UNIVERSITY OF LONDON
IMPERIAL COLLEGE OF SCIENCE, TECHNOLOGY AND MEDICINE

EXAMINATIONS 1998

MEng Honours Degrees in Computing Part IV
MEng Honours Degree in Information Systems Engineering Part IV
MSci Honours Degree in Mathematics and Computer Science Part IV
MSc Degree in Advanced Computing
for Internal Students of the Imperial College of Science, Technology and Medicine

This paper is also taken for the relevant examinations for the
Diploma of Membership of Imperial College
Associateship of the City and Guilds of London Institute
Associateship of the Royal College of Science

PAPER 4.74 / I4.8

MULTI-AGENT SYSTEMS

Tuesday, May 5th 1998, 10.00 - 12.00

Answer THREE questions

For admin. only: paper contains 4 questions

1a What is the purpose of a blackboard architecture in Artificial Intelligence? What is the blackboard? What are the other constituents? How is it organised? How does a blackboard architecture become distributed?

b Many problems in realising distributed artificial intelligence can be expressed in terms of the interaction between processing agents. In which way does the design of the April programming language facilitate the construction of such multi-agent systems?

c Suppose that April is used to emulate a worldwide active blackboard architecture, using legacy databases and problem solving systems accessed through April "wrappers".

Discuss how the key constituents and organisational features of a blackboard architecture could be emulated by multiple levels of April processes.
Can you see any advantages in such an emulation?

2a KQML was designed as a Knowledge Query and Manipulation Language, but it has also been described as a communication language for intelligent information agents. Briefly explain how the following aspects of agent communication are supported in KQML:

i) knowledge sharing,

ii) communication protocol,

iii) communication facilitators,

Illustrate each answer with a KQML-style message

b i) Suggest a representation of a KQML performative as an April message.

ii) Very briefly outline the structure of a matchmaking facilitator in April. (*Do not concern yourself with detailed syntax*).

c KQML has been criticised as lacking adequate semantics.

i) How does KQML avoid the main semantic issues in the content of messages?

ii) In which way does the FIPA agent Communication Language seek to give meaning to performatives?

iii) Briefly discuss whether either of these languages supports the communication of commitment by one agent to another?

3a Summarise the main similarities and the main differences between Agent0 and a condition-action rule production system.

b Represent in Agent0 the following power plant condition-action rules, giving priority to the second rule over the first:

If dusty, then dust.
If melt-down-light-on, then run.

Do not worry about syntactic details.

c Give an example of a problem which can be represented easily in the Rao-Georgeff BDI agent architecture, but which would be difficult to represent in Agent0. Explain why the problem would be difficult to represent in Agent0.

The three parts carry, respectively, 50%, 30%, 20% of the marks.

4a Summarise the main similarities and the main differences between the "practical" Rao-Georgeff BDI agent architecture and a condition-action rule production system.

b Represent, in the practical Rao-Georgeff BDI agent architecture, the following power plant condition-action rules, giving priority to the second rule over the first:

If dusty, then dust.
If melt-down-light-on, then run.

Do not worry about syntactic details.

c Give an example of a commitment rule which can be represented easily in Agent0, but which would be difficult to represent in the Rao-Georgeff BDI agent architecture. Explain why the example would be difficult to represent in Agent0.

The three parts carry, respectively, 50%, 30%, 20% of the marks.

End of paper