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Multicoordinate Positioning System for Industrial Equipment Design Method

FUNCTIONAL ELECTRICAL AND ELECTRONIC MATERIALS AND DEVICES

1. Multicoordinate System TriPlanar Control Levels

TriPlanar [1] is a multicoordinate complex positioning system with 6 degrees of freedom. Like any other complex equipment's control system, TriPlanar's one is divided into several levels aiming to represent the information and functional integrity of each of them. Each control level is based on the lower one, so by such means the information integrity is achieved. Fig. 1 represents the block-diagram of TriPlanar control system.

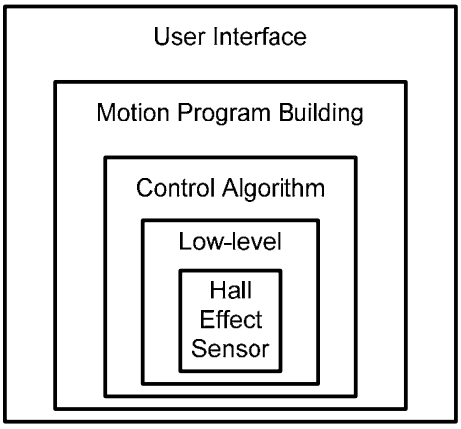

Fig. 1 The Control Levels of TriPlanar

2. Motion Program Building Control Level

While dividing TriPlanar's control system into layers, we should mention that every of those is implemeted by its own software and/or hardware sets: the low-level is implemented by the means of sensors (e.g., Hall Effect Sensors) and filtering/processing routines to get clear and ungarbled information about system state. Control Algorithm level is understood as regulator of control system (PID etc.), and its goal is providing the best dynamics for the system. The User Interface control level is graphical user interface aiming easy interaction between the user and the system. Another control system level, which will be described here, is Motion Program Building level. Positioning between Control Algorithm and User Interface, it is supposed to build motion program basing on user input data and pass control signals to the lower system. While plenty of motion program building algorithms exist, the current work discusses one which is based on holonomic automatic systems.

3. The Concept of Holonomic Automatic Systems

The systems with the behavior which is established with exactness up to a variety

intersection are related to the class of holonomic automatic systems. The problem of synthesis of holonomic systems presupposes the synthesis of differential analyzer in the form of differential equations for which the solution is the reproducible program of movement [2].

The usage of such class of systems gives such advantages as simplification of control algorithm and automatic control system structure, possibility to control the dynamics of affix movement, possibility of optimal curves programming, control microcomputer memory safe [3].

4. Computer Simulation and Results

As the result, the computer models and visualization software sets were developed for the purposes of Motion Program Building level abilities demonstration. The software set is based on differential analyzers and is used to reproduce any curve on a quadric surface. The screenshot of developed software is on fig. 2.

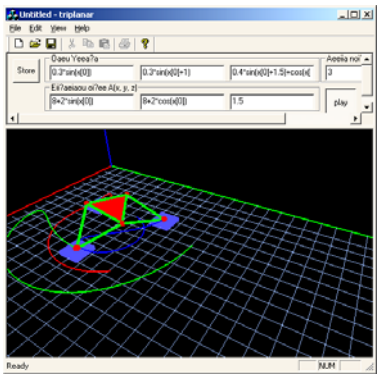

Fig. 2 Motion Program Building Demonstration Program

The worked out models and control system are providing TriPlanar with all advantages mentioned above, so using holonomic automatic systems for motion program building purposes can improve the system's control characteristics.

References:

[1] Homepage Mechatronik Laboratorium Paderborn, Universität Paderborn
[2] Zimmermann K., Ahranovich A., Karpovich S. Analysis and Synthesis of Differential Analyzers for Holonomic Automatic Systems // Scientific Proceedings. - Vol.1. - Aachen: Shaker Verlag, 2004. - p.246-251
[3] Ahranovich A., Zimmermann K., Karpovich S. Investigating the Ability of Holonomic Automatic Systems` Dynamics Control // Proceedings of 50th International Scientific Colloquium, Ilmenau (Germany), September 19-23, 2005. - TU-Ilmenau, 2005. - p.127-128

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