SCIENCE AND ENGINEERING RESEARCH COUNCIL
RUTHERFORD APPLETON LABORATORY

COMPUTING DIVISION

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Notes on a meeting with Dr R Weston and Mr K Miles   D A Duce
Loughborough University on 11 March 1982

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1. Introduction

Richard Weston made an unsuccessful application in September 1981 with
Redfearn Glass Ltd for a Cooperative Award to study the requirements for
a local area network to operate in a glass forming factory and then to
install such a network in one of the Redfearn lines. Richard Weston has
subsequently formulated a proposal to look at networking requirements in
general for the manufacturing environment. The purpose of the meeting
was to give some feedback on this application and a second application
concerned the modular robots.

2. Modular Robots Application

The meeting started with a tour of the laboratories in the Engineering
Production Department. Existing SERC - funded work on modular robots was
demonstrated. Both linear and rotary modules were shown; both are
pneumatically controlled.

During the discussion of this application the following points arose :

1. Manufacture is a problem for the Loughborough group as they lack
technicians. The rotary module took several months to produce and final
machining was done by a research assistant. Component prices in this
application were deliberately inflated to allow for manufacture by an
outside contractor.

   After discussion it was felt to be entirely proper for Loughborough
to ask for a technician on the application and to state that he would
spend some time doing work for other SERC funded robotics projects in the
department. The grade represented would be 5 or less; there is not a
case for a supervisory grade technician.

An alternative approach would be for Loughborough Consultants (a University
base company) to provide manufacturing. This option was discussed outside

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the meeting with the Managing Director Dr Silkin.

2. Peter Smith encouraged the group to seek an industrial partner for the project. It is essential that problems in a number of industries be examined, one way to achieve this would be through involvement with a large company, eg GEC. Loughborough see their work as more relevant in small companies; they are worried about the inflexibility sometimes displayed by large companies and don't wish to see their thinking restricted.

The existing modular robot grant is a Cooperative Award with Martonair Ltd and concern was expressed that Martonair might see an award with another company as prejudicial to their interests. It was agreed there was no real conflict of interests and a meeting will be sought with Martonair to explain the situation.

It was agreed that Loughborough will investigate the industrial involvement question. What is sought is not a 1:1 partnership, the partners contribution could be to provide access to a range of applications in subsidiary companies.

3. A good research assistant will be required for the grant. Consideration should be given to grade as he will need to talk to companies at a high level.

4. Loughborough were asking for a Cambridge Ring on the grant. After discussion it became clear that this was an insurance against the failure of the network grant and that it would be more appropriate to ask for additional Allen Bradley nodes for the new equipment to connect to the existing Allen Bradley network. (Roughly £2 - 2.5K).

3. <u>Network Application</u>

During the tour of the Department's laboratories we were shown the Departmental network based on the Allen Bradley Data Highway. This work was funded by the Manufacturing Technology Committee (The Intergration of Programmable Controllers with other Digital Equipment in Industrial Control Schemes).

The Allen Bradley Data Highway is a commercially available network for linking Allen Bradley Programmable Controllers. The network has been used unmodified; interfaces have been built, based on TI 9900 hardware to provide RS 232 connections to the network. In this way a TI development system, an Apple and other computers have been linked to the network. A crude file server has been written which runs on the Apple. All software is written in Pascal. The bandwidth of the A-B network is 50K bps.

The capabilities of the system — the manufacturing environment have been demonstrated with a simple manufacturing cell consisting of a pick and place robot, rotary transfer drilling machine and optical inspection station. The system allows the provision of management information services and for centrally stoned, locally executed, operating sequences to be transmitted to the Programmable Controllers. Extensions are obvious.

The RA employed on the project is Paul Hanlon who is very good.

During discussion of the draft application the following points were made :

1. Loughborourgh see their role in this project as one of coordination and catalysis. They want to use existing commercially available network components (including software). They do not want to develop a new network or write layer upon layer of network software. They want to talk to manufacturers and possibly suggest product changes for the manufacturing environment. Ideally they would like to see a robot manufacturer teaming up with a network manufacturer but this seems unlikely in the near future. These points need to be stressed in the application.

2. David Duce suggested they talked to DCS investigators also, as some of the problems they encounter have known solutions in the DCS environment. Also it would do DCS good to see another application area.

3. The group have been talking to Thames Systems Ltd who are the ungerman Bass agents. They will soon be announcing a broad band network product which might be good in this application. Thame seem keen to cooperate with Loughborough.

4. Initially it was thought that this project would not fall within the scope of the Robotics Programme, but Loughborough stress that they are interested in how networks can help robotics systems; they think the general manufacturing technology problem is too broad.

5. There is a second strand to the project concerned with the communication requirement between robots and their associated workstations. This is a topic not being addressed elsewhere in Robotics and merits emphasis in the proposal.

    Peter Smith is considering holding a workshop on multiprocessing in robotics to which would include DCS Specialists.

4. Overall Impression

The overall impression is that the Loughborough group are very enthusiastic and able people. Both draft applications were well written and offer considerable merit.