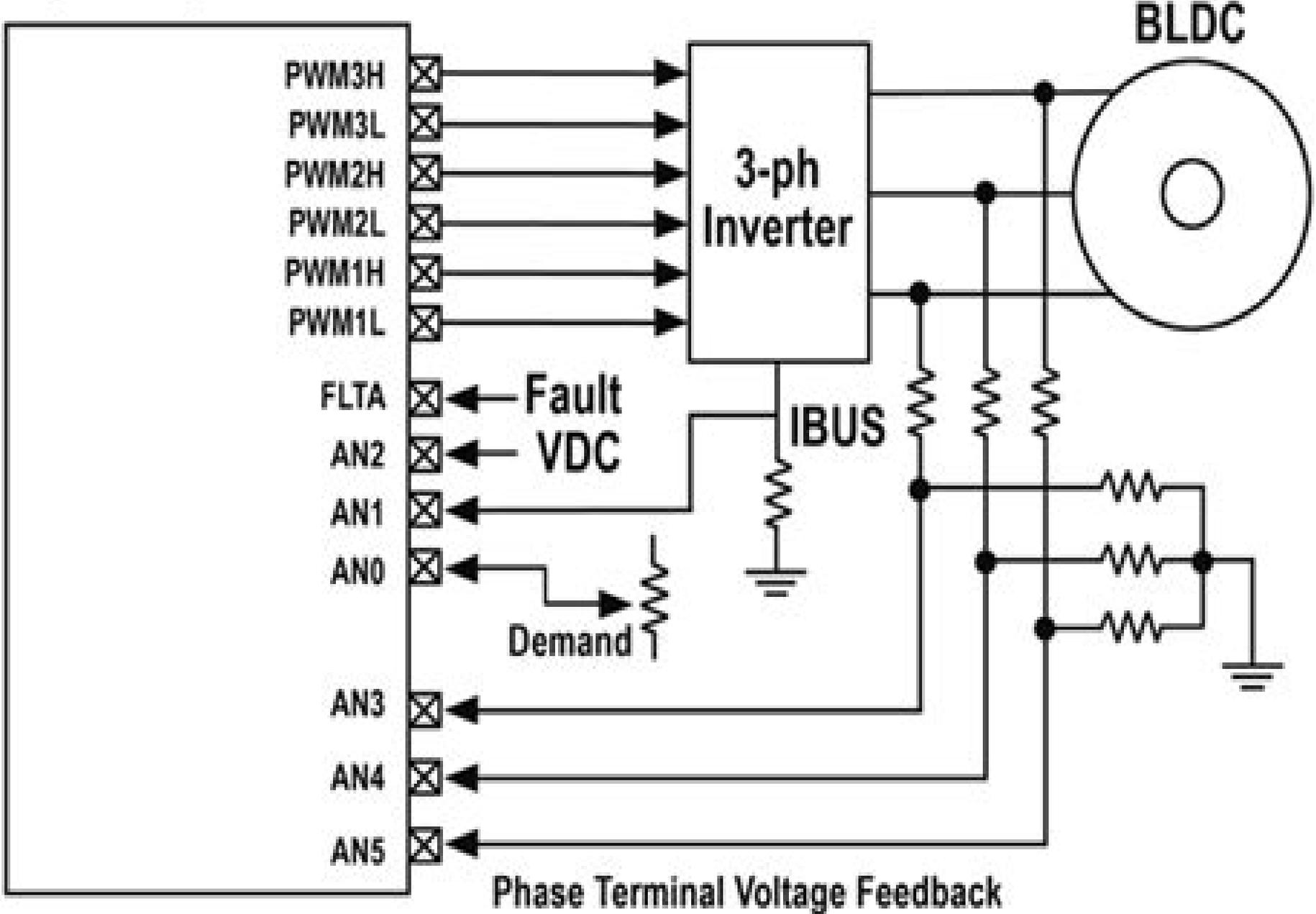


# Digital Signal Controller



# Sensorless Bldc Motor Control Using A Majority Function

**B. Mahesh Kumar,G. Ravi,R.  
Chakrabarti**



## **Sensorless Bldc Motor Control Using A Majority Function:**

**Proceedings of Symposium on Power Electronic and Renewable Energy Systems Control** Sankarsan

Mohapatro,Jonathan Kimball,2021-07-09 This book includes high quality research papers presented at Symposium on Power Electronic and Renewable Energy Systems Control PERESC 2020 which is held at the School of Electrical Sciences IIT Bhubaneswar Odisha India during 4 5 December 2020 The book covers original work in power electronics which has greatly enabled integration of renewable and distributed energy systems control of electric machine drives high voltage system control and operation The book is highly useful for academicians engineers researchers and students to be familiar with the latest state of the art in power electronics technology and its applications **Design News** ,2008 Modern Electric, Hybrid Electric, and Fuel Cell Vehicles Mehrdad Ehsani,Yimin Gao,Sebastien E. Gay,Ali Emadi,2004-12-20 Air quality is deteriorating the globe is warming and petroleum resources are decreasing The most promising solutions for the future involve the development of effective and efficient drive train technologies This comprehensive volume meets this challenge and opportunity by integrating the wealth of disparate information found in scattered pape *A Digital Sensorless BLDC Motor Control Algorithm Utilizing Line-To-Line Voltages for Aerospace Applications* Ellis John Stevens,2021 **Variable Gain Control of Brushless DC Motor Control with Low Resolution Sensors** Chung-Hsiang Wang,1999 In this work feasibility of using low cost low resolution sensor for high performance brushless dc BLDC motor speed control is investigated Conventional control using a tachometer or high resolution encoder suffers from drawbacks such as high cost large physical volume and high sensor processing bandwidth On the other hand sensorless BLDC motor appealing in its hardware simplicity does not provide sufficient fast performance Using a standard low resolution sensor such as a hall sensor or commutation encoder a compromise between cost and performance can be obtained However the use of a low resolution sensor does pose a challenge to the control design the sensor signal is discrete and speed dependent Together with the nonlinear drive voltage speed characteristic of the motor control of the BLDC motor requires a more advanced algorithm than fixed gain control This thesis presents a speed dependent control scheme to produce optimal performance The characteristics of the control scheme is first assessed by numerical simulation based on the mathematical model of the BLDC motor This is followed by experimental verification of the BLDC motor From the available data it is concluded that speed dependent control provides significant advantages over fixed gain control when low resolution sensor is used Hybrid Speed Control of Sensorless Brushless Dc Motor with Fuzzy-Based Estimation B. Mahesh Kumar,G. Ravi,R. Chakrabarti,2012 This paper describes a simple way to control the Brushless DC BLDC motor for electrical applications To control this machine it is generally required to measure the speed and position of the rotor by using the sensor because the inverter phases acting at any time must be commutated depending on the rotor position Encoders and resolvers have been used for sensing the rotor position with respect to the stator These sensors however make the motor system more complicated and mechanically

unreliable A method for the estimation of the speed and rotor position of a BLDC motor is presented in this paper Fuzzy based back EMF observer is employed to estimate the speed by using measurements of the stator line voltage and line current Most existing sensorless methods of the BLDC motor have low performance in a transient state or low speed range and occasionally require an additional circuit To overcome this problem the estimation of back EMF is carried out by fuzzy logic techniques to improve the performance of the system This method proposes a back EMF observer based on fuzzy function approximation and the system state equation of the BLDC motor and describes a fuzzy logic approach to design a Hybrid Controller HC for variable speeds of a BLDC motor Here Proportional Integral PI controller is tuned by the fuzzy logic technique The fuzzy logic tuner is used to adjust the two gains of the PI controller In this approach the fuzzy tuning of the gains of a conventional PI controller is achieved through fuzzy rules deduced from many simulation tests applied to BLDC motor for a variety of operating conditions Experimental results show that the proposed fuzzy tuning PI controller is better than the controller with fixed gains in terms of robustness and speed rise time even under great variations of operating conditions and load disturbance

**Speed Control of Sensorless Brushless DC Motor** MD Sabbir Ahmed,2018-11-22

This book is all about running a brushless DC motor using a sensorless technique The target of the work was to make a very simple operating method for a brushless motor and formulate a speed control mechanism Initially the work was started with both considering back EMF and without considering back EMF Because of more complexity in the back EMF sensing method and as our intention was to make a simpler and cost effective operation so finally we assembled our project the without back EMF sensing Even though being a simple and inexpensive machine the performance was quite good However adding back EMF sensing in this machine can give it more dependability

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 Computing Back EMF From Line Voltage Difference R. Sivakami, G. Sugumar, 2020 Sensorless operation of permanent  
 magnet brushless direct current BLDC motor drive controls the rotating speed with different applied voltage No phase  
 lagging is produced which leads to increase the efficiency and minimize the torque pulsation of the BLDC motor Initially  
 motor can be started by following the v f method then allows the sensorless mode after reaching the minimum speed of 500  
 1000rpm The Sensorless BLDC motors are highly used due to higher efficiency reliability power acoustic noise smaller  
 lighter greater dynamic response better speed versus torque characteristics higher speed range and longer life Thus the  
 source voltage spikes and switching losses are reduced This method can be demonstrated through MATLAB stimulation and  
 DSP TMS 320LF2407A is used in the experimental setup to get the output Permanent Magnet Brushless DC Motor Drives  
 and Controls Chang-liang Xia, 2012-04-24 An advanced introduction to the simulation and hardware implementation of BLDC  
 motor drives A thorough reference on the simulation and hardware implementation of BLDC motor drives this book covers  
 recent advances in the control of BLDC motor drives including intelligent control sensorless control torque ripple reduction  
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 which also have applications to other types of motors Includes presentation files with lecture notes and Matlab 7 coding on a  
 companion website for the book Sensorless Control of a BLDC Motor, 2018 **An Adaptive System for  
 Position-sensorless Start-up of Brushless DC Motors Using Online Mutual Voltage Monitoring** Ozegbe James  
 Chukwuma, 2015 The proliferation of applications for brushless direct current BLDC motors in different industries continues  
 to drive advances in not just BLDC machines but also their driver circuit system and control mechanisms Position sensorless  
 start up of BLDC motors continues to be an active area of research as more advanced control methods exploiting previously  
 unused start up techniques come to light In this work a start up technique for accelerating BLDC motors based on dynamic

offset cancellation and adaptive conditioning of the mutual voltage is introduced. The mutual voltage sensed across the floating phase and the center tap of the motor is a by-product of the mutual inductance generated from flux in magnetically salient BLDC motors. It is position dependent and can be used for position estimation and commutation decisions similar to the self inductance. However, the amplitude and offset characteristics of the mutual voltage can vary for multiple BLDC motors as it is typically not a machine specification parameter and is not an explicitly controlled design parameter. This creates challenges in manufacturing flows that use multi-source strategies for procuring BLDC motors but require unique start-up solutions, thus the need for self-tuning and adaptive start-up systems. This adaptive system for position sensorless start-up of BLDC motors using mutual voltage is designed to be fully implementable as a discrete system on-chip SoC integrated circuit. The hardware subsystem functions such as PWM ADC conversion and GPIO are achieved using a microcontroller. A mutual voltage analog front-end circuitry consisting of programmable gain instrumentation amplifiers connected across each phase and the center tap of the motor level shifters and an analog multiplexer to select the floating phase channel. Signal processing algorithms such as offset cancellation and gain selection by saturation detection are used in correcting the amplitude and offset characteristics of the mutual voltage. These are implemented in firmware. Using the corrected mutual voltage, a commutation criteria based on a hybrid of its peak and threshold detection is used in accelerating the motor from standstill through a pre-defined number of electrical or mechanical cycles until enough back EMF has been attained for closed-loop controlled acceleration to the target speed.

**Synchronous-Misalignment Detection/Correction Technique of Sensorless BLDC Control** James Phillip Johnson, 1998 *Sensorless Field Oriented Control (FOC) for a 3-phase BLDC Motor*, 2020 **Sensorless Control of the BLDC Motors from Near-zero to Full Speed** Taehyung Kim, 2003

**Sensorless, Brushless DC Motor Controller** Raleigh G. Thompson, Purdue University Calumet, Electrical Engineering Technology Department, 2000 [Sensorless AC Electric Motor Control](#) Alain Glumineau, Jesús de Leon Morales, 2015. This monograph shows the reader how to avoid the burdens of sensor cost, reduced internal physical space, and system complexity in the control of AC motors. Many applications fields, electric vehicles, wind and wave energy converters, and robotics among them, will benefit. [Sensorless AC Electric Motor Control](#) describes the elimination of physical sensors and their replacement with observers, i.e., software sensors. Robustness is introduced to overcome problems associated with the unavoidable imperfection of knowledge of machine parameters, resistance, inertia, and so on, encountered in real systems. The details of a large number of speed and/or position sensorless ideas for different types of permanent magnet synchronous motors and induction motors are presented along with several novel observer designs for electrical machines. Control strategies are developed using high-order sliding mode and quasi-continuous sliding mode techniques, and two types of observer-controller schemes based on backstepping and sliding mode techniques are described. Experimental results validate the performance of these observer and controller configurations with test trajectories of significance in difficult sensorless AC machine problems.

Control engineers working with AC motors in a variety of industrial environments will find the space and cost saving ideas detailed in Sensorless AC Electric Motor Control of much interest Academic researchers and graduate students from electrical mechanical and control engineering backgrounds will be able to see how advanced theoretical control can be applied in meaningful real systems Advances in Industrial Control aims to report and encourage the transfer of technology in control engineering The rapid development of control technology has an impact on all areas of the control discipline The series offers an opportunity for researchers to present an extended exposition of new work in all aspects of industrial control

**Discrete time sliding mode control strategies applied to a multiphase brushless DC machine** Godoi Dias, Milena Sabrina,2017 Nowadays environmental issues motivates the replacement of mechanical hydraulic and pneumatic system by electrical system in the transport sector aiming to reduce emissions generated by burning of fossil fuels in vehicles The electrical system must ensure high electrical efficiency and should not exceed the weight of the substituted components To attend these high performance requirements a fault tolerant multiphase brushless DC machine was chosen for this research The present work introduces a six phase 600W brushless DC machine with 8 poles The main challenge for the control issues of this machine is the mutual magnetic coupling between the phases due to the wave winding machine configuration In this context theoretical and practical investigations of different current control strategies based on the sliding mode control approach applied to the six phase brushless DC machine are presented

**Sensorless control of brushless DC motor using back EMF commutation** David Bomassi,2000 BLDC Motor Control Using Arduino Controller Board ,2014

**Study of Speed Sensorless Control of Brushless DC Motor Using Rotor Flux State Observer** □□□,2009

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