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| **Title:** Biogeography-Based Optimization  **Main author:** Dan Simon  **Year:** 2008  **Link:**  Member Name: Haider Ali 15140101 |
| **Journal:** IEEE TRANSACTIONS ON EVOLUTIONARY COMPUTATION  **IF:** 8.124  **Pages:** 12 |
| **Structure of the paper**   1. Abstract 2. Introduction 3. Biogeography(inspiration) 4. Biogeography Based Optimization    * Migration    * Mutation    * BBO Definitions and Algorithm    * Difference between BBO and other population base algorithm 5. Aircraft Engine health estimation 6. Simulation results    * Benchmark Results    * Sensor Selection Results 7. Conclusion 8. Appendix 9. References |
| **Detail of figures and plots**  **Regarding inspiration**   1. Species model of a single habitat.   **Regarding Mapping of the inspiration**   1. Illustration of two candidate solutions to some problem.   **Related to experimental studies**  2- Average sensor selection results of BBO without mutation, and BBO with probability-based mutation.  **Schematic views of engineering problem**   1. Schematic of an aircraft turbofan engine. |
| **Experimental setup and experimentation**   * **Experiment-1:** Performed on 14 benchmark functions   + **Compared with:** Es, DE, GA, PBIL, PSO, SGA, ACO   + **Outputs:** *AVERAGE* MINIMA, CPU Time   + **Output structure:** Tabular * **Experiment-2:** Performed on 14 benchmark functions   + **Compared with:** Es, DE, GA, PBIL, PSO, SGA, ACO   + **Outputs:** *Best* MINIMA   + **Output structure:** Tabular * **Experiment-2:** OPTIMIZATION RESULTS FOR THE SENSOR SELECTION PROBLEM.   + **Compared with:** Es, DE, GA, PBIL, PSO, SGA, ACO   + **Outputs:** *Best* Minimum, Mean Minimum   + **Output structure:** Tabular |
| **A brief summary of the proposed work [one paragraph]**  BBO Algorithm is inspired by concept of biogeography in which we study behavior of different species that how they immigrate and emigrate from one place (Iceland or habitat) to another in algorithm we have a population of habitats in which each habitat is a solution to problem and every habitat have its own immigrate and emigrate probability which depend on fitness (habitat suitability index). Algorithm basically have three steps in first step population of habitats is initialized and second step (Modification) habitats are selected with immigration probability and then replace with randomly selected SIV (suitability index variable) of other habitats which are can be selected with emigration probability and then third step (Mutation) in which priori probability is calculated for every habitat and then selected with this probability and then mutated (replaced) with a random SIV and algorithm go back to second step and keep on running until stopping criteria. |
| **Critical review**  BBO varies for exploration and exploitation it explores more if we have less SIV (suitable index variable) and larger population size and exploit more if we have more SIV than Population size. So BBO’s exploration and exploitation depends on our problem type (as we need to encode our problem in SIV) and population size ratio. |
| **Any idea to upgrade the concept**  Author also mention some of ideas to enhance this algorithm and there is an addition of one more that if introduce concept of reproduction of species like if some species live for longer time in a habitat than this species become more mature this may show elitism in our algorithm. |
| **Name five papers from references, you’d like to read next**  **1. A. Wallace*, The Geographical Distribution of Animals (Two Volumes)* Boston, MA: Adamant Media Corporation, 2005.**   1. **D. Simon and D. L. Simon, “Kalman filter constraint switching for turbofanengine health estimation,” *Eur. J.Control*, vol. 12, pp. 331–343, May 2006.** 2. **M. Dorigo and T. Stutzle*, Ant Colony Optimization*. Cambridge, MA: MIT Press, 2004.** 3. **H. Beyer*, The Theory of Evolution Strategies*. New York: Springer, 2001.** 4. **R. Eberhart and Y. Shi, “Special issue on particle swarm optimization,” *IEEE Trans. Evol. Comput.*, vol. 8, no. 3, pp. 201–228, Jun. 2004.** |
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