CONTROLLING DC MOTOR USING MICROCONTROLLER PIC16F72 WITH PWM

Can you control a DC motor with PWM? PWM control works well with DC motors and other slowly changing loads.

Can you control AC motor with PWM? AC drives that use PWM techniques have varying levels of performance based on control algorithms. There are four basic types of control for AC drives today. These are Volts per Hertz, Sensorless Vector Control, Flux Vector Control, and Field Oriented Control. variable frequency drive for applications like fan and pump.

What is PWM speed control of DC motor using microcontroller? PWM (Pulse Width Modulation) One method that is often used for DC motor control using a microcontroller is Pulse Width Modulation (PWM) method. The speed of the electric motor depends on the modulator voltage. The greater the voltage, the faster the rotation of an electric motor.

How to use PWM in microcontroller? The basic idea to generate PWM signal is using a counter (or timer), a CMP (compare) value, and a digital output pin. The counter continuously counts to up or down, and is compared with CMP value. The digital output (PWM) will be changed when the counter matches the CMP value, or when counter resets.

What is the best PWM frequency for DC motors? A higher frequency will cause a shorter cycle time of the PWM; hence the current will have less time to rise. Portescap recommends using PWM frequencies not less than 50 kHz for brushless

DC motors. PWM frequencies of 80 kHz or more would be even more appropriate for motors having very small electrical time constant.

Can you control a DC fan with PWM? PWM control of brushless DC fans is never perfect, as the fan may not behave well due to the chopping of the power supply to the fan control IC. Some fans can deal with it because they have some internal filtering for that control circuit, others will freak out depending on the PWM frequency.

What are the disadvantages of speed control of DC motor using PWM? But this method is usually not used for two reasons. The first reason is energy wastage i.e. the resistor dissipates energy as heat. The second reason is if we want to use any devices like microcontrollers or any other digital equipment for automating our DC Motor speed control, then this method cannot be used.

Is PWM used for AC or DC? Pulse width modulation uses transistors that switch the DC voltage on and off in a defined sequence to produce the AC output voltage and frequency. Most VFDs today utilize insulated gate bipolar transistors or IGBTs.

What are the disadvantages of PWM control?

How can we change the speed of a DC motor using PWM? The circuit is used to control speed of DC motor by using PWM technique. Series Variable Speed DC Motor Controller 12V uses a 555 timer IC as a PWM pulse generator to regulate the motor speed DC12 Volt. IC 555 is the popular Timer Chip used to make timer circuits.

Why PWM is used in DC motor? This enables use of the motor in an application where dynamic behavior and fast responses are desired. The use of PWM enables current control in the windings. Hence, the output torque, which is linearly proportional to the average winding current, can be correctly controlled; thanks to our coreless design.

How to control a motor using a microcontroller? Direction control of a DC motor is very simple; just reverse the polarity, means every DC motor has two terminals out. When we apply DC voltage with proper current to a motor, it rotates in a particular direction but when we reverse the connection of voltage between two

terminals, motor rotates in another direction.

What mode must you put a pin in to use it for PWM output? You need to both enable the pin for output and enable the PWM mode on the pin in order to get any output. I.e. you need to do pinMode() and set the COM bits. The different timers use the control bits and prescaler differently; check the documentation for the appropriate timer.

What is the smallest microcontroller with PWM? MicroPlex® 7H - the smallest CAN controller with PWM.

How to generate PWM c program?

What frequency should I choose for PWM? As a rule of thumb, you want the frequency of your PWM signal to be greater than 5 over 2 pi tau, where tau is the electrical time constant for your desired motor. If you go to high, however, the transistors inside of your driver may experience thermal limitations due to switching losses.

Which is better fast PWM or phase correct PWM? Fast PWM is faster than phase correct PWM because fast PWM performs a single slope (i.e., up only) count. Phase correct PWM uses an up-then-down dual slope counting technique.

What is the frequency of PWM in microcontroller? The PWM frequency is the frequency by which analog output can be adjusted. The PWM frequency also determines the cutoff frequency of the filter. The PWM signal is a square wave with a different duty cycle depending on the dc output voltage target. The filter will convert the square wave to an average dc voltage.

Where to plug in a PWM cable on a motherboard? If you want to use the PWM function then the 4 Pin fan must be connected to a 4 Pin header on the motherboard. If you connect the 4 Pin fan connector to a 3 Pin header, then the fan will run at maximum RPM.

How many fans can PWM handle? Example: If a fan has a current strength of 0.2 Ampere and the motherboard fan connector has 1 Ampere, up to 5 fans can be operated in series via PWM Sharing Technology.

Does PWM control voltage or current? In terms of functional operation, PWM achieves this control by controlling the average current and voltage it delivers to the load. This method is accomplished by rapidly turning the switch between the load and the source, on and off.

Can PWM damage a DC motor? An increase in the PWM frequency results in an increase in the power loss on the H-bridge used with your Arduino microcontroller and may cause the motor driver board to overheat. Users will need a method of cooling down their H-bridge or motor driver to prevent the components from getting damaged.

What is the most efficient speed control of DC motor?

Which of the PWM mode is preferable for controlling motors? A higher frequency will cause a shorter cycle time of the PWM; hence the current will have less time to rise. PWM frequencies not less than 50 kHz for brushless dc motors are recommended. PWM frequencies of 80 kHz or more would be even more appropriate for motors with a very small electrical time constant.

Can DC fan be controlled with PWM? While direct PWM of the power supply can be used for controlling brushless fan & there are ICs designed to do just that, it's not generally recommended by fan manufacturers and those ICs generally operate at low frequencies on the order of 10s of Hz–enough to let the electronics get a few proper commutation cycles in ...

Should I set fans to PWM or DC? If you are building a PC that has a regular workload, constant speed DC fans provide sufficient cooling performance as well as a relatively long life. For those seeking as much control over the PC as possible, PWM is generally the way to go.

Which PWM technique is best? Space-Vector Modulation It has advantages such as higher source usage and lower harmonics when compared to other approaches such as 180-degree conduction, SPWM, and so on. SVM is a digital modulating technique that generates PWM load line voltages that are on average equal to a given (or reference) load line value.

How can we change the speed of a DC motor using PWM? With 50% duty cycle the average value is 2.5V, and if the duty cycle is 80%, the average voltage is 4V and so on. The maximum duty cycle can be 100%, which is equivalent to a DC waveform. Thus, by varying the pulse-width, we can vary the average voltage across a DC motor and hence its speed.

What are the disadvantages of speed control of DC motor using PWM? The first reason is energy wastage i.e. the resistor dissipates the excess energy as heat. The second reason is if we want to use any devices like microcontrollers or any other digital equipment for automating our DC Motor speed control, then this method cannot be used.

How to control DC motor with PWM Arduino? Since we will be controlling only one motor in this tutorial, we will connect the Arduino to IN1 (pin 5), IN2 (pin 7), and Enable1 (pin 6) of the L298 IC. Pins 5 and 7 are digital, i.e. ON or OFF inputs, while pin 6 needs a pulse-width modulated (PWM) signal to control the motor speed.

How to speed control of DC motor?

What is the difference between SCR and PWM motor control? A SCR DC motor control will typically be smaller than a comparable PWM DC motor control. A PWM contains all of (or similar) components as the power section of a SCR, and then some. However, other features on the drive may make a difference in size.

How to control speed using PWM pin?

Can PWM change the motor direction? The motor is connected to the driver on the Base-board using two wires, its direction of rotation and rotation speed can be controlled by changing the duty cycle of the PWM signals.

Can PWM damage a DC motor? An increase in the PWM frequency results in an increase in the power loss on the H-bridge used with your Arduino microcontroller and may cause the motor driver board to overheat. Users will need a method of cooling down their H-bridge or motor driver to prevent the components from getting damaged.

How to control DC motor speed using microcontroller? Here we do the same experiment by using a microcontroller. For that purpose, here we will use ATmega8 controller to produce PWM wave. By varying the width of this PWM wave, we can control the speed of DC motor. In ATmega8 controller, timer1 and timer2 have PWM mode.

How is the PWM signal used to control DC motors? If we switch the power on and off quickly enough, the motor will run at some speed part way between zero and full speed. This is exactly what a p.w.m. controller does: it switches the motor on in a series of pulses. To control the motor speed it varies (modulates) the width of the pulses – hence Pulse Width Modulation.

What is the main idea of PWM in motor control using microcontroller? Pulse Width Modulation (PWM) uses digital signals to control power applications, as well as being fairly easy to convert back to analog with a minimum of hardware. If either voltage or current is near zero then power will be near zero. PWM takes full advantage of this fact.

How to control DC motor without driver? If you are looking for the simplest possible way to control a DC motor, then you will need a single transistor. You can choose a transistor that is appropriate for the current requirements of the motor that you want to control. A Darlington TIP122 transistor is a common device used in DC motor control applications.

Can DC fan be controlled with PWM? While direct PWM of the power supply can be used for controlling brushless fan & there are ICs designed to do just that, it's not generally recommended by fan manufacturers and those ICs generally operate at low frequencies on the order of 10s of Hz–enough to let the electronics get a few proper commutation cycles in ...

What is the easiest way to control a DC motor? A simple way to control the speed of a DC motor is to regulate the supply voltage with pulse width modulation (PWM). The basic idea behind PWM is that it switches the supply voltage ON and OFF very quickly.

How to control the speed of a DC motor using Arduino? In this tutorial we are going to interface a DC motor to Arduino UNO and control it's speed using PWM (Pulse Width Modulation) concept. This feature is enabled in UNO to get variable voltage over constant voltage. The method of PWM is explained here; consider a simple circuit as shown in figure.

Can any DC motor be speed controlled? The speed of a DC motor can be controlled by changing the flux applied to it as the speed of the motor is inversely proportional to the flux per pole.

What happened to the people who kidnapped Solomon Northup? The D.C. government did not pursue the case. Those who had kidnapped and enslaved Northup received no punishment. In his first year of freedom, Northup wrote and published a memoir, Twelve Years a Slave (1853).

How was Solomon Northup tricked into slavery? In 1841 Solomon Northup was recruited by two men, supposedly to join their circus act as a fiddler. The three traveled from New York to Washington, D.C., where Northup was drugged and awoke in shackles. He was sold at a slave market in New Orleans and spent 12 years in slavery in central Louisiana.

Who sold Solomon into slavery? In 1841 Solomon Northup, a free black New Yorker, was kidnapped in Washington, DC, and sold to slave trader James Birch. Renaming Northup "Platt Hamilton," Birch created a fictitious backstory for Platt before shipping him south via the brig Orleans to his partner Theophilus Freeman in New Orleans.

What does Solomon Northup's narrative reveal about the relation between slavery and social institutions such as marriage and the family? Twelve Years a Slave, in particular, supports the antislavery argument that the institution of slavery undermined and perverted the institutions of marriage and the family. Solomon Northup was a free black man who was kidnapped from his home in the North and sold into slavery in the South.

Did Solomon Northup reunite with his wife? Right: Solomon Northup is reunited with his wife and children at the end of his 1853 memoir.

What happened to Solomon Northup at the end? After he was freed, Northup filed kidnapping charges against the men who had defrauded him, but the lengthy trial that followed was ultimately dropped because of legal technicalities, and he received no remuneration. Little is known about Northup's life after the trial, but he is believed to have died in 1863.

Why did Ford sell Solomon? Ford faces financial troubles and must sell Solomon to Tibeats. Tibeats and Solomon go to work at another plantation owned by Ford, which is overseen by the reasonable Mr. Chapin. One morning, Tibeats becomes angry with Solomon even though Solomon has done exactly what Tibeats asked.

Why did Armsby betray Solomon? Armsby betrayed Northup by telling Epps that Northup was trying to write a letter to his friends in New York. Armsby (Garret Dillahunt) was trying to obtain a position as an overseer with Epps, which is presumably why he ratted out Northup's attempts to write home.

When did slavery start? Slavery was institutionalized by the time the first civilizations emerged (such as Sumer in Mesopotamia, which dates back as far as 3500 BC). Slavery features in the Mesopotamian Code of Hammurabi (c. 1750 BC), which refers to it as an established institution.

What is a famous quote from Solomon Northup? Life is dear to every living thing; the worm that crawls upon the ground will struggle for it.

Who owned the first 11 slaves? Leslie Harris: The first 11 enslaved people, all male, who came to New Amsterdam, were brought by the Dutch West Indian Company. They were owned by the company, not by individuals. So they're company slaves. And they're bought by the company for the purpose of building the colony.

How did Northup finally gain his freedom? Northup finally won his freedom when a visiting white carpenter from Canada wrote letters to family, friends and a kindly storekeeper. As unbelievable as Northup's story is, it was not uncommon – historians have documented hundreds of such kidnappings of free African-American men and women.

What did Solomon Northup say about slavery? Extreme violence is central in Northup's narrative; he emphasizes that the slave owner's authority was only maintained by terrorizing enslaved black people they owned with relentless physical and psychological violence.

Why was Solomon Northup's story so unique to history? As Frederick Douglass' Paper described the book upon its release in 1853: “It is a strange history, its truth is far stranger than fiction.” This dichotomy between “truth” and “fiction” was at the center of Solomon Northup's story, in part because of the direct corollaries between his narrative and the best selling ...

What are the differences between Frederick Douglass and Solomon Northup? Douglass was born a slave, taught himself to read and write, realized that he should be free and escaped, while Northup was born free and was kidnapped into slavery, where he remained for twelve years until his rescue.

Did Solomon Northup have kids? On December 25, 1829, Solomon Northup married Anne Hampton, and the couple had three children: Elizabeth, Margaret, and Alonzo. The Northup family sold the family farm and moved to Glens Falls, New York where he worked numerous seasonal jobs around their county of residence.

Why did African Americans stay in the South? Since the second Great Migration ended in 1970, many Black people have moved back to the South. This is largely due to improved race relations and an improvement of the economy in the South. Primary destinations are states such as Texas, Georgia, North Carolina, Maryland, Virginia, Tennessee, and Florida.

What are scars on a slave's back considered evidence of? Sometimes a man or woman was taken back to the small house in the yard, stripped, and inspected more minutely. Scars upon a slave's back were considered evidence of a rebellious or unruly spirit, and hurt his sale.

When was Solomon Northup rescued? Book/Printed Material Twelve years a slave. Narrative of Solomon Northup, a citizen of New-York, kidnapped in Washington city in 1841, and rescued in 1853, from a cotton plantation near the Red River in Louisiana.

Who did Northup write his account for? With the help of co-writer David Wilson, Northup publishes his famous book of his experiences. He dedicates his book to Harriet Beecher Stowe, the author of Uncle Tom's Cabin. His book sold more than 30,000 copies in the first three months.

What happened to Edwin Epps? Epps and his wife died in 1867, two years after Abraham Lincoln (which by extension means they lived to see slavery abolished) of unknown circumstances, though many speculate it was due to Yellow Fever. Patsey was taken from Epps' plantation roughly a decade after Solomon was freed.

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How many children did Solomon Northup have? His father, Mintus Northup, an emancipated slave, was a farm owner, voted in local elections, and valued education for his sons, Solomon and elder brother Joseph. On December 25, 1829, Solomon Northup married Anne Hampton, and the couple had three children: Elizabeth, Margaret, and Alonzo.

Why does Theophilus Freeman refuse to sell Emily Berry to Northup's master? Northup offers a price to buy Emily and her mother, preventing the two from being separated and allowing them to have a better life. However Theophilus Freeman refuses to sell, because he does not believe that slaves should be treated well and because he has other plans for Emily.

How can parents support play based learning at home? Independent play is very important for fostering creativity, problem-solving and autonomy. Offer your preschool student a variety of art materials (crayons, markers, chalk, finger paints), building materials (blocks, Magna-Tiles, Legos) or imaginary play props and allow them to construct their own craft or play.

How can parents support children's play in developmentally appropriate ways?

How to facilitate play at home?

What strategies can we share with parents to assist students at home?

How do you involve parents in play? An excellent way of developing partnerships with parents is to invite them to bring in items to add to a collection of resources, be it a treasure basket, heuristic play objects, fabrics or a particular theme.

How does a parent facilitate play? Offer open-ended toys. “The simplest toys allow for the highest creativity,” says Dr. Ginsburg. Playthings such as blocks, dolls, and balls (see “Let 'Em Loose!”) that can be used in more than one way encourage imagination better than things like coloring books or board games, which have specific rules to follow.

How can parents enhance the play experience for their child? Encourage your child to try a variety of movements in a safe environment—for example, hopping, swinging, climbing and doing somersaults. Balance media use and screen time to with "real world" activities. Age-appropriate media can have benefits for older children, especially if you watch and play with them.

How can parents support their child's learning at home?

How do you support a play-based approach to learning? Providing open-ended resources and activities and encouraging children to respond to these in their own way, makes sure that opportunities for play-based learning are appropriate to children's development. Open-ended resources are objects or substances which have no particular purpose or method of use.

How to explain play-based learning to parents? Instead of relying solely on traditional teaching methods, play-based learning embraces the innate curiosity and creativity of children to foster their development. By engaging in purposeful play, children not only acquire essential academic skills but also develop crucial social, emotional, and cognitive abilities.

How can parents support teachers at home? Include calm, peaceful times in your children's afternoons and evenings. Maintain a schedule that allows them to go to school rested, and if they are sick, have a system in place so they are able to stay home. Remember, it's your children's homework, not yours.

The 68000 Microprocessor 5th Edition by James L. Antonakos

Questions and Answers

What is the 68000 microprocessor? The 68000 microprocessor is a 16/32-bit microprocessor developed by Motorola in 1983. It was widely used in personal computers, workstations, and embedded systems during the 1980s and 1990s.

What are the key features of the 68000 microprocessor? The 68000 microprocessor features a 32-bit data bus and a 16-bit address bus, allowing it to access 2^16 = 65,536 memory locations. It also has 16 general-purpose registers, a 7-stage pipeline, and supports multiple addressing modes.

What is the memory map of the 68000 microprocessor? The 68000 microprocessor has a 24-bit memory map, meaning that it can access up to 2^24 = 16,777,216 memory locations. The memory map is divided into four segments: supervisor, user, I/O, and kernel.

What are the different addressing modes supported by the 68000 microprocessor? The 68000 microprocessor supports nine addressing modes: immediate, direct, indirect, register, extended, post-increment, pre-decrement, and program counter relative. These addressing modes provide the programmer with flexible options for accessing data and memory locations.

What are some typical applications of the 68000 microprocessor? The 68000 microprocessor was used in a wide variety of applications, including personal computers (such as the Apple Macintosh and Commodore Amiga), workstations (such as the Sun Microsystems SPARCstation and Hewlett-Packard HP 9000), and embedded systems (such as automotive and industrial control systems).

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