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OPTIMIZATION OF COMPOUND MOTION OF THE ROBOT-MANIPULATOR

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It is known that during the operation of cranes there are pendulum oscillations, which create additional loads on the power elements, and also increase the risk of emergency situations.

Therefore, the urgent task is to eliminate fluctuations in the system of the mechanism of rotation of the crane and the simultaneous movement of the load, which, in turn, optimizes the mode of movement. This will increase productivity, reduce the load on the drive elements of the crane and increase the convenience and safety of operation. The first way to find the solution is controlled positions and velocities digitally. Each motion or degree of freedom (D.O.F.) of the manipulator is positioned using a separate position control system. All the motions are coordinated by a supervisory computer to achieve the desired speed and positioning of the end effect. The computer also provides an interface between the robot and the operator that allows programming the lower-level controllers and directing their actions. The control algorithms are downloaded from the supervisory computer to the control computers, which are typically specialized microprocessors known as digital signal processing (DSP) chips. The DSP chips execute the control algorithms and provide closed-loop control for the manipulator. A simple block diagram of its digital control in robotic manipulator is shown in Figure 1.

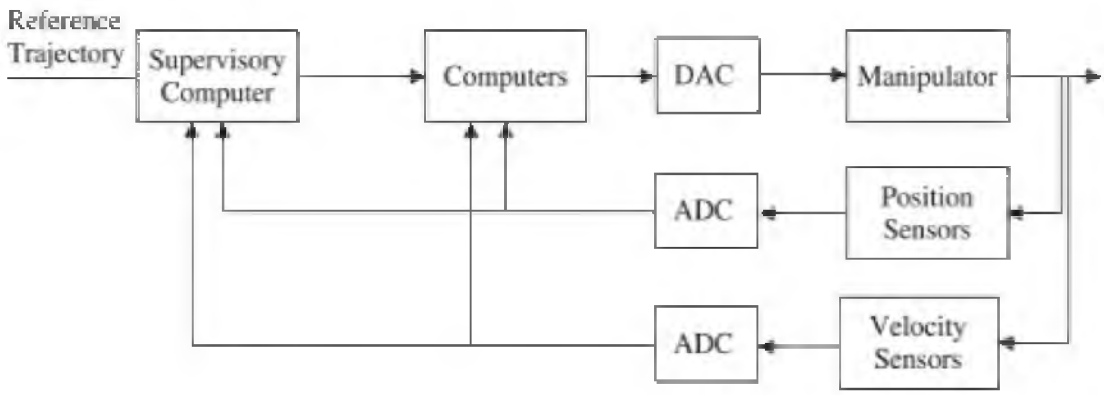

Fig. 1. Block diagram.

The second way is to stabilize manipulator trajectory control using neural networks.The offline learning algorithm guarantees that the neural network will finally accurately approximate the modified manipulator dynamics within the training data sets The control structures and online learning algorithms guarantee that the closed-loop system will be asymptotically stable and the tracking errors will asymptotically approach zero. There is one disadwantage is difficult to ascertain the neural network approximation accuracy, which is used to design the neural controller. This difficulty is overcome in simulation by trial and error. However, simulations also show that the results are not sensitive to approximation accuracy, although this is not theoretically proved.