Design and Development of a Hybrid Control System for Flexible Manufacturing

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ABSTRACT

Flexible Manufacturing Systems (FMS) appeared upon the manufacturing scene in the early 1970s, installations presently number in the thousands. However, many current installations in fact lack flexibility, do not operate in real-time and are prohibitively expensive. Therefore there are obvious benefits to be gained from making improvements to existing flexible manufacturing systems.

Research conducted for this thesis focused on two major areas. The implementation of the FMS control system on a SCADA package and the development of an auction based scheduling system. This entailed the development of a hybrid control model composed of three distinct layers; factory, cell and intelligent entity. Key portions of both the factory and cell controllers were then implemented so as to create a minimal system. This has been completed to the point where the auction algorithm has been implemented and tested in an appropriate framework.

In achieving the goals mentioned above a number of novel design concepts have been utilised. There are two which are most important, these are the use of low cost modules for the construction of a flexible co-operative manufacturing system, and the ability of this system to operate in a physically distributed area via a Local Area Network. Meaning it is inherently adaptable and resistant to failure. These novel design concepts were ingrained throughout the entire three layered control model.

It is felt that this research has succeeded in demonstrating the possibility of implementing a FMS control system on a low cost SCADA package using low cost software and computing elements. The ability of the distributed, auction-based approach to operate successfully within this system, has also been demonstrated through simulation.

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