

Sgent-Based Workflow Management System Architecture

劉培棋、楊豐兆

E-mail: 9314385@mail.dyu.edu.tw

ABSTRACT

Due to personnel are fluid and cost of personnel is becoming more and more expensive, workflow automation has increased its productivity and reduce expenses effectively, it is the expectative objective of government and enterprise. Multi-agent System has become the standard paradigm in software development. Developers are able to construct more effective and flexible applications with agent characters, such as autonomy, initiative, reactivity, social ability and so on. The paper applies the Generic Workflow Production Structure provided by WfMC and combines multi-agent technology to present an agent-based workflow management system. This system is implemented by using JADE toolkit. The paper makes a conference information system as an example to construct the agent-based workflow management system. Agents that live in the system assist to handle tasks to reduce working time, cost and probable mistakes.

Keywords : workflow automation、 Multi-agent System、 Generic Workflow Production Structure、 workflow management system

Table of Contents

封面內頁 簽名頁 授權書.....	iii	中文摘要.....	v	英文摘要.....	viii
要.....	vi	誌謝.....	vii	目錄.....	viii
表目錄.....	xi	圖目錄.....	xiii	第一章 緒論.....	1
論.....	1	1.1 研究背景.....	1	1.2 研究動機.....	2
機.....	1	1.3 研究目的.....	2	1.4 研究範圍與限制.....	3
制.....	3	1.5 研究方法與步驟.....	3	第二章 文獻探討.....	5
討.....	5	2.1 軟體代理人.....	5	2.1.1 代理人定義.....	5
義.....	5	2.1.2 FIPA 組織.....	7	2.1.3 代理人通訊語言(Agent Communication Language).....	8
Language).....	8	2.1.4 多重代理人系統.....	13	2.1.5 建構代理人之工具.....	14
2.1.5.1 JADE.....	14	2.1.6 Gaia.....	20	2.1.6.1 分析階段.....	21
段.....	21	2.1.6.2 設計階段.....	26	2.2 工作流程.....	28
程.....	28	2.2.1 工作流程的定義.....	28	2.2.2 流程自動化的分類.....	29
類.....	29	2.2.3 工作流程之組成元素.....	32	2.2.4 工作流程管理系統.....	37
統.....	37	2.2.5 工作流程系統參考模型.....	38	第三章 以代理人為基礎的工作流程管理系統架構分析與設計.....	41
管理系統架構分析與設計.....	41	3.1 需求分析.....	41	3.2 ABWMSA 架構設計.....	43
計.....	43	3.2.1 角色模式(role model).....	44	3.2.2 互動模式(interaction model).....	49
model).....	49	3.2.3 代理人模式(agent model).....	51	3.2.4 服務模式(services model).....	52
.....	52	3.2.5 交際模型(acquaintance model).....	53	3.2.6 ABWMSA 架構圖.....	54
圖.....	54	3.3 小結.....	55	第四章 以代理人為基礎的工作流程管理系統架構實作.....	56
構實作.....	56	4.1 代理人通訊語言.....	56	4.1.1 ABWMSA 之代理人通訊語言.....	56
言.....	56	4.1.2 ABWMSA 中的Ontology 規格.....	58	4.1.2.1 物件描述.....	59
述.....	59	4.1.2.2 功能與提議描述.....	64	4.2 ABWMSA 中的代理人設計.....	67
計.....	67	4.2.1 SimpleBehaviour.....	68	4.2.1.1 CyclicBehaviour.....	69
CyclicBehaviour.....	69	4.2.1.2 OneShotBehaviour.....	71	4.2.2 CompositeBehaviour.....	72
.....	72	4.2.2.1 ParallelBehaviour.....	72	4.2.2.2 SequenceBehaviour.....	74
SequenceBehaviour.....	74	4.2.2.3 FSMBehaviour.....	75	4.3 小結.....	77
結.....	77	第五章 以代理人為基礎的研討會工作流程管理系統.....	78	5.1 角色模型.....	79
型.....	79	5.2 代理人模型(agent model).....	82	5.3 交際模型(acquaintance model).....	83
.....	83	5.4 研討會資訊系統建置.....	83	5.4 小結.....	92
章 結論.....	93	6.1 研究結論.....	93	6.2 研究貢獻.....	93
獻.....	93	6.3 未來方向.....	94	參考文獻.....	95
獻.....	95				

REFERENCES

1. Y. Shoham, "Agent Oriented Programming," *Artificial Intelligence*, Vol. 60, No. 1, pp. 51-92, 1993.
2. M. Wooldridge, *An Introduction to MultiAgent Systems*. London : John Wiley& Sons Ltd, 2002.
3. D. Georgakopoulos, M. Hornick and A. Sheth, "An Overview of Workflow Management: From Process Modeling to Workflow Automation Infrastructure," *Distributed and Parallel Databases*, Vol. 3, No. 2, pp. 119-153, 1995.
4. The Workflow Management Coalition . <http://www.wfmc.org>.
5. The Workflow Reference Model. <http://www.wfmc.org/standards/standards.htm>
6. JADE Homepage. <http://jade.cse.it/>.
7. P. Maes, "Agents that Reduce Work and Information Overload," in *Communications of the ACM*, Vol. 37, No.7, pp. 31-40, 1994.
8. O. Etzioni, and D.S. Weld, "Intelligent Agents on the Internet: Fact, Fiction, and Forecast," *IEEE Expert*, Vol. 10, No. 4, pp. 44-49, 1995.
9. M. Wooldridge and N.R. Jennings, "Intelligent Agents: Theory and Practice," *The Knowledge Engineering Review*, Vol. 10, No. 2, pp. 115-152, 1995.
10. L. Steels, "When are robots intelligent autonomous agents?," pp. 3-9, 1995.
11. H.S. Nwana, "Software Agents: An Overview," *Knowledge Engineering Review*, Vol. 11, No. 2, pp. 205-244, 1996.
12. M. Wooldridge and N.R. Jennings, "Intelligent Agents: Theory and Practice," *The Knowledge Engineering Review*, Vol. 10, No. 2, pp. 115-152, 1995.
13. The Foundation for Intelligent Physical Agents. <http://www.fipa.org>.
14. Henrik Stormer, "Task Scheduling in Agent-Based Workflow," *International ICSC Symposium on Multi-Agents and Mobile Agents in Virtual Organizations and E-Commerce (MAMA'2000)*, Dec. 11-13 2000, Wollongong Australia.
15. FIPA Specifications Policy. <http://www.fipa.org/docs/output/f-out-00003/f-out-00003A.html>.
16. FIPA 97 Part 2 Version 2.0: Agent Communication Language Specification. <http://www.fipa.org/specs/fipa00003/>.
17. FIPA Abstract Architecture. <http://www.fipa.org/specs/fipa0000>.
18. publicly available implementations of agent platforms. <http://www.fipa.org/resources/livesystems.html>.
19. Agentcities. <http://www.agentcities.net/index.jsp>.
20. S. McCready, "There is more than one kind of Work-flow Software," *Computerworld*, Nov. 2, 1992.
21. D. Hollingsworth, *The Workflow Reference Model – The Workflow Management Coalition Specification*, "WfMC TC00-1003, Workflow Management Coalition, 1995.
22. Workflow Management Coalition, *Interface 1: Process Definition Interchange Process Model, version1.1*, The Workflow Management Coalition Specification, 1999.
23. M. Wooldridge, N. R. Jennings and D. Kinny, "Methodology for Agent-Oriented Analysis and Design," in *Proceedings 3rd Int. Conference on Autonomous Agents*, pp. 69-76, 1999.
24. M. Wooldridge, N. R. Jennings and D. Kinny, "The Gaia Methodology for Agent-Oriented Analysis and Design," *Journal of Autonomous Agents and Multi-Agent Systems*, Vol. 3, No. 3, pp. 285-312, Mar 2000.
25. M. Dinsoreanu, I. Salomie and K. Puztai, "On the Design of Agent-Based Systems using UML and Extensions," in *Proceedings of the 24th Int. Conference Information Technology Interfaces ITI*, pp. 205-210, 2002.
26. Q. Chen, P. Chundi, U. Dayal and M. Hsu, "Dynamic Agents", *International Journal on Cooperative Information Systems*, Vol. 8, No 2&3, pp. 195-223, 1999.
27. M.L. Griss, "My Agent Will Call your Agent But Will It Respond?," *Software Development Magazine*, 2000.
28. FIPA Agent Management Specification. <http://www.fipa.org/specs/fipa0023>.
29. Stevens R, Goble CA, Bechhofer S, "Ontology based knowledge representation for bioinformatics," *Briefings in Bioinformatics*, Nov. 1, No. 4, pp. 398-414, Nov. 2000.
30. FIPA Ontology Service Specification. <http://www.fipa.org/specs/fipa00086>.
31. F.M.T Brazier, B.M Dunin-Keplicz, N.R Jennings and J. Treur, "DESIRE: Modelling Multi-Agent Systems in a Compositional Formal Framework," *International Journal of Cooperative Information Systems (IJCIS)*, Vol. 6, No.1, pp. 67 – 94, Mar 1997.
32. N.C. Narendra, "AdaptAgent: Integrated Architecture for Adaptive Workflow and Agents," *The 2001 International Conference on Artificial Intelligence*, June 25-28 2001, Nevada USA.