FPGA Implementation of a CORDIC-Based Joint Angle Processor for a Climbing Robot

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Abstract

This paper presents a novel architecture of a joint angle processor for robot arm. The objective of the proposed CORDIC-based joint angle processor is to provide a hardware solution for computing the inverse kinematic for a robot arm control system. The complicated trigonometry operation is computed by the famous CORDIC algorithm. Simulation results show that the proposed joint angle processor achieves high precision. Moreover, an efficient pipelined architecture for VLSI and FPGA implementation is also proposed, this architecture has the advantage of saving hardware cost and power consumption. As a result, the proposed CORDIC-based joint angle processor provides a high speed inverse kinematic computation that assists the main MCU to operate the robot arm at real time. Therefore, the motion of the robot will be very smooth and capable of powering multiple joints at same time and provide smooth walking or climbing motions.

Keyword：CORDIC, joint angle processor, inverse kinematic, FPGA, robot