2581-4575

International Journal For Recent Developments in Science & Technology

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STRATEGY OF A LOW-SLUNGCHARGE CAD-CAM CONVERTOR FOR CNC CLAIMS

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ABSTRACT

This paper focuses on reducing costs for CAD – CAM software convertor and on position control of the motors used on modern CNC. To achieve the proposed goal free software packages were used and integrated with low cost motion controllers. A G code to TrioBASIC language convertor was developed and validated using an experimental CNC machine for printed circuit boards milling.

INTRODUCTION

In modern CNC systems, end-to-end component design is highly automated using computer-aided design (CAD) and computeraided manufacturing (CAM) programs. The programs produce a computer file that is interpreted to extract the commands needed to operate a particular machine via a post processor, and then loaded into the CNC machines for production. The series of steps needed to produce any part is highly automated and produces a part that closely matches the original CAD design. With the on-going development of technology and economy, new industrial requirements such as high precision, good quality, high production rates and low production costs are increasingly demanded. Most of such requirements, including dimensional accuracy, conformance to tolerances of finished products and production rate can be met with better machine tools. With the help of CNC technology, machine tools today are not limited to human capabilities and are able to make ultra-precision products down to Nano scales in a much faster manner.

Manufacturers face intense competitive challenges in today's global economy. Regardless of the industry in which you operate, as a manufacturing organization you must consistently develop products that your customers want to buy, cost-effectively manufacture those products, and successfully sell them at a profit. In short, competitive pressures compel your company to continuously generate higher levels of innovation, efficiency, and productivity.

Those unrelenting goals are the driving forces behind technological advances in product development, and nowhere is that more apparent than in the integration of the design through manufacturing process. Until recently, product design and manufacturing groups generally operated as separate, autonomous functions and organizations. Whether they are machining parts,

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developing jigs and fixtures, or making molds, manufacturing engineers, machinists, and production personnel typically do not get involved in the development of a product until the design is released for production by a design engineer.

The product development transition from design to manufacturing is almost always a handoff of 3D design and tooling data, and associated 2D drawings. Because designers and manufacturing engineers use different tools for handling design data—one uses CAD software to design the product and the other uses a CAM application to create tool paths and machine molds—the handoff has typically not been clean, requiring data imports, translations, and conversions. Moreover, once the handoff is made, a virtual wall in terms of communication can go up between design and manufacturing. This lack of communication is the basic problem that an integrated CAD/CAM platform solves. However, the potential positive ramifications of the solution are much more widespread.

This paper will explore how an integrated CAD/CAM solution can help you unify the design through manufacturing process, and the benefits of doing so. What is integrated CAD/CAM? It's a CAM solution that uses a CAD system as its front-end, geometry engine. Instead of importing or converting a CAD file, or some other data format, such as IGES or STEP, an integrated CAD/ CAM platform performs CAM operations on the CAD file itself, offering full single-window, bidirectional associativity between the CAM application and the CAD system. This technological advance offers many advantages that can help you boost productivity, control costs, and resolve manufacturability issues.

CNC Machine

The word CNC stands for computer numerical control. In this practice the tool and workpiece both are controlled with the help of a numerical program.

The complete process of CNC machining depends on CAD and CAM.The word CAD stands for Computer Aided Design whereas the word CAM stands for Computer Aided Manufacturing.

With the help of CAD we make 3-D design of the object which we have to make and with the help of CAM that design is converted into reality.Modern day CNC machines are highly precise and can reduce the time to perform a job drastically.

STEPPER MOTOR

Stepper motors are DC motors that move in discrete steps. They have multiple coils that are organized in groups known as "phases". By energizing each phase in sequence, the motor will rotate one step at a time. With a computer controlled stepping you can achieve very precise positioning and speed control. For this reason, stepper motors are the motor of choice for many precision motion control applications. With a computer controlled stepping you can achieve very precise positioning and/or speed control. For this reason, stepper motors are the motor of choice for many precision motion control

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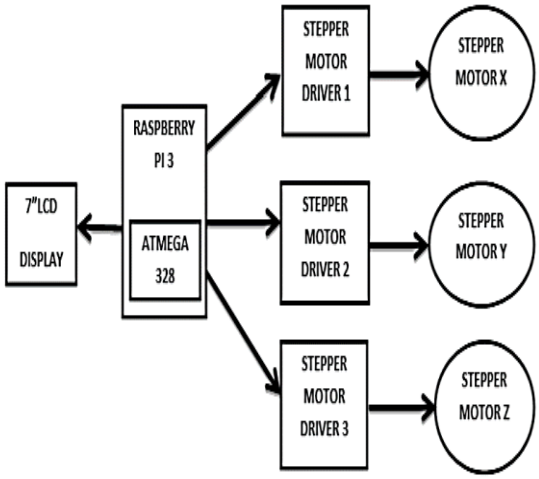
applications. Positioning – Since steppers move in precise repeatable steps, they excel in applications requiring precise positioning such as 3D printers, CNC, Camera platforms and X, Y Plotters. Some disk drives also use stepper motors to position the read/write head.

Speed Control – Precise increments of movement also allow for excellent control of rotational speed for process automation and robotics

Low Speed Torque - Normal DC motors don't have very much torque at low speeds. A Stepper motor has maximum torque at low speeds, so they are a good choice for applications requiring low speed with high precision.



Mastercam

Mastercam (also MasterCAM) is a suite of Computer-Aided Manufacturing (CAM) and CAD/CAM software applications. Founded in MA in 1983, CNC Software, Inc. is one of the oldest developers of PC-based computer-aided design / computer-aided manufacturing (CAD/CAM) software. They are one of the first to introduce CAD/CAM software designed for

both machinists and engineers. Mastercam, CNC Software's main product, started as a 2D CAM system with CAD tools that let machinists design virtual parts on a computer screen and also guided computer numerical controlled (CNC) machine tools in the manufacture of parts. Since then, Mastercam has grown into the most widely used CAD/CAM package in the world.[2] CNC Software, Inc. is now located in Tolland, Connecticut.

Mastercam's comprehensive set of predefined toolpaths—including contour, drill, pocketing, face, peel mill, engraving, surface high speed, advanced multiaxis, and many more—enable machinists to cut parts efficiently and accurately. Mastercam users can create and cut parts using one of many supplied machine and control definitions, or they can use Mastercam's advanced tools to create their own customized definitions.

Mastercam's name is a double entendre: it implies mastery of CAM (computer-aided manufacturing), which involves today's latest machine tool control technology; and it simultaneously pays homage to yesterday's machine tool control technology by echoing the older term master cam, which referred to the main cam or model that a tracer followed in order to control the movements of a mechanically automated machine tool.

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In November 2018, Mastercam launched mastersofcam.com, a website content-driven platform for Mastercam users.

With the release of Mastercam 2017, Mastercam entered the 3rd interface in the product history moving to a familiar Windows Office tab format. Prior to Mastercam 2017 was Version X that was introduced in 2005. With Version X the application became a true Windows-based application, as opposed to one ported over from DOS. It also represented a fundamental shift in the way the application was configured. Mastercam supports many types of machines, each with a choice of levels of functionality, as well as offers optional add-ins for 4-axis and 5-axis machining.

Based on the type of controller used there comes a need of different conversions from CAD to CNC commands. Code G can be easily obtained from CAD data, but controllers running G code tend to be expansive. The authors propose a convertor from G code to Step NC by this expanding the number of controllers that can be used. Advantages for Step NC presented are: higher readability, the organization in block structure and wider information included. Authors present the algorithms and also experimental software used for conversion.

CAD-CAM Software

CAD-CAM software provides the ability to create complex 3 Axis machine tool paths quickly and efficiently. Without CAD-CAM, programming complex parts is practically impossible as there are multiple tool paths required from advanced roughing, semifinishing and multiple finishing tool path strategies. This allows existing CAD users to create the necessary machining for the part, simulate everything and create the NC programs for them. This is highly beneficial, as the CAD users do not have to completely relearn a new CAD-CAM system; they only need to learn the machining side.

CAD Software image to be etched

GRBL Code

GRBL is a no-compromise, high performance, low cost alternative to parallel-port-based motion control for CNC milling. It will run on an Arduino as long as it sports an Atmega 328. It accepts standards-compliant g-code and has been tested with the output of several CAM tools with no problems. Arcs, circles and helical motion are fully supported, as well as, all other primary g-code commands. Macro functions, variables, and most canned cycles are not supported, but we think GUIs can do a much better job at translating them into straight g-code anyhow. GRBL includes full acceleration management with look ahead. That means the controller will look up to 18 motions into the future and plan its velocities ahead to deliver smooth acceleration and jerk-free cornering.

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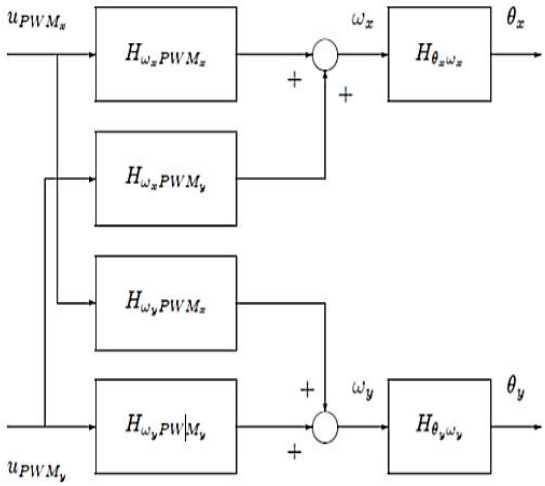

METHODOLOGY

CNC Etcher

Computer Numerical Control – Taking digitized data, a computer and CAM program is used to control, automate, and monitor the movements of a machine. The CNC controller works together with a series of motors and drive components to move and control the machine axes, executing the programmed motions. In modern CNC systems, end-to-end component design is highly automated using computer-aided design (CAD) and computer-aided manufacturing (CAM) programs. The programs produce a computer file that is interpreted to extract the commands needed to operate a particular machine by use of a post processor, and then loaded into the CNC machines for production.

CNC Etcher

Working Algorithm

Step1: CAD image is converted into G-code via CAM software

Step2: G-code is fed to raspberry pi through linux CNC.

Step3: Direction and step inputs are given to the stepper motor driver

Step4: Stepper motors are controlled through drivers.

Step5: The control to the CNC is given via an AT-MEGA 328 controller and the raspberry pi

CONCLUSION

In this paper a method for converting CAD data to CNC commands using CAM software is presented. The proposed convertor takes G code commands and translates them to TrioBASIC language which is preferred because of the compatibility to available TrioMotion motor drivers.

For validation of the convertor a 2 axis positioning system was designed and used to mill a printed circuit board. The precision obtained during the test was at a level of a one hundredth of a millimeter.

By using the proposed method it was possible to lower the price of the CNC

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machine including software and electrical components.

As a future development for the proposed method a convertor directly from CAD data to TrioBASIC is planned that will also include cross-compilation capabilities, by this eliminating the need for the G code convertor.

REFERENCES

[1] Seung-Jun Shina, Suk-Hwan Suhb and Ian Stroudc, "Reincarnation of G-code based part programs into STEP-NC for turning applications", Computer-Aided Design, vol. 39, pp. 1–16, 2007

[2] W. Lee, Y.- B. Bang, M. S. Ryou, W. H. Kwon and H. S. Jee, "Development of a PC-based milling machine operated by STEP-NC in XML format", International Journal of Computer Integrated Manufacturing, vol. 19, No. 6, pp. 593 – 602, 2006

[3] Satyanarayana, P. and Subramanyam Pavuluri, D.A., 2013. PARAMETRIC MODELING AND DYNAMIC CHARACTERIZATION FOR STATIC STRENGTH OF STEAM TURBINE MOVING BLADES. International Journal of Innovative Research in Science, Engineering and Technology, 2(7).

[4] PAVULURI, S. and KUMAR, D.A.S., 2013. „" Experimental Investigation On Design Of High Pressure Steam Turbine Blade"". International Journal of Innovative Research in Science, Engineering and Technology, 2(5), pp.1469-1476.

[5] Sreenivas, P., Kumar, A.S. and Subramanyam Pavuluri, D.A., 2013. Investigations on transient dynamic response of functionally graded materials. a a, 1, p.2.

[6] Pavuluri, S., Rajashekar, B. and Damodhar, B., Process of Press Tool Design and its Manufacturing for Blanking Operation.

[7] KUMAR, S.S. and SUBRAMANYAM, P., DESIGN AND WEIGHT OPTIMIZATION OF OIL PAN BY FE ANALYSIS.

[8] PAVULURI, S. and KUMAR, D.A.S., 2013. „" Experimental Investigation On Design Of High Pressure Steam Turbine Blade"". International Journal of Innovative Research in Science, Engineering and Technology, 2(5), pp.1469-1476.

[9] K.Ogata, "Modern Control Engineering", 8th Ed. Upper Saddle River, NJ, USA: Prentice Hall PTR, 2011