival of the fittest principles.
219. New populations in GA are created by applying genetic operators iteratively, including chromosome representation, selection, crossover, mutation, and fitness function computation.
220. Random initialization ensures diversity in the population, allowing GA to explore a wide search space.
221. Selection, crossover, and mutation operations contribute to the evolution of the population, and these steps are repeated until a new population is formed.
222. GA dynamically changes the search process by adjusting crossover and mutation probabilities, adapting to different stages of evolution.
223. The crossover rate (Cp) in GA influences the probability of producing offspring through the single-point crossover operator.
224. The mathematical analysis of GA involves the parameter R, dynamically changing with the number of evolutionary generations, ensuring balance and diversity.
225. In the early stages, low similarity ensures that the new population doesn't destroy the initial genetic schema, preserving diversity and preventing premature convergence.
226. The Schema theorem guides the replacement of original schemas with modified ones, contributing to diversity preservation in the population.
227. Algorithm 1 pseudocode illustrates the main steps of a classical genetic algorithm, including initialization, selection, crossover, mutation, and population update.
228. Genetic operators in GAs include encoding schemes, crossover, mutation, and selection, collectively contributing to the search process.
229. Encoding schemes are vital in GAs for representing problem domains, with examples like binary, octal, hexadecimal, permutation, value-based, and tree encoding.
230. Binary encoding represents genes as strings of 1s and 0s in GAs, but challenges include issues like epistasis and natural representation in certain engineering design problems.
231. Roulette wheel selection in GAs determines the participation of individuals in the reproduction process based on their fitness values.
232. Rank selection in GAs is a modification of roulette wheel selection, using ranks instead of fitness values to reduce premature convergence.
233. Tournament selection in GAs involves selecting individuals based on fitness values in pairs, with higher fitness individuals added to the next generation pool.
234. Stochastic universal sampling in GAs is an extension of roulette wheel selection, improving the even distribution of selection probabilities by using random starting points.
235. Boltzmann selection in GAs is based on entropy and sampling, addressing premature convergence by introducing randomness and preventing information loss.
236. Elitism selection in GAs ensures that the best individual always propagates to the next generation, preventing the loss of the fittest solution.
237. Order crossover in GAs involves copying parts of parent chromosomes to generate offspring, especially useful for ordering problems.
238. Partial matched crossover in GAs maintains the ordering of solutions and contributes to better exploration, especially in multi-objective scheduling problems.
239. Shuffle crossover in GAs was introduced to reduce bias from other crossover techniques, shuffling values before crossover and restoring them afterward.
240. Reduced surrogate crossover in GAs assumes that better individuals result from diverse parent chromosomes and reduces unnecessary crossovers in similar compositions.
241. GA variants are classified into real and binary coded, multiobjective, parallel, chaotic, and hybrid GAs based on chromosome representations and objectives.
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265. GA variants are classified into real and binary coded, multiobjective, parallel, chaotic, and hybrid GAs based on chromosome representations and objectives.
266. Real-coded GAs differ by representing chromosomes with real values, offering robustness and accuracy, while binary-coded GAs face challenges like Hamming cliffs and precision issues.
267. Crossover operators are crucial in real-coded GAs, and researchers have modified them to enhance performance in continuous search spaces, introducing operators like simulated binary crossover (SBX).
268. Simulated binary crossover (SBX) in real-coded GAs overcomes Hamming cliffs and precision challenges, ensuring better exploration and avoiding premature convergence.
269. MOGAs aim to generate the optimal Pareto Front without disturbing other fitness functions, differing from simple GAs in fitness function assignment.
270. Convergence, diversity, and coverage are main goals in multiobjective GAs, ensuring a well-distributed and representative set of solutions.
271. Multiobjective GAs are categorized into Pareto-based and decomposition-based, differing in how they handle Pareto dominance and subproblem decomposition.
272. Pareto dominance in multiobjective GAs, introduced by Fonseca and Fleming, determines the superiority of one solution over another in multiple objectives.
273. NSGA is introduced to address Pareto dominance, but it faces challenges such as a lack of elitism, the need for sharing parameters, and high computation complexity.
274. NSGA-II introduces elitism to address diversity maintenance challenges in Pareto fronts, providing a fast and efficient non-dominated sorting approach.
275. Dynamic crowding distance, proposed by Luo et al., enhances NSGA-II's diversity maintenance by adapting the crowding distance to evolving population characteristics.
276. NPGA is introduced to handle multimodal problems in MOGAs, using tournament selection and Pareto dominance to maintain diversity and make informed selections.
277. Pareto-based approaches may face performance deterioration in many-objective problems due to challenges in handling numerous objectives and maintaining diversity.
278. Decomposition-based multiobjective GAs decompose problems into subproblems, solving them simultaneously and exchanging solutions among neighboring subproblems.
279. MOGLS achieves multiobjective optimization, using random weights for parent selection and local search to explore different regions of the search space.
280. C-MOGA extends MOGA by introducing a cellular structure, performing selection within cells to enhance the cooperative evolution of solutions.
281. CI-MOGA introduces immigration to enhance diversity, allowing individuals to move between cells and maintain a diverse set of solutions.
282. Tchebycheffs-based genetic algorithm (MOTGA) is introduced for convergence and diversity, utilizing the Tchebycheff scalar function to generate non-dominated solutions.
283. Opposition-based learning contributes to D-MOGA by improving weight vector generation, providing balance between solution diversity and exploration of the search space.
284. Parallel genetic algorithms aim to enhance computational efficiency and solution quality by distributing individuals across processors.
285. Parallel genetic algorithms are categorized into master-slave, fine-grained, and multi-population coarse-grained. Master-slave GAs distribute fitness function computations over several processors.
286. Fine-grained parallel genetic algorithms utilize parallel computers to solve real-life problems, with genetic operators interacting within their neighborhoods.
287. Multi-population coarse-grained parallel genetic algorithms involve exchanging individuals among subpopulations, facilitating diversity and information sharing.
288. Master-slave parallel GAs maximize computation power by utilizing a large number of processors, but they may face challenges in high computational time.
289. Hong et al. used master-slave parallel GAs for solving data mining problems, implementing fuzzy rules with parallel computation of fitness functions.
290. Sahingzo implemented master-slave parallel GAs for UAV pathfinding problems, distributing genetic operator executions across processors for parallel computation.
291. Opposition-based learning in D-MOGA improves weight vector generation, enhancing the balance between solution diversity and exploration of the search space.
292. Parallel genetic algorithms address challenges by maximizing memory bandwidth and arranging threads to harness the computational power of GPUs.
293. Control parameters in multi-population coarse-grained parallel genetic algorithms are transferred during migration, influencing the exchange of individuals among subpopulations.