[Component Test] Stepper Motor

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Author : Adrien Komaroff-Kourloff

Purpose of the task:

- Principle: Operate the stepper motor that will be used on both robots. Write a brief report on its operation (including the written functions). Find the optimal operating parameters for the motor.
- Objectives: Familiarize yourself with the operation of stepper motors, prepare for their integration into the code.

Ressources :

To understand the principle of a stepper motor: Stepper Motor Principle

For information on micro-stepping: Microstepping Basics

The hardware connections to be made are detailed in the motor shield component test.

Parameter Optimization

To achieve the best performance with the motors, it is necessary to have a good understanding of the parameters in the BlocMoteurs.h file :

Modify that struct : init for each motor

```
De L6470_init_t initShield[L6470DAISYCHAINSIZE]
```

For this purpose, I have adapted the content of this technical document, which is recommended reading: STMicroelectronics Voltage Mode Control Operation and Parameter Optimization.

Please be aware that the library already performs some calculations after filling in L6470_init_t, and the units and quantities in this technical note may not be exactly the same as what needs to be filled in. You should adapt them based on a study of this library and its various functions.

To find the motor parameters, you need to have various parameters available in the motor datasheet and obtain them through measurement.

Here is the MATLAB script (available as an attachment) that allows me to perform the calculations.

```
R=5.3 %datasheet
L=12.5*10^-3; %datasheet
Iph = 1; %datasheet
Vbus = 22; %I choose that so that Vbatt always > Vbus
ttick = 250*10^-9; %definition on AN4144

%Finding Ke

N=3; %number of period
Ttot = 59.615 * 10^-3;
T=Ttot/N;
f=1/T
Vpeak = 3.2083
Ke = Vpeak/f

%Calculating Shield Parameters

Kval = (R*Iph) % (/vbus)*2^8 taken into account in the lib
intersectSpeed = ((4*R)/(2*pi*L))
startingSlope = ((Ke/4)/Vbus)
finalSlope = (((2*pi*L*Iph+Ke)/4)/Vbus)
```

The "Findink Ke" section is based on a measurement performed with an oscilloscope (Analog Discovery), and the principle is explained in ST's technical note.