Abstract

There are several issues related to the software maintenance but a more important critical one highlighted in this work is tracking over the behavior of software maintenance. This is because inferring the knowledge about the maintenance of software products in advance is really a difficult process which is pointed out by many researchers. Considering this issue the main purpose of this work is inspired based on Bio-Inspirational behavior-based optimization technique with an objective to predict software maintainability. In this paper, an attempt has been made to use subset of class-level object-oriented metrics in order to predicting software maintainability. Here, different subset of Object-Oriented software metrics have been considered to provide requisite input data to design the models for predicting maintainability using Neuro-Particle Swarm Optimization algorithm (NPSO). This technique is applied to estimate maintainability on dataset collected from two different case studies such as Quality Evaluation System (QUES) and User Interface System (UIMS). The performance parameters used in this technique has been evaluated based on the basis of Magnitude of Relative Error (MRE), Mean Magnitude of Relative Error (MMRE) and Prediction.
References

1. Kan, S.H., Metrics and models in software quality engineering. 2002: Addison-Wesley Longman Publishing Co., Inc.
2. Coleman, D., et al., Using metrics to evaluate software system maintainability. Computer, 1994. 27(8): p. 44-49.
3. Singh, B. and S.P. Kannoja, A Model for Software Product Quality Prediction. 2012
4. John Michura, Miriam A. M. Capretz, and Shuying Wang, Extension of Object-Oriented Metrics Suite for Software Maintenance, Software Engineering, Volume 2013 (2013)
5. Marcio P. Basgalupp, Rodrigo C. Barros, Duncan D. Ruiz, Predicting software maintenance effort through evolutionary-based decision trees, SAC ’12 Proceedings of the 27th Annual ACM Symposium on Applied Computing pp 1209-1214, March 2012
6. Yahya Tashhtoush, Mohammed Al Maolegi, Bassam Arkok, The Correlation among Software Complexity Metrics with Case Study, International Journal of Advanced Computer Research (ISSN (print): 2249-7277 ISSN (online): 2277-7970) Volume-4 Number-2 Issue-15 June-2014 414
7. M. Thwin and T. Quah, "Application of neural networks for software quality prediction using object oriented metrics," Journal of Systems and Software, vol. 76, no. 2, pp. 147-156, 2005.
8. S. Misra, "Modeling design/coding factors that drive maintainability of software systems," Software Quality Journal, vol. 13, no. 3, pp. 297-320, 2005.
9. A Kaur, K Kaur, R Malhotra, “Soft Computing Approaches for Prediction of Software Maintenance Effort”, International Journal of Computer Applications), vol 1, no. 16, pp : 0975 – 8887, 2010.
10. MO. Elish and KO. Elish “Application of TreeNet in predicting object-oriented software maintainability: A comparative study,” European Conference on Software Maintenance and Reengineering, pp 1534-5351, DOI 10.1109/CSMR
11. Ruchika Malhotra, Anuradha Chug, Application of Group Method of Data Handling model for software maintainability prediction using object oriented systems, International Journal of System Assurance Engineering and Management, ISSN 0975-6809Volume 5Number 2, 2014
12. M.M. Ibrahiem, E.I. Emamy and S. Ramakrishnan, “On the Application of Various Probabilistic Neural Networks in Solving Different Pattern Classification Problems”, World Applied Sciences Journal , vol. 4, no. 6, pp. 772-780, 2008, ISSN 1818- 4952.
13. Martin CL, Applying a general regression neural network for predicting development effort of short-scale programs. Neural Comput Appl, 20:389–401, 2011
14. Ruchika Malhotra and Anuradha Chug, Software Maintainability Prediction using Machine Learning Algorithms, Software engineering : an international Journal (SeiJ), Vol. 2, no. 2, September 2012
15. Lov Kumara, Debendra Kumar Naikb, Santanu Ku. Rathc, Validating the Effectiveness of Object-Oriented Metrics for Predicting Maintainability, Third International Conference on Recent Trends in Computing (ICRTC’ 2015)
16. Eberhart, R. C. and R. W Dobbins (1990). Neural Network PC Tools: A Practical Guide. Academic Press, San Diego, CA.
17. Eberhart, R. C. and Kennedy, J. A new optimizer using particle swarm theory., Proceedings of the Sixth International Symposium on Micromachine and Human Science,
Nagoya, Japan. pp. 39-43, 1995

18. Kennedy, J. and Eberhart, R. C. Particle swarm optimization. Proceedings of IEEE International Conference on Neural Networks, Piscataway, NJ. pp. 1942-1948, 1995

19. Li, W. and S. Henry, Object-oriented metrics that predict maintainability. Journal of systems and software, 1993. 23(2): p. 111-122.

20. B.A. Kitchenham, L.M. Pickard, S.G. MacDonell, M.J. Shepperd," What accuracy statistics really measure," IEEE ProceedingsSoftware vol. 148, no. 3, pp 81–85, 2001.

21. S. Conte, H. Dunsmore, and V. Shen," Software engineering metrics and models". Book, Menlo Park, CA: Publisher: Benjamin-Cummings publishing co., ISBN: 0-8053-2162-4, 1986.

22. N.E. Fentom, S.L. Pfleeger, “Software metrics: A Rigorous and practical approach, second edition," PSW publishing Company, 1997.

Index Terms

Computer Science  Software Engineering

Keywords

PSO, NPSO, QUES, UIMS, MRE, MMRE