

## Embedded System is Computer System with Dedicated Function:-A Study

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**Abstract:** Embedded system basically a computer with dedicated function with a large mechanical and electrical system. The use or application of embedded system in various areas worldwide. Hence in this study, we discussed about the wide area of application and finally we have discussed about the use of embedded system in connection with industrial robot along with CNC technology in flexible manufacturing (FMS) where accurate control of speed and position of DC motor in precession and repeatability in motion control have achieved in servomotor and machine actuators.

**Keywords:** - Embedded system, operating system, FMS, AGV, CNC, Real time, Process control.

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### I. Introduction:-

Embedded system is a computer system with dedicated function with a larger mechanical or electrical system, often with real – time computing constrain [1, 2]. It is embedded as part of a complex device often including hardware and mechanical parts. Embedded system control many device in common use today [3]. More than 98% of all microprocessor are manufactured as component of embedded system [4]. Modern embedded system are often based on microcontroller i.e. CPU with integrated memory or peripheral interface [5]. In ordinary microprocessor by using external chips for memory and peripheral interface circuits are commonly used in more complex system. Microcontroller based on single or multi digital panel meter for voltage, current, resistance and frequency.

In either case, the processor(s) used may be types ranging from general purpose to those specialized in certain class or computations, or even customer designed for the application at hand. A common standard class of dedicated processor is the digital signal processor (DSP).

An embedded system is some combination of computer hardware and software, either fixed in capability or programmable, that is specifically designed for a particular function. Industrial machines, automobile, medical equipment's, household appliances, airplane etc., are among the myriad possible with programming interface and embedded system programming is a specialized occupation. Modern Embedded system are based on microcontroller i.e. CPUs with integrated memory or peripheral interface (^Giovino, Bill, "Microcontroller.com-Embedded system supersite"). But ordinary microprocessor by using external chips for memory and peripheral interface circuits are common, especially in more complex system. The standard class of dedicated processors is the digital signal processor (DSP).

A higher integration level with high performance embedded system debugging, the IEEE-ISTO Nexus 5001 forum standard for a global embedded debug interface, is introduced and is related to the test and debugging requirement of development engineers.

Power related hardware-Software Co-synthesis of heterogeneous distributed embedded system is the process of partitioning an embedded system specification into hardware and software modules to meet performance power and cost goals. Embedded system is generally specified in terms of a set of a cyclic task graphs. According to one embodiment of the invention, a co-synthesis algorithm, called COSYN, starts with periodic task graph with real time constraints and produces low cost heterogeneous distributed embedded system architecture meeting these constraints. The algorithm has a pre-processing phase during which task graph, system/task constraints and resource libraries for the embedded system are parsed, wherein the resource library has different PEs requiring different power supply voltages. The algorithm also has a synthesis phase, following the pre-processing phase, during resource library, based on performance evaluation of one or more possible allocations each of group and edges in light of the system/task constraints. Where in two or more PEs in the embedded system use two or more different power supply voltage power dissipation is considered along with cost and real time constraints, during at least one of the task grouping, group/ edge allocation and or performance evaluation.

Convergence embedded system and application point-to-point scale (POS) devices in corporate dual display for advertising complex accounting applications. This system used for planning to buy certain items where inventory system used ABC analysis. Hence planning, scheduling for buying POS give more effective for both sellers and buyers.

## II. Various Useof Embedded System:-

- Telecommunication such as telephone S/cell phone and computer networking uses, such as dedicated route and network bridges to route data.
- Consumer Electronics such as personal digital system, MP3player, mobilephone, video game consoles, digital camera, DVD player, GPS receiver and printer.
- House hold appliances' such as micro oven, washing machine, dish washer, remote control of TV, Water meter reading etc.
- Advanced HVAC system such as network thermostat, season home automation  
Wired and wireless network such as controlling traffic light, climate, security, audio/visual system i.e. buzzer(sound), andon (visual indicator) system, surveillance etc., all of which are used as embedded devices for sensing and controlling.
- Air Transport system for anti-skid operation of wheel breaking, flight in automation (auto pilot), poke yoke (stand by in L G operation), ADF (Automatic Direction Finder) and Auto landing, inertial guidance system and GPS receiver, automatic fire alarming etc.
- Fax or photocopy or printer or scanner machine.
- Fire and safety and security for automatic fire detecting and alarming, (fail safe technique) including fire extinguishing.
- Banking system such as net banking, ATM credit card transition.
- Signal tracking system such as image filtering and processing. Pattern recognition as well as speech processing and video processing.
- Electronic stability control (ESC/ESP).
- Traction control and signal control in railway.
- Automatic 4 wheel drive, engine control, car-area-network, fuel management, variable cylindrical system including safety in a car (breaking, engine, steering).
- For large complex system like hybrid vehicle, Avionics etc. This complexity varies from low with a signal microcontroller chip to very high with multiple units peripheral and network mounted inside a large chassis or enclose.
- Full applications of Embedded system along with Robot been used in Hotel at Japan.
- Medical equipment or apparatus such as use of vital signs monitoring, electronic, stethoscope for amplifying sound, medical imaging (PET, SPECT, CT, MRI) for non-invasive internal inspection etc. These all are used through industrial computer. Hence silicon chip revolution make easier to accurate diagnosis of cholesterol monitors, blood glucose level, replacement of organ and tissue etc. Application of Nano robot shall more useful in medical (surgical) purpose.
- For Military applications Armament (missile) Technology is much successful.

- Space craft and Satellite communication in wide area applications.

## III. Specific Area of Embedded System and its Applications are:-

- Applications of specific processor and devices.
- Business applications.
- Component and binding models.
- Embedded computing education.
- Embedded hardware support.
- Embedded software support.
- Embedded system architecture.
- Hard ware and software co-design.
- Industrial practices and bench mark suites.
- Integration with business logic.
- Integration with SQA.
- Middleware.
- Networked embedded system
- Policy-based management.
- Programming Abstractors.
- Real time system.
- Recent trends.
- Service oriented Architectures.
- Testing technique.

## IV. Design of Reconfigurable CNC System Based on Embedded Technology in FMS

Embedded processor and embedded real time operating system combined, CNC technology based where the hardware platform a dual CPU model is designed by ARM & DSP, which is used for process control. FPGA model realizes the FMS (Flexible Manufacturing System) system reorganization in shop floor management. This also emphasis about material procurement through the application of computer known as ERP I and ERP II. This can be used for SCM (supply chain management) in production process.

The **design** of reconfiguration CNC system based on embedded technology.

## V. Inspection controlling Indexing are:

- CNC, Embedded system, field programming gate arrays, FMS, O S (computer), and Production control.

### IEEE items are:-

- CNC, Digital signal processing, embedded software, field programming gate arrays, FMS, hardware, O.S., Process and production control, as well as Real-time system.

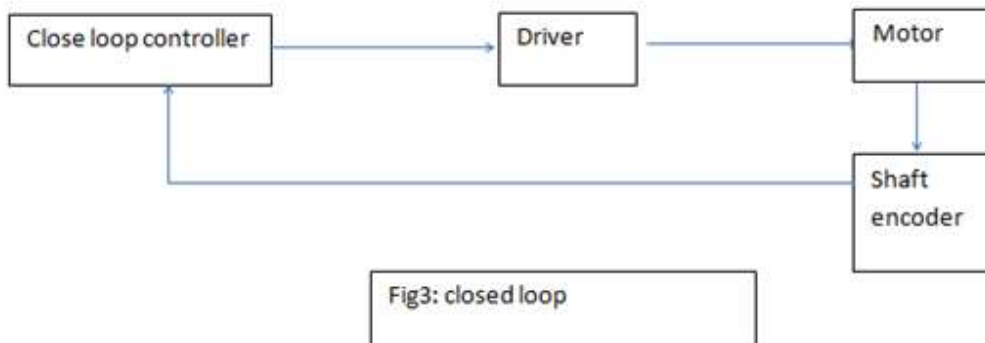
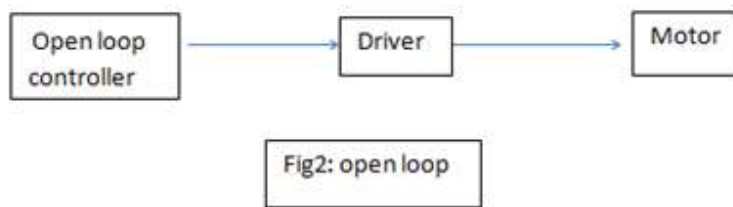
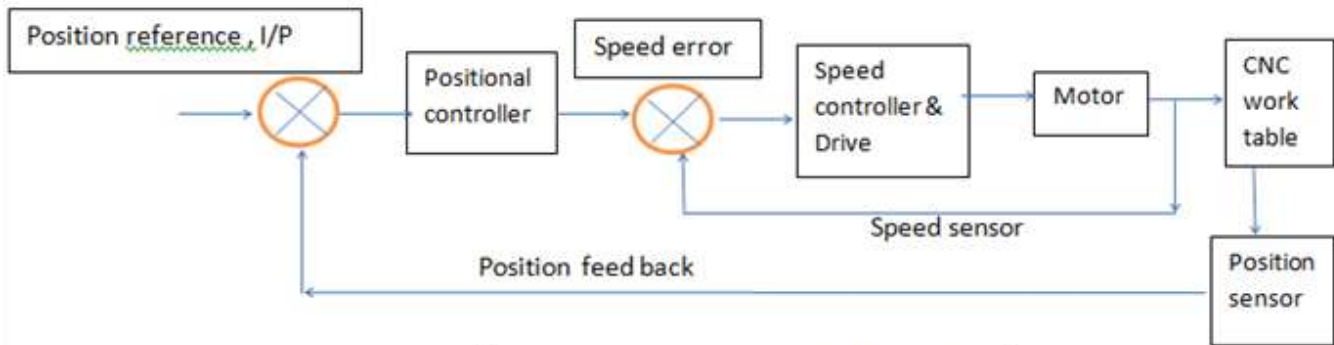
## VI. Accurate control of speed and position of D C motor of CNC Machine:-

In motion control servomotor and machine actuators are available for getting precession motion and **repeatability**. Hence servo system provides the required torque, speed and accuracy for performing the operation. This also performed

the transmission of load, mechanical transformation, the duty cycle of the system i.e. How often starts and stops and how fast the system need to be operated that all are been decided by the embedded system in connection with electrical and mechanical actuations.

Hence for performing the CNC operation sizing software used which contain the mathematical formula used to find out the inertia of the load, a critical parameter when selecting a servo motor.

**VII. The following components been used for getting precession motion control.**



- Servo motor, Motor Drive, Gear Box, Actuator, Feedback Encoder, Motor control, Control of turning software and Drive communication software.

Servomotor, Encoder and Servo drive works as Amplifier and the Motor is designed for transmitting the load. Reduction Gear box provide the precession, accuracy and repeatability for in CNC machine shop in turn provides higher efficiency. The servo system coupled with planetary gear box to get accurate motion actuation. For accurate control of speed and position of a D C motor, a robotics system, a CNC machine controller been used in production process.

Also PLC programming has been used for motion control or a position control of CNC machine and the position control module are Shaft encoder input, On board dedicated high

speed CPU, Motor drive set point output, Digital 10, Programmer port and set point from data bus

The rotational movements of the motor are calibrated and required movement as per the CAD design is obtained. The motor movement has been calibrated by connecting an encoder to the motor. The close loop control shall be controlled by entering X, Y & Z value manually through GUI develop.

**VIII. Conclusion:-**

Use of Embedded system i.e. Computer with dedicated function within a larger mechanical and Electrical system in connection with CNC controller in flexible manufacturing (FMS) ,there is a remarkable increase in productivity in terms of quality which reduces the generation of scrap. In

CNC manufacturing system automated material handling with the help of Industrial robot and automated tool changing in magazine box as-well-as automated speed and feed control, real time feedback facility in multi axis CNC machine provides high performance in CNC manufacturing process. Thus use of embedded system becomes enormous world-wide in wide area of applications.

#### IX. Bibliography:-

- [1] Michael barr," Embedded system glossary", neutrino technical university, retrieved 2007-04-21.
- [2] Heath, steve (2003), Embedded systemdesign, EDN series for design engineers(zed) newness,p2, ISBN 978-0-7506-5546-0,"An embeded system is a microprocessor based system that is built to control a function or arange of functions.
- [3] Michael barr, Anthony J.massa(2006)," Introduction ,programming embedded system ,withC and GNU development tools@`reilly ,pp 1-2,ISBN978-0-596-00983-0.
- [4] Barr, Michael (1 august 2009), "real mean programme in C ", embedded systems design. Tech in sights (business media),p2 retrieved 2009-12-23.
- [5] C Macnamee and D. Heffernah. Vol ii, issue 6, dec 2000 pp 295-303.
- [6] Encyclopedia " Embedded system".