

CDROM

This Media CD contains a soft copy of master's Thesis titled "BLDC Motor Power Control Techniques Appraisal" and two version of simulation One version models the ESC as ideal and as such neglects the losses associated with it. This speeds up simulation time and is useful in work relating to control loop tuning. The second is a full simulator taking into account the losses associated with the ESC, giving greater accuracy but at the expense of computational power and time. Both simulators are released as below:

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<<http://www.gnu.org/licenses/>>.

Built using MATAB Simulink version R2012b and ran using default Solver od45 with tolerance of 1e-6[as a minimum], built heavily reliant on block diagram, scopes can be added at points of interest by the user and operating conditions adjusted at block diagram level.

In order to run the simulators a minimum amount of information must be inputted via the command window in Mat lab. And a operating conditions adjusted within the block diagram [relevant parts are commented]. The variables need are as shown in the tables below:

Simulation type	Reference	units
PWM	PWM	1=on 0=off
CAM	CA	1=run 0=off
PAM	PAM	1=on 0=off

Simulation type arming signals

Input variable	reference	units	Notes
BEMF constant	Kv	Vs/rad	
Phase resistance	R	Ohms	Per phase
Phase inductance	L	Henries	Per phase

Motor electrical parameters

Input variable	reference	units	notes
Inertia	J	Kg.m ²	
Friction coefficient	Fr	Nms/rad	Related to mechanical speed
Number of poles	P	n/a	Total poles not pairs

Motor mechanical parameters

Variable	Reference	units	notes
On resistance H-Bridge	H-Rt	Ohms	Per transistor
Switching time H-bridge	H-offon	Seconds	Total switching Time
PWM Frequency H-Bridge	H-Freq	Hz	
Source Voltage	Vs	Volts	DC only
PAM PWM Frequency	P-Freq	Hz	

On Resistance PAM	P-Rt	Ohms	For additional bus bar control
Switching Time total PAM	P-Toffon	seconds	

- ESC parameters

Input variable	reference	units	notes
Proportional constant	Kp	n/a	
Integral constant	Ki	n/a	

Control values

As an example the information can be pasted into the command window, to simulate PWM control of a small motor with an input voltage of 6v:

```

Vs=6
R=6.25
L=0.0455e-3
Kv=1.05e-3
J=5e-10
Fr=1.38e-8
P=2
H_Rt=0.117
H_Toffon=165e-9
PWM=1
PAM=0
CA=0
H_Freq=32000
LoopFreq=1000
P_Toffon=0
P_Rt=0
P_Freq=0
Kp=2.2e-5
Ki=5e-3
Kd=0

```