

ABSTRACT

An Intelligent Workstation Controller for Computer Integrated Manufacturing.

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A shop floor control system (SFCS), a central part of a computer integrated manufacturing system, performs the production activities required to fill orders received from the factory level control system. In order to effectively control these activities, it is necessary to define a control architecture and functional perspective of how a SFCS operates. In this research, a hierarchical SFCS (shop, workstation, equipment) is adopted. In the context of the hierarchical control architecture, each level fulfills its own responsibility by a means of planning, scheduling, and execution. The objective of the research is to develop an intelligent workstation controller (IWC) at the middle level of a SFCS. The IWC is responsible for selecting a specific process routing, allocating resources, scheduling and coordinating the activities across the equipment, monitoring the progress of activities, detecting and recovering from errors, and preparing reports. One of the requirements for the development of the IWC is to define all the functions and integrate them into an intelligent controller. To this end, a process plan representation model and the evolution of a process plan from the shop down to the equipment are presented. Further, the three functions are detailed and illustrated. A deadlock detection and resolution model is also presented to maintain the system in a deadlock-free state. Finally, the IWC software is created to demonstrate the architectural linkages with other controllers. As a result, the development of the IWC will save cost and time in developing control software for the automated manufacturing systems.