

Project 3: Motor Control

Questions?

Finish digital to analog exercise...

Project 2

- Finish demos by tomorrow
- Lessons learned?

Project 3: Motor Driver Control

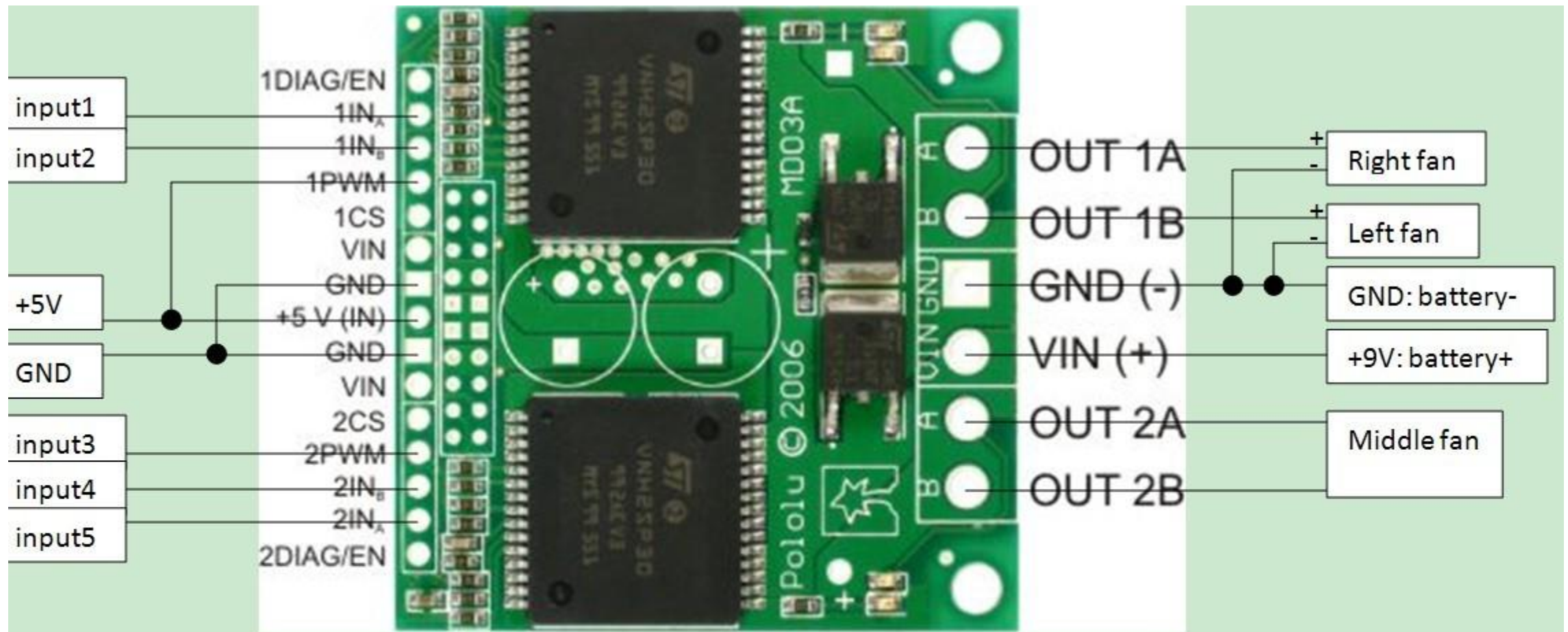
Three ducted fans for our hovercrafts:

- Lift fan: bidirectional control
 - Full H-bridge
 - PWM signal specifies thrust
 - 2 digital outputs specify thrust direction
- Lateral fans
 - $\frac{1}{2}$ H-bridge each
 - PWM signal for each specifies thrust

Component 1: Circuit

- H-bridge to power:
 - Power harness + switch + batteries
- H-bridge to fans
- H-bridge to Arduino board
 - PWM (3) and direction control signals (2)
 - Arduino power and ground

Be careful with direct battery power!



Note: Input1 to input5 should be connected to 5 output pins on Atmega and these are the control signals. Particularly, sending a PWM signal to input1 controls the rotational speed of the right fan; sending a PWM signal to input2 controls the rotational speed of the left fan; sending a PWM signal to input3 controls the rotational speed of the middle fan; input4 and input5 control the rotation direction of the middle fan. Specifically, input4=1 & input5=0, one rotation direction; input4=0 & input5=1, the other rotation direction.

Component 2: Define a New Data Type

Add to project.h:

```
typedef enum {  
    STOP,  
    HOVER  
} MotorDirection;
```

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Data type



Component 2: Define a New Data Type

Add to project.h:

```
typedef enum {  
    STOP,  Legal values  
    HOVER   
} MotorDirection;
```

Component 2: Interface Functions

```
void set_lift_motor_direction(MotorDirection  
                             direction)
```

```
void set_lift_motor_magnitude(int16_t magnitude)
```

```
void set_lateral_motor_magnitudes(int16_t magnitude_left,  
                                  int16_t magnitude_right)
```

Component 3: main() Function

Depending on switch state:

- Ramp the middle fan up, then down, then reverse up and then down
- Ramp left up, then down, then right up and then down

Coding

- Make sure that each function that you implement does exactly what the specification says & no more
- Stick to the documentation specification

New Hardware for Today

- Frisbees
- 3 Fans
- 2 Batteries + trickle charger
 - Rapid chargers can be found in Felgar 300
- Power harness

Be careful with the battery power! (go slow)

Next Time

Analog-to-digital systems