

Lab 04

BLDC Motor

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CSE 4355- Section 001

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Directly Powering the BLDC

- Every Electrical Step resulted in ~30 Degrees of Physical Rotation
- 2 full Electrical Rotations results in ~ 1 full Physical Rotation

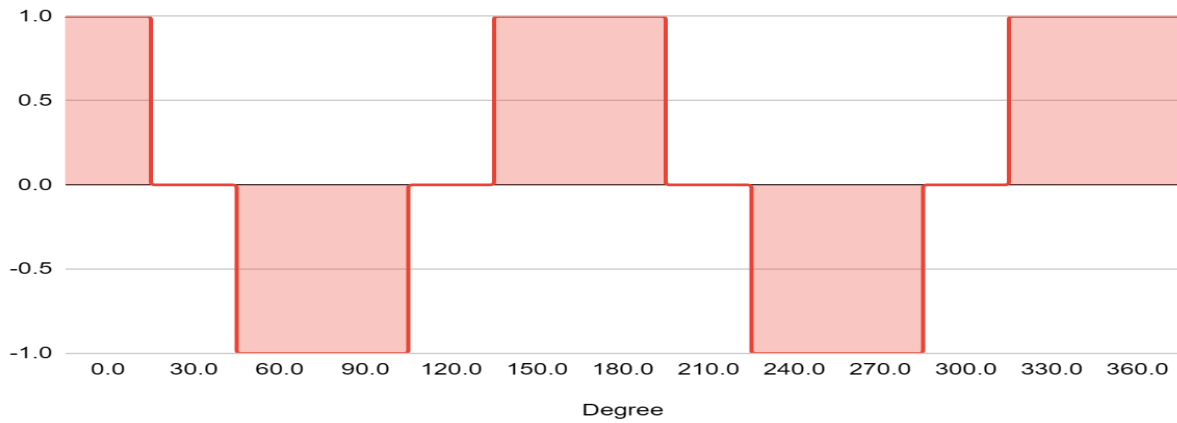
Degree	Coil A	Coil B	Coil C
0	6V	0V	floating
30	floating	0V	6V
60	0V	floating	6V
90	0V	6V	floating
120	floating	6V	0V
150	6V	floating	0V
180	6V	0V	floating
210	floating	0V	6V
240	0V	floating	6V
270	0V	6V	floating
300	floating	6V	0V
330	6V	floating	0V
360 (0)	6V	0V	floating

Hall Effect Sensors

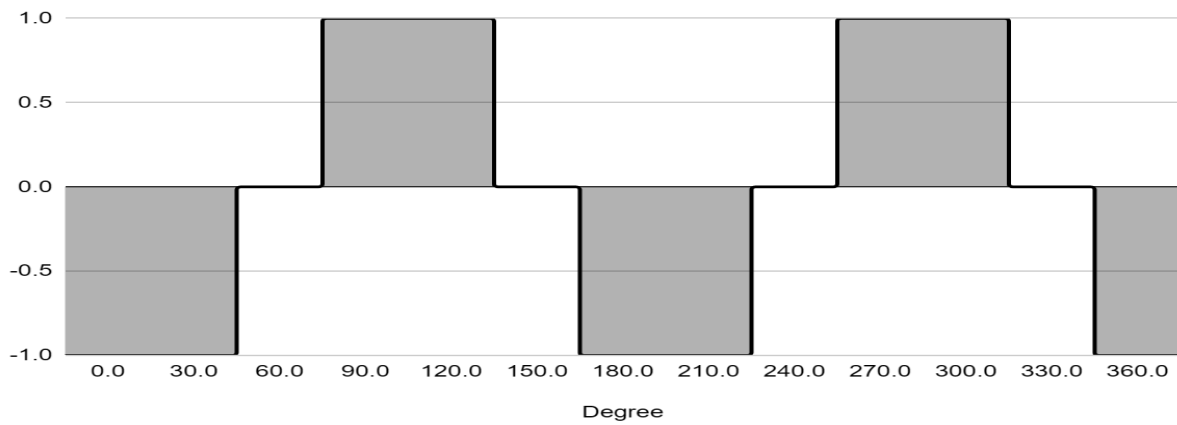
Degree	HE1	HE2	HE3
0	1	0	1
30	0	0	1
60	0	1	1
90	0	1	0
120	1	1	0
150	1	0	0
180	1	0	1
210	0	0	1
240	0	1	1
270	0	1	0
300	1	1	0
330	1	0	0
360 (0)	1	0	1

Hall Effect Sensors Compared to Coil Direction

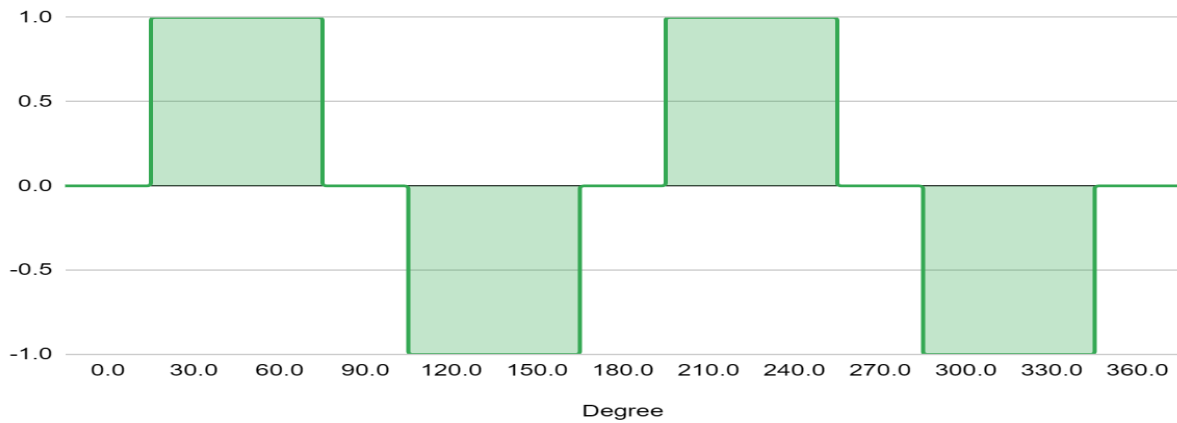
Coil A (Red)



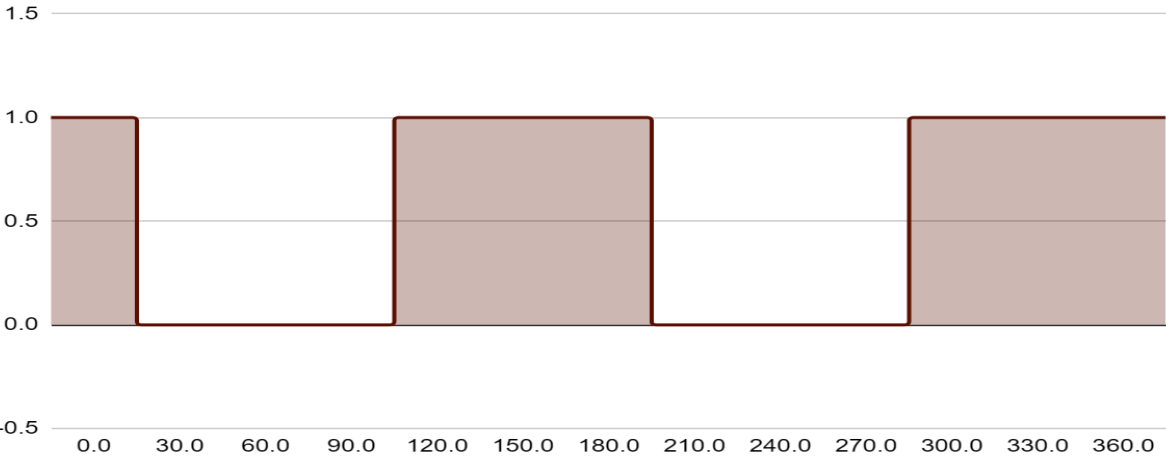
Coil B (Black)



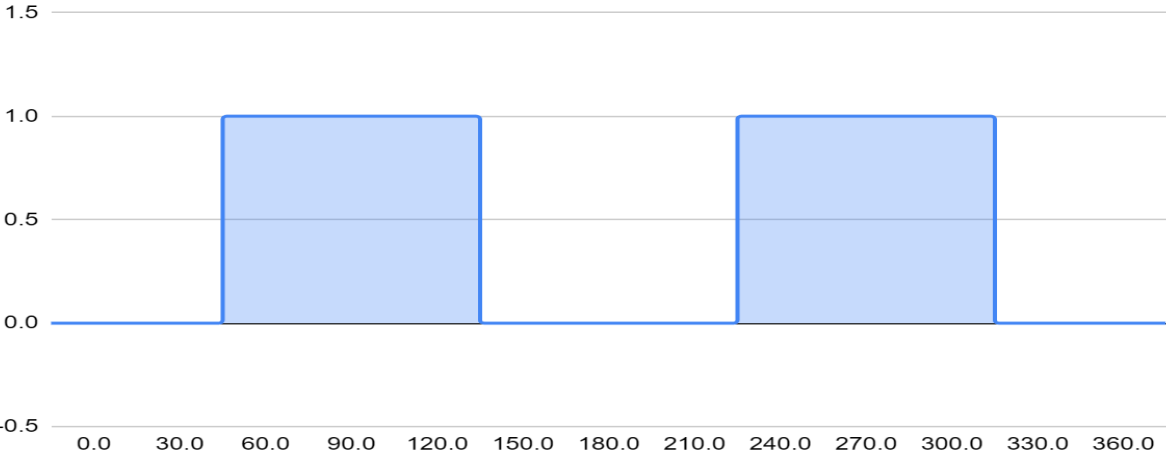
Coil C (Green)



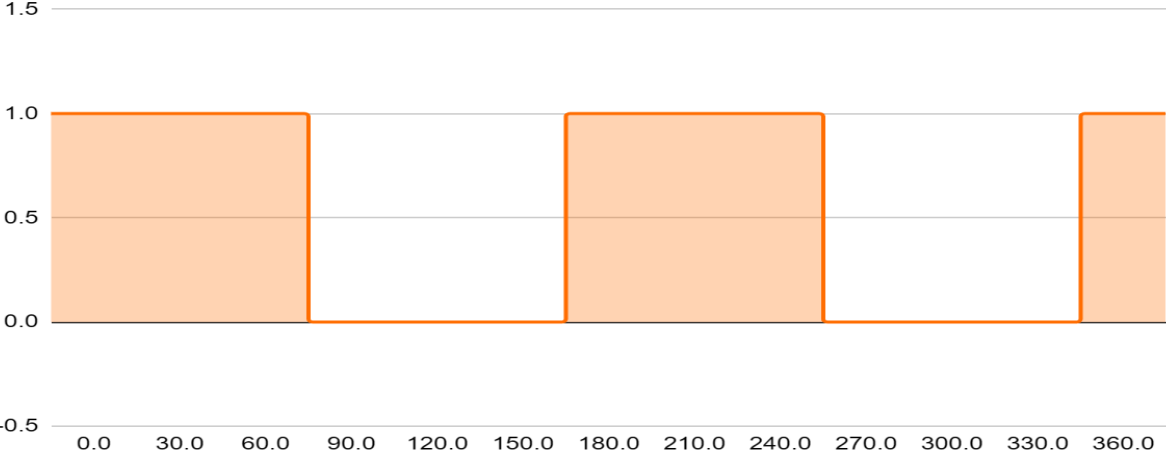
HE1 (Brown)



HE2 (Blue)



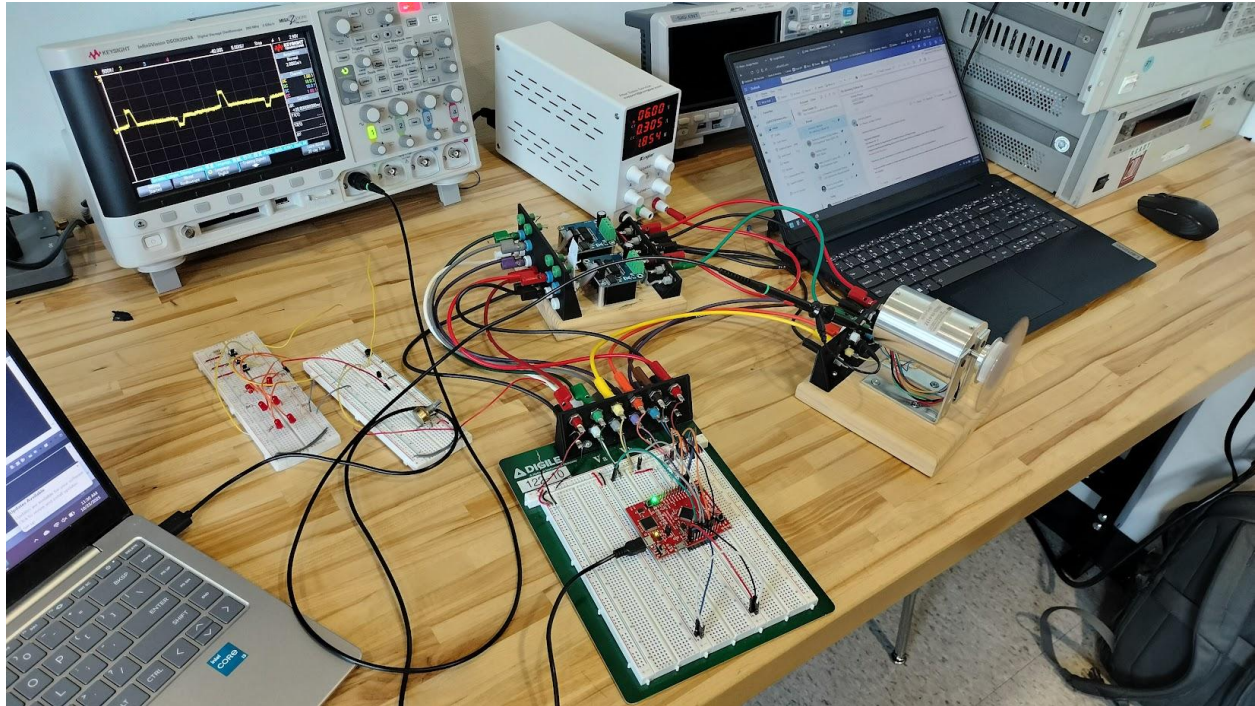
HE3 (Orange)

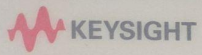


Driving w/ TM4C (Manual Wait Time)

- Minimum wait time between steps we were able to achieve was 4450 us

Driving w/ TM4C (Hall Effect Sensors)





InfiniiVision DSOX2024A

Digital Storage Oscilloscope 200 MHz 2 GSa/s

MEGA Zoom
50K wfms/s

1 500V/ 2 3 4 -40.00% 5.000% Stop f 1 2.99V



Acquisition
Normal
2.00GSa/s

Channels
DC 1.00:1
DC 10.0:1
DC 10.0:1
DC 1.00:1

Cursors
ΔX:
+20.00000000ms
Y1(1):
Y2(1):
ΔY:

Sprache, Langue, Idioma, Lingua, 语言, Language, 언어, 語言, Язык, Język, Язык, Jazyk, Dil

Getting
Started

About
Oscilloscope

Language
English

Training Signals

Learn About
30-day Trial

Main Driver Functions

```
void update_coils()
{
    // d = "don't care" for ease of viewing (d=0)
    if (x==0){ A_DIR = 1; B_DIR = 0; C_DIR = d; A_ENABLE = 1; B_ENABLE = 1; C_ENABLE = 0; }
    else if(x==1){ A_DIR = d; B_DIR = 0; C_DIR = 1; A_ENABLE = 0; B_ENABLE = 1; C_ENABLE = 1; }
    else if(x==2){ A_DIR = 0; B_DIR = d; C_DIR = 1; A_ENABLE = 1; B_ENABLE = 0; C_ENABLE = 1; }
    else if(x==3){ A_DIR = 0; B_DIR = 1; C_DIR = d; A_ENABLE = 1; B_ENABLE = 1; C_ENABLE = 0; }
    else if(x==4){ A_DIR = d; B_DIR = 1; C_DIR = 0; A_ENABLE = 0; B_ENABLE = 1; C_ENABLE = 1; }
    else if(x==5){ A_DIR = 1; B_DIR = d; C_DIR = 0; A_ENABLE = 1; B_ENABLE = 0; C_ENABLE = 1; }
    else x = 0; // just in case
}

void drive_with_hall_effect()
{
    if (HE1 == 1 && HE2 == 0 && HE3 == 1) { A_DIR = d; B_DIR = 0; C_DIR = 1; A_ENABLE = 0; B_ENABLE = 1; C_ENABLE = 1; }
    else if(HE1 == 0 && HE2 == 0 && HE3 == 1) { A_DIR = 0; B_DIR = d; C_DIR = 1; A_ENABLE = 1; B_ENABLE = 0; C_ENABLE = 1; }
    else if(HE1 == 0 && HE2 == 1 && HE3 == 1) { A_DIR = 0; B_DIR = 1; C_DIR = d; A_ENABLE = 1; B_ENABLE = 1; C_ENABLE = 0; }
    else if(HE1 == 0 && HE2 == 1 && HE3 == 0) { A_DIR = d; B_DIR = 1; C_DIR = 0; A_ENABLE = 0; B_ENABLE = 1; C_ENABLE = 1; }
    else if(HE1 == 1 && HE2 == 1 && HE3 == 0) { A_DIR = 1; B_DIR = d; C_DIR = 0; A_ENABLE = 1; B_ENABLE = 0; C_ENABLE = 1; }
    else if(HE1 == 1 && HE2 == 0 && HE3 == 0) { A_DIR = 1; B_DIR = 0; C_DIR = d; A_ENABLE = 1; B_ENABLE = 1; C_ENABLE = 0; }
}

void step()
{
    x = (x+1) % 6;
    update_coils();
    //waitMicrosecond(wait_time);
}

void step_back()
{
    if(x==0) x = 5;
    else x--;

    update_coils();
    //waitMicrosecond(wait_time);
}
```