結合客觀量測與主觀意見以進行道路施工環境影響評估審查之風險預測與管理 = Integrating objective measurement and ...

陳嘉伸、劉豐瑞

E-mail: 9708085@mail.dyu.edu.tw

摘 要

中文摘要 我國環境影響評估法規定各種開發行為，在規劃階段應同時 考量環境因素，若對環境有不良影響者，應提出環境影響評估說 明書或報告書。在準備環境影響評估說明書或報告書時，編撰人 員最關心的事：審查結論風險的預測與審查結論的風險管理。先 前研究提出利用案例式推理(Case-Based Reasoning, CBR)結合模 糊推理(Fuzzy Reasoning)推測審查結論的機率，並以重要-績效分 析法(Important Performance Analysis, IPA)進行環境因子審查結論 風險分析。然而，在先前研究中是以客觀的量測值直接當作為環 境影響的顯著性(Significance)，並以此當作案例式推理(CBR)的特 徵值，作為預測系統的輸入。雖然其驗證通過率雖高達96.7%， 但仍有小部分風險預測不夠精確。事實上，環境影響評估說明書 或報告書的審查是以委員會的形式來進行，更明確而論，一個開 發案之環境影響是否具有顯著性，是一個依據客觀資訊的主觀意見(Subjective judgment)。因此，單以客觀量測值來進行審查風險 預測，可能是造成預測系統不夠精確的原因。因此，本研究提出： ⑴找出影響各個因子顯著性的準則(主觀意見)；⑵以模糊推理方 式來將客觀量測與主觀意見融合以評估顯著性；⑶以資料採礦 (Data mining, DM)中的分類樹(Classification tree)的技術來進行風 險預測與管理。最後，與先前研究之成效進行比較。在本研究進 行客觀量測與主觀意見之結合後，依據其顯著性程度而成功分類 出有條件通過、進入第二階段審查與不通過之案例，使得其先前 研究96.7%之驗證通過率，提高至100%。 關鍵詞：環境影響評估、模糊推理、主觀意見、顯著性、分類樹

關鍵詞 : 環境影響評估 ; 模糊推理 ; 主觀意見 ; 顯著性 ; 分類樹

目錄

參考文獻

參考文獻 1. Aamodt, A., Plaza, E., (1994). Case-based reasoning: foundational issues, methodological variations, and system approach, AI Communications 7(1), 39-59. 2. Antunes P, Santos R, Jordao L. The application of Geographical Information Systems to determine environmental impact significance. Environ Impact Asses Rev 2001;21:511 – 35. 3. Altunkaynak, A., Ozger, M., Cakmakc?, M., (2005). Fuzzy logic modeling of the dissolved oxygen fluctuations in Golden Horn. Ecological Modelling 189(3/4), 436-446. 4. Andriantiatsaholiniaina, L.A., Kouikoglou, V.S. and Phillis, A.P., (2004). Evaluating strategies for sustainable development: fuzzy logic reasoning and sensitivity analysis, Ecological Economics 48(2), 149-172. 5. Astel, A., (2007). Chemometrics based on fuzzy logic principles in environmental studies. Talanta 72(1), 1-12. 6. Beattie RB., (1995). Everything you already know about EIA (but don ’ t often admit). EIA Review ;15(2):109 – 14. 7. Barreto-Neto, A., de Souza Filho, C.R., (2008). Application of fuzzy logic to the evaluation of runoff in a tropical watershed 23(2), 244-253. 8. Borri, D., Concilio, G. and Conte, E., (1998). A fuzzy approach for modeling knowledge in environmental systems evaluation, Computer Environment and Urban Systems 22(3), 299-313. 9. Bojorquez-Tapia LA, Ezcurra E, Garcia O. Appraisal of environmental impacts and mitigation measures through mathematical matrices. J Environ Manag 1998;53:91 – 9. 10. Chan, F.T.S., (2005). Application of a hybrid case-based reasoning approach in electroplating industry. Expert Systems with Applications 29(1), 121-130. 11. Cheng, C. B., (2003). A fuzzy inference system for similarity assessment in case-based reasoning systems--An application to product design, Mathematical and Computer Modelling 38, 385-394. 12. Dai, J., Lorenzato, S. and Rocke, D.M., (2004). A knowledge-based model of watershed assessment for sediment, Environmental Modelling & Software 19(4), 423 – 433. 13. de Siqueira Campos Boclin, A., de Mello, R., (2006). A decision support method for environmental impact assessment using a fuzzy logic approach. Ecological Economics 58(1), 170-181. 14. Dixon, B., (2005). Groundwater vulnerability mapping: A GIS and fuzzy rule based integrated tool. Applied Geography 25(4), 327-347. 15. Dzeng, R.J., Lee, H.Y., (2004). Critiquing contractors' scheduling by integrating rule-based and case-based reasoning, Automation in Construction 13(5), 665 – 678. 16. Duinker Peter N, Beanlands Gordon E. (1986). The significance of environmental impacts: an exploration of the concept. Environ Manage;10(1):1-11. 17. Dubois, D., Prade, H., (1980). Fuzzy Sets and Systems: Theory and Applications, New York, USA: Academic Press. 18. Fleming, G., van der Merwea, M., McFerren, G., (2007). Fuzzy expert systems and GIS for cholera health risk prediction in southern Africa. Environmental Modelling & Software 22(4), 442-448. 19. Gonzalez, B., Adenso-Diaz, B. and Gonzalez-Torre, P.L., (2002). A fuzzy logic approach for the impact assessment in lca, Resources, Conservation and Recycling 37(1), 61-79. 20. Graham Wood, (2008) Thresholds and criteria for evaluating and communicating impact significance in environmental statements: ‘ See no evil, hear no evil, speak no evil ’ ? Environmental Impact Assessment Review 28(1) 22 – 38 21. Hatzikos, E.V., Bassiliades, N., Asmanis, L., Vlahavas, I., (2007). Monitoring water quality through a telematic sensor network and a fuzzy expert system. Expert Systems 24(3), 143-161. 22. Humphreys, P., McIvor, R., Chan, F., (2003). Using case-based reasoning to evaluate supplier environmental management performance, Expert Systems with Applications 25(2), 141-153. 23. Jacobo, V.H., Ortiz, A., Cerrud, Schouwenaars, R., (2007). Hybrid expert system for the failure analysis of mechanical elements. Engineering Failure Analysis 14(8), 1435 – 1443. 24. Kontic B. (2000). Why are some experts more credible than others? Environmental Impact Assessment Review;20(4):427 – 34. 25. Kalapanidas, E., Avouris, N., (2001). Short-term air quality prediction using a case-based classifier, Environmental Modelling & Software 16(3), 263-272. 26. Kaster, D.S., Medeiros, C.B., Rocha, H.V., (2005). Supporting modeling and problem solving from precedent experiences: the role of workflows and case-based reasoning, Environmental Modelling & Software 20(6), 689-704. 27. King, J.M.P., Banares-Alcantara, R., Manan, Z.A., (1999). Minimising environmental impact using CBR: an azeotropic distillation case study. Environmental Modelling & Software 14(5), 359 – 366. 28. Kolodner, J., (1993). Case-based reasoning, Morgan Kaufmann Publishers, San Mateo. 29. Kowalski, Z., Meler-Kapcia, M., Zieli?ski, S., Drewka, M., (2005). CBR methodology application in an expert system for aided design ship's engine room automation. Expert Systems with Applications 29(2), 256-263. 30. Lee, B.H., Scholz, M., Horn, A., Furber, A.M., (2006). Constructed Wetlands: Prediction of Performance with Case-based Reasoning (Part B), Environmental Engineering Science 23(2), 332-340. 31. Lee, H. K., Oh, K.D., Park, D.H., Jung, J.H. and Yoon, S.J., (1997). Fuzzy expert system to determine stream water quality classification form ecological information, Water Science Technology 36(12), 199-206. 32. Liu, K.F.R., (2007b). Evaluating environmental sustainability: An integration of multiple-criteria decision-making and fuzzy logic. Environmental Management 39(5), 721-736. 33. Liu, K.F.R., (2007a). A high-level fuzzy Petri nets model for integrating quantitative and qualitative decision-making. Journal of Uncertainty, Fuzziness & Knowledge-Based Systems 15(3), 253-284. 34. Marsili-Libelli, S., (2004). Fuzzy prediction of the algal blooms in the Orbetello lagoon. Environmental Modelling & Software 19(9), 799-808. 35. Metternicht, G., Gonzalez, S., (2005). FUERO: foundations of a fuzzy exploratory model for soil erosion hazard prediction. Environmental Modelling & Software 20(6), 715-728. 36. Marling C.R., Petot G.J., Sterling, L.S., (1999). Integrating case-based and rule-based reasoning to meet multiple design constraints, Computational Intelligence 15(3), 308-332. 37. Martilla, J.A. and James, J.C., (1977). Importance-performance analysis, Journal of Marketing 41(1), 77-79. 38. Mouton, A.M., Schneider, M., Depestele, J., Goethals, P.L.M.; De Pauw, N., (2007). Fish habitat modelling as a tool for river management. Ecological Engineering 29(3), 305-315. 39. Miyashita, K., Sycara, K., (1995). CABINS: A framework of knowledge acquisition and iterative revision for schedule improvement and reactive repair, Artificial Intelligence Journal 76(1-2), 377-426. 40. Mizoguchi, R., Miyashita, K., Sycara, K., (1996). Modeling ill-structured optimization tasks through cases, Decision Support Systems 17(4), 345-64. 41. Nunez, H., Sanchez-Marre, M., Cortes, U., Comas, J., Martinez, M., Rodriguez-Roda, I., Poch, M., (2004). A comparative study on the use of similarity measures in casebased reasoning to improve the classification of environmental system situations, Environmental Modelling & Software 19(9), 809-819. 42. Ocampo-Duque, W., Ferre-Huguet, N., Domingo, J.L.,

Schuhmacher, M, (2006). Assessing water quality in rivers with fuzzy inference systems: A case study. Environment International 32(6), 733-742. 43. Pal, K., (1999). An approach to legal reasoning based on a hybrid decision-support system. Expert Systems with Applications 17(1), 1 – 12. 44. Phillis, Y.A., Andriantiatsaholiniaina, L.A., (2001). Sustainability: an ill-defined concept and its assessment using fuzzy logic, Ecological Economics 37(3), 435-456. 45. Prato, T., (2007). Assessing ecosystem sustainability and management using fuzzy logic. Ecological Economics 61(1), 171-177. 46. Prato, T., (2005). A fuzzy logic approach for evaluating ecosystem sustainability. Ecological Modelling 187 (2/3), 361-368. 47. Prentzas, J., Hatzilygeroudis, I., (2007). Categorizing approaches combining rule-based and case-based reasoning. Expert Systems 24(2), 97-122. 48. Remm, K., (2004). Case-based predictions for species and habitat mapping, Ecological Modelling 177(3/4), 259-281. 49. Reynold, K.M., Jensen, M., Andreasen, J. and Goodman, I., (2000). Knowledge-based assessment of watershed condition, Computers and Electronics in Agriculture 27(1), 315-333. 50. Riesbeck, C.K., Schank, R.C., (1989). Inside Case-based reasoning, Erlbaum, Northvale, NJ. 51. Riordan, D., Hansen, B.K., (2002). A fuzzy case-based system for weather prediction, Engineering Intelligent Systems 10(3), 139-146. 52. Rodriguez-Roda, I., Sanchez-Marre, M., Comas, J., Baeza, J., Colprim, J., Lafuente, J., Cortes, U., Poch, M., (2002). A hybrid supervisory system to support WWTP operation: implementation and validation, Water Science and Technology 45(4-5), 289-297. 53. Rossille, D., Laurent, J.F., Burgun, A., (2005). Modelling a decision-support system for oncology using rule-based and case-based reasoning methodologies, International Journal of Medical Informatics 74(2-4), 299-306. 54. Roussel, O., Cavelier, A., Werf, H.M.G., (2000). Adaptation and use of a fuzzy expert system to assess the environmental effect of pesticides applied to field crops, Agriculture, Ecosystems and Environment 80(1), 143 – 158. 55. Sadiq, R., Al-Zahrani, M.A., Sheikh, A.K., Husain, T., Farooq, S., (2004). Performance evaluation of slow sand filters using fuzzy rule-based modelling. Environmental Modelling & Software 19(5), 507-515. 56. Schank, R.C., Abelson, R.P., (1977). Scripts, Plans, Goals and Understanding: an Inquiry into Human Knowledge Structures, L. Erlbaum, Hillsdale, NJ. 57. Verdenius, F., Broeze, J., (1999). Generalised and instance-specific modelling for biological systems, Environmental Modelling & Software 14(5), 339-348. 58. Vicente-Agustin Cloquell-Ballester, Rafael Monterde-Diaz, Victor-Andres Cloquell-Ballester, Maria-Cristina Santamarina-Siurana, (2007) Systematic comparative and sensitivity analyses of additive and outranking techniques for supporting impact significance assessments, Environmental Impact Assessment Review 27(1) 62 – 83 59. Wilkins H. (2003) The need for subjectivity in EIA: discourse as a tool for sustainable development. Environmental Impact Assessment Review 23(4):401 – 414. 60. Wang, W., Cheung, C.F., Lee, W.B., Kwok, S.K., (2007). Knowledge-based treatment planning for adolescent early intervention of mental healthcare: a hybrid case-based reasoning approach. Expert Systems 24(4), 232-251. 61. Werf, H.M.G. and Zimmer, C., (1998). An indicator of pesticide environmental impact based on a fuzzy expert system, Chemosphere 36(10), 2225-2249. 62. Wieland, R., Mirschel, W., (2008). Adaptive fuzzy modeling versus artificial neural networks 23(2), 215-224. 63. Yong, M., Yong-zhen, P., Xiao-lian, W., Shu-ying, W., (2006). Intelligent control aeration and external carbon addition for improving nitrogen removal. Environmental Modelling & Software 21(6), 821-828. 64. Yanger, R., (1980). On a general class of fuzzy connectives, Fuzzy Sets and Systems 4(3), 235-242. 65. Zaheeruddin, Jain, V.K., (2006). A fuzzy expert system for noise-induced sleep disturbance. Expert Systems with Applications 30(4), 761-771. 66. Zadeh, L.A. (1965) Fuzzy Sets. Information and Control 8, 338-353. 67. 劉建華，(2003)，「案例式推理應用於河川生態工法成本估算之 研究」，中華大學營建管理研究所碩士論文。 68. 劉豐瑞, 賴嘉宏, (2007/a)，結合模糊分析網路程序法與模糊邏輯 於營建工程環境影響評估(I):理論研究, 科學與工程技術期刊 3(2): 55-67. 69. 劉豐瑞, 賴嘉宏, (2007/b)，結合模糊分析網路程序法與模糊邏輯 於營建工程環境影響評估(II):案例研究, 科學與工程技術期刊 3(2): 69-84, 70. 余志偉，(2007)，結合案例式推理與模糊推理於道路工程環境 影響評估審查結論預測，大葉大學環境工程研究所碩士論文。