Section E1

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Finding roots of a nonlinear equation using bat-inspired algorithm

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Numerical approaches that have been suggested to solve nonlinear equations generally require the derivative information of the desired equation and are capable of giving one approximation at a time. Bat inspired algorithm [BA] provides novel solutions for those problems. It does not use the derivative information of the equation and it considers the problem of finding all the roots of a nonlinear equation simultaneously. The results revealed that the performance of the proposed BA in solving nonlinear equations was better than almost all of the available numerical approaches. The analysis was done with 24 randomly selected equations within the domain [-10, 10]. The number of roots found by BA out of all the roots within the range and the time required to give the roots are the main results obtained. The analysis is limited to problems with at most 10 roots. The error tolerance (accuracy) of the approximation was $10^{(-3)}$. The results were encouraging as it achieves the goal of finding all the roots simultaneously within the domain for all 24 equations. The execution time of the algorithm was also very short. This is a significant finding when compared with the famous Newton's method as the Bat algorithm was also capable of giving approximations for multiple root situations.

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