DOWNLOAD PDF STEPPING MOTORS AND THEIR MICROPROCESSOR CONTROLS

Chapter 1 : Stepping motors and their microprocessor controls - Takashi KenjÅ•, Akira Sugawara - Google

Stepping motors are used wherever repeated stop-start or intermittent motions are encountered. Found in a diverse range of machines such as clocks, typewriters, automatic draughting machines, numerically controlled machine tools, and computer peripherals, stepping motors offer easy compatibility with digital equipment and ease of control.

Show Context Citation Context It consists of two phase A and B in the stator. In order to constitute a state space representation, the state variables of the model were defined as below: Stanciu, Stefan Dan, Mariana D. The CMM computes programming commands from the inspection software with positioning signals from the optical scales sensors and pass to actuators the driving signals in order to reach the prescribed inspection area. The conversion of the command signal into the driving signal can be elaborate by the The conversion of the command signal into the driving signal can be elaborate by the computer itself, if the driving signal for motors is digital, or by controllers if the actuating signal is analogical high voltage. Such a program sequence to control a step-motor is described in the present paper, the benefits and the weaknesses for a CMM being underlined. In the figure 2 the two blocks coordinator for sliding on the axe Hamidreza Jamali, Gholamreza Z. Rafi, Safieddin Safavi-naeini " Abstractâ€"In this paper, a novel hybrid tracking method for mobile active phased-array antenna systems is developed. The proposed technique consists of a mechanical stabilization loop and a direction-of-arrival DOA estimation algorithm, which is based on electronic beamforming. Compared with other track-ing methods, the proposed method requires only one low-cost yaw rate sensor. The method utilizes electronic feedback from the phased-array antenna to compensate for the low-cost sensor irregularities. The effectiveness of the proposed tracking method is demonstrated by measured performance of a fast-moving ultra-low-profile phased-array satellite terminal, which uses the pro-posed approach. Although performance of the proposed tracking system is verified in the context of a mobile satellite television reception system, the basic principles can be applied to any tracking system that employs phased-array antennas. The mobile satellite Internet terminal is an important example. Index Termsâ€"Digital control system, direction-of-arrival DOA estimation, hybrid tracking, microelectromaechanical system MEMS , real-time experiments, satellite communication system, sensor drift, tracking system. Abstract â€" In this paper a new method has been developed to control the operation of a DC motor remotely. It becomes very much advantageous if a DC motor is controlled using a cellphone. In order to do that the proposed method uses a complex programmable logic device CPLD. The control input of CPL The decoder is connected with a cellphone. It becomes very much beneficial as range of controlling becomes very much wider i. It is known that CPLD provides quick implementation and fast hardware verification. It gives facilities of reconfiguring the design construct unlimited number of times. Hardware is implemented using CPLD trainer kit model: A step motor can be viewed as a synchronous AC motor with the number of poles on both rotor and stator increased, taking care that they have no c A step motor can be viewed as a synchronous AC motor with the number of poles on both rotor and stator increased, taking care that they have no common denominator. Additionally, we have discussed about its characteristics, classification, operation, advantages and electric magnetic effects. Most stepping motors can IJSER be stepped at audio frequencies, allowing them to spin quite quickly and with an appropriate controller, they may be started and stopped "on a dime" at control orienta A motorized moving stage with submicron precision is needed to support cellular manipulation e. This study aims to build an automatic moving stage prototype which has two degrees of freedom using hybrid stepper motor connected mechanically with r This study aims to build an automatic moving stage prototype which has two degrees of freedom using hybrid stepper motor connected mechanically with rails of the microscope moving stage. As its name implies,spermanent magnet stepper motor has a permanentsmagnet drum on rotor core.

Chapter 2 : PDF Stepping Motors and Their Microprocessor Controls EBook - Video Dailymotion

Stepping motors are used wherever repeated stop-start or intermittent motions are encountered. Found in a diverse range of machines such as clocks, typewriters, automatic draughting machines, numerically controlled machine tools, and computer peripherals, stepping motors offer easy compatibility.

Hybrid synchronous stepper Permanent magnet motors use a permanent magnet PM in the rotor and operate on the attraction or repulsion between the rotor PM and the stator electromagnets. Variable reluctance VR motors have a plain iron rotor and operate based on the principle that minimum reluctance occurs with minimum gap, hence the rotor points are attracted toward the stator magnet poles. Whereas hybrid synchronous are a combination of the permanent magnet and variable reluctance types, to maximize power in a small size [2]. Two-phase stepper motors[edit] There are two basic winding arrangements for the electromagnetic coils in a two phase stepper motor: Unipolar motors[edit] A unipolar stepper motor has one winding with center tap per phase. Each section of windings is switched on for each direction of magnetic field. Since in this arrangement a magnetic pole can be reversed without switching the direction of current, the commutation circuit can be made very simple e. Typically, given a phase, the center tap of each winding is made common: Often, these two phase commons are internally joined, so the motor has only five leads. A micro controller or stepper motor controller can be used to activate the drive transistors in the right order, and this ease of operation makes unipolar motors popular with hobbyists; they are probably the cheapest way to get precise angular movements. Unipolar stepper motor coils For the experimenter, the windings can be identified by touching the terminal wires together in PM motors. If the terminals of a coil are connected, the shaft becomes harder to turn. One way to distinguish the center tap common wire from a coil-end wire is by measuring the resistance. Resistance between common wire and coil-end wire is always half of the resistance between coil-end wires. This is because there is twice the length of coil between the ends and only half from center common wire to the end. A quick way to determine if the stepper motor is working is to short circuit every two pairs and try turning the shaft. Whenever a higher than normal resistance is felt, it indicates that the circuit to the particular winding is closed and that the phase is working. Bipolar motors[edit] Bipolar motors have a single winding per phase. The current in a winding needs to be reversed in order to reverse a magnetic pole, so the driving circuit must be more complicated, typically with an H-bridge arrangement however there are several off-the-shelf driver chips available to make this a simple affair. There are two leads per phase, none are common. A typical driving pattern for a two coil bipolar stepper motor would be: Static friction effects using an H-bridge have been observed with certain drive topologies. Because windings are better utilized, they are more powerful than a unipolar motor of the same weight. This is due to the physical space occupied by the windings. Though a bipolar stepper motor is more complicated to drive, the abundance of driver chips means this is much less difficult to achieve. An 8-lead stepper is wound like a unipolar stepper, but the leads are not joined to common internally to the motor. This kind of motor can be wired in several configurations: Bipolar with series windings. This gives higher inductance but lower current per winding. Bipolar with parallel windings. This requires higher current but can perform better as the winding inductance is reduced. Bipolar with a single winding per phase. This method will run the motor on only half the available windings, which will reduce the available low speed torque but require less current Higher-phase count stepper motors[edit] Multi-phase stepper motors with many phases tend to have much lower levels of vibration. Stepper motor driver circuits[edit] Stepper motor with Adafruit Motor Shield drive circuit for use with Arduino Stepper motor performance is strongly dependent on the driver circuit. Torque curves may be extended to greater speeds if the stator poles can be reversed more quickly, the limiting factor being a combination of the winding inductance. To overcome the inductance and switch the windings quickly, one must increase the drive voltage. This leads further to the necessity of limiting the current that these high voltages may otherwise induce. An additional limitation, often comparable to the effects of inductance, is the back-EMF of the motor. This AC voltage is subtracted from the voltage waveform available to induce a change in the current. However, it is winding current, not voltage that applies torque to the stepper motor shaft. The current I in each winding is related to the applied voltage V by the winding inductance L and the winding resistance R. To obtain high torque at high speeds requires a large drive voltage with a low resistance and low inductance. This will waste power in the resistors, and generate heat. It is therefore considered a low performing option, albeit simple and cheap. Modern voltage-mode drivers overcome some of these limitations by approximating a sinusoidal voltage waveform to the motor phases. The amplitude of the voltage waveform is set up to increase with step rate. If properly tuned, this compensates the effects of inductance and back-EMF, allowing decent performance relative to current-mode drivers, but at the expense of design effort tuning procedures that are simpler for current-mode drivers. Chopper drive circuits[edit] Chopper drive circuits are referred to as constant current drives because they generate a somewhat constant current in each winding rather than applying a constant voltage. On each new step, a very high voltage is applied to the winding initially. The current in each winding is monitored by the controller, usually by measuring the voltage across a small sense resistor in series with each winding. When the current exceeds a specified current limit, the voltage is turned off or "chopped", typically using power transistors. When the winding current drops below the specified limit, the voltage is turned on again. In this way, the current is held relatively constant for a particular step position. Integrated electronics for this purpose are widely available. Phase current waveforms[edit] Different drive modes showing coil current on a 4-phase unipolar stepper motor. A stepper motor is a polyphase AC synchronous motor see Theory below , and it is ideally driven by sinusoidal current. A full-step waveform is a gross approximation of a sinusoid, and is the reason why the motor exhibits so much vibration. Various drive techniques have been developed to better approximate a sinusoidal drive waveform: Wave drive one phase on [edit] In this drive method only a single phase is activated at a time. It has the same number of steps as the full-step drive, but the motor will have significantly less than rated torque. It is rarely used. The animated figure shown above is a wave drive motor. In the animation, rotor has 25 teeth and it takes 4 steps to rotate by one tooth position. Full-step drive two phases on [edit] This is the usual method for full-step driving the motor. Two phases are always on so the motor will provide its maximum rated torque. As soon as one phase is turned off, another one is turned on. Wave drive and single phase full step are both one and the same, with same number of steps but difference in torque. Half-stepping[edit] When half-stepping, the drive alternates between two phases on and a single phase on. This increases the angular resolution. This may be mitigated by increasing the current in the active winding to compensate. The advantage of half stepping is that the drive electronics need not change to support it. In animated figure shown above, if we change it to half-stepping, then it will take 8 steps to rotate by 1 teeth position. Its angle per step is half of the full step. Microstepping[edit] What is commonly referred to as microstepping is often sineâ€"cosine microstepping in which the winding current approximates a sinusoidal AC waveform. Sineâ€"cosine microstepping is the most common form, but other waveforms can be used. Resolution will be limited by the mechanical stiction , backlash , and other sources of error between the motor and the end device. Gear reducers may be used to increase resolution of positioning. Step size repeatability is an important step motor feature and a fundamental reason for their use in positioning. Then, as the microstepping divisor number grows, step size repeatability degrades. At large step size reductions it is possible to issue many microstep commands before any motion occurs at all and then the motion can be a "jump" to a new position. Additionally, soft magnetic material with many teeth on the rotor and stator cheaply multiplies the number of poles reluctance motor. Modern steppers are of hybrid design, having both permanent magnets and soft iron cores. To achieve full rated torque, the coils in a stepper motor must reach their full rated current during each step. Winding inductance and counter-EMF generated by a moving rotor tend to resist changes in drive current, so that as the motor speeds up, less and less time is spent at full current â€" thus reducing motor torque. As speeds further increase, the current will not reach the rated value, and eventually the motor will cease to produce torque. Pull-in torque[edit] This is the measure of the torque produced by a stepper motor when it is operated without an acceleration state. At low speeds the stepper motor can synchronize itself with an applied step frequency, and this pull-in torque must overcome friction and inertia. It is important to make sure that the load on the motor is frictional rather than inertial as the friction reduces any unwanted oscillations. Pull-out torque[edit] The stepper motor pull-out torque is measured by accelerating the motor to the desired speed and then increasing the torque loading until the motor stalls or misses steps. As noted below this curve is affected by drive voltage, drive current and current switching techniques. A designer may include a safety factor between the rated torque and the estimated full load torque required for the application. Detent torque[edit] Synchronous electric motors using permanent magnets have a resonant position holding torque called detent torque or cogging , and sometimes included in the specifications when not driven electrically. Soft iron reluctance cores do not exhibit this behavior. Ringing and resonance[edit] When the motor moves a single step it overshoots the final resting point and oscillates round this point as it comes to rest. This undesirable ringing is experienced as motor vibration and is more pronounced in unloaded motors. An unloaded or under loaded motor may, and often will, stall if the vibration experienced is enough to cause loss of synchronisation. Stepper motors have a natural frequency of operation. When the excitation frequency matches this resonance the ringing is more pronounced, steps may be missed, and stalling is more likely. Motor resonance frequency can be calculated from the formula:

Chapter 3 : Stepping motors and their microprocessor controls | Oxfam GB | Oxfamâ€™s Online Shop

Stepping Motors And Their Microprocessor Controls (Monographs in Electrical and Electronic Engineering) This book is in very good condition and will be shipped within 24 hours of ordering. The cover may have some limited signs of wear but the pages are clean, intact and the spine remains undamaged.

Chapter 4 : Stepper motor - Wikipedia

Stepping motors are used wherever repeated stop-start or intermittent motions are encountered. Found in a diverse range of machines such as clocks, typewriters, automatic draughting machines, numerically controlled machine tools, and computer peripherals, stepping motors offer easycompatibility with digital equipment and ease of control.

Chapter 5 : Stepping Motors and Their Microprocessor Control - Takashi KenjÅ• - Google Books

Stepping_Motors. Save. Documents Similar To Stepping Motors and Their Microprocessor Controls () A Three-Phase Induction Motor Problem. Uploaded by. owens.

Chapter 6 : Stepping Motors and Their Microprocessor Controls by Takashi Kenjo

IEEE Xplore. Delivering full text access to the world's highest quality technical literature in engineering and technology.

Chapter 7 : Stepping Motors and their Microprocessor Controls : Akira Sugawara :

stepping motors and their microprocessor controls Fri, 19 Oct GMT stepping motors and their microprocessor pdf - Stepping Motors and Their.

Chapter 8 : CiteSeerX â€” Citation Query Stepping Motors and their Microprocessor Controls

Indian Politicians can't control their teeth so how they control their Country.