

Computer Numerical Control-PCB Drilling Machine with Efficient Path Planning – Case Study 2

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Abstract

In Printed Circuit Board (PCB) drilling machines, the location of the drill holes are fed into the machine and the PCB will be drilled at the corresponding coordinates. Some machines do not choose the optimal route when completing their tasks. Hence, this paper proposes an approach, which is based on the Algorithm Shortest Path Search Algorithm (SPSA), for finding the optimal route in PCB holes drilling process. In SPSA, when the robotic arm at the initial position, the algorithm calculates the nearest point to the initial position from all points that the wires start or ends with. If the nearest point is a start-of-wire point, it will use SPS algorithm 1. If the nearest point is an end-of-wire point, it will use SPS algorithm 2. This process is repeated until drilling all the lines. Then, the robotic arm will drill all the holes according to the proposed Simulated Annealing Algorithm (AS) in order to determine the optimal machining parameters for milling operations. The results of the different optimization algorithms Genetic

Algorithm (GA) and AS are compared and conclusions are presented. The proposed Computer Numerical Control (CNC) machine consists of a driver, drill, three stepper motors, cables and microcontroller PIC16f877A to control the movement of the machine. The SPSA algorithm optimizes the use of the motors and other mechanical paths involved in the process while reducing total time taken to traverse all the drill holes. This paper also explains the detailed problem of interest and the mathematical formulation of the problem is defined. Experimental result indicates that the proposed SPSA-based approach is capable to efficiently find the optimal route for PCB holes drilling process.

Keywords:

Shortest Path Search Algorithm PCB Drill Holes Path Planning Routing Problem

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Notes

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