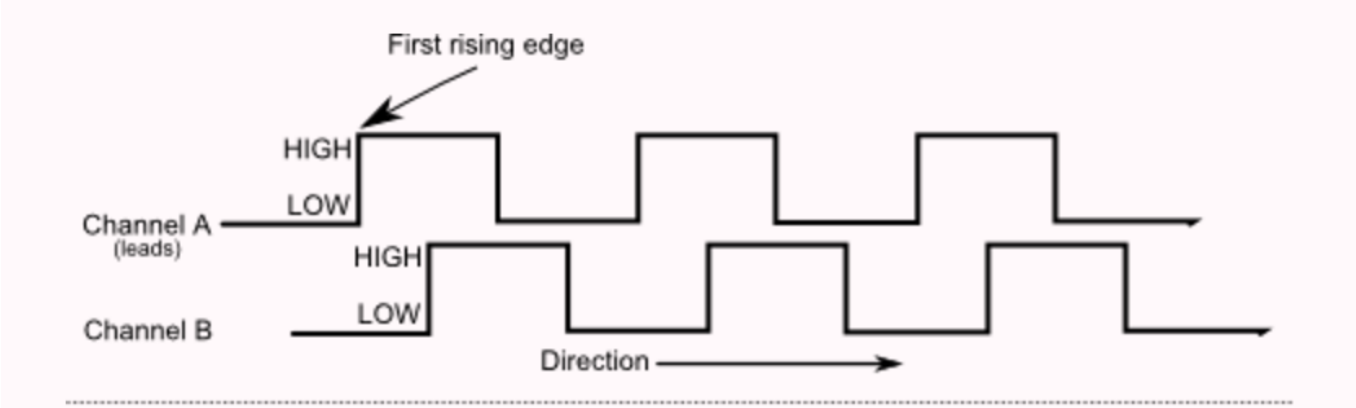
Mobile Robot: Measuring Wheel Position Using Incremental Encoder

Introduction

- **Incremental Encoder**
  - Use to measure angular position and generally attached to motor shaft.

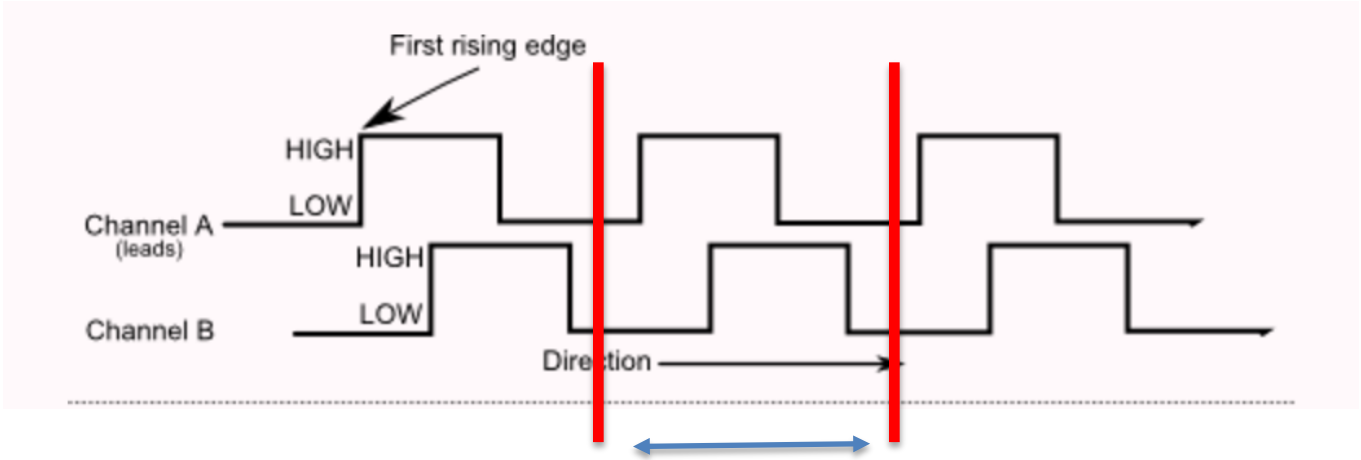
Introduction

- **Incremental Encoder**
  - Generates two signals that are 90 deg. out of phase



Introduction

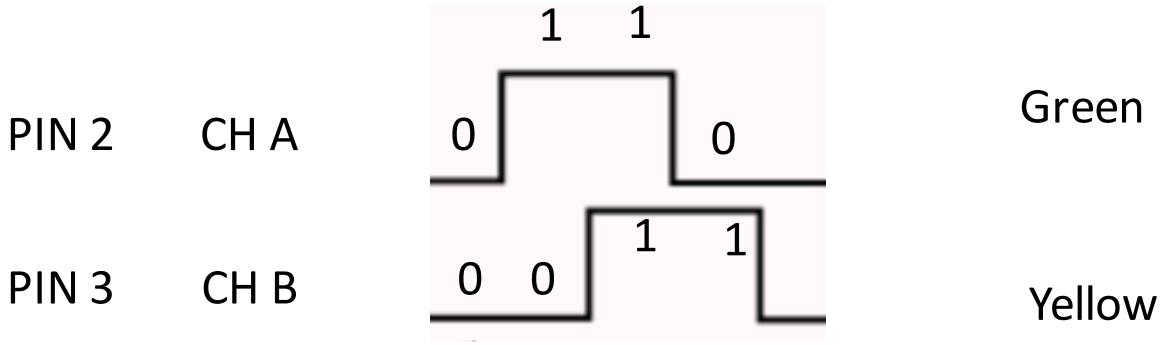
- **Decoding Incremental Encoder (Quadrature Decoding)**
  - Channel A and Channel B will be wired to interrupt pins. If there is a change in state for example high to low or low to high an interrupt is triggered.
  - Quadrature decoding – all rising and falling edges create interrupts. Quadrature since there are four sign changes in Ch A and Ch B for one encoder count.



1 encoder count

Introduction

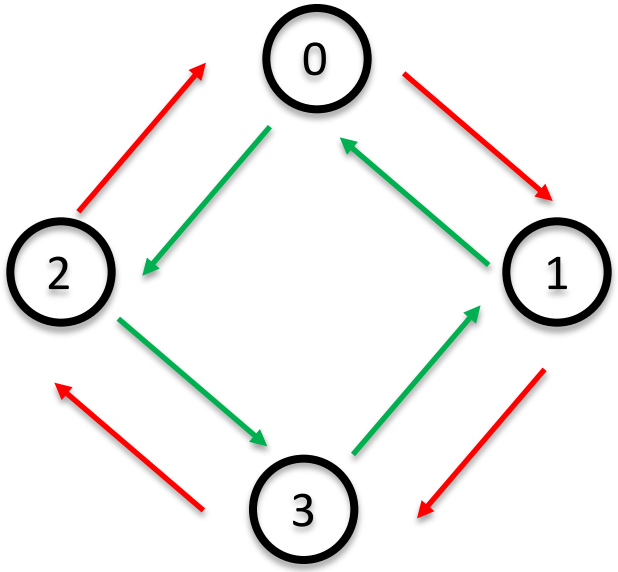
- **Decoding Incremental Encoder (Quadrature Decoding)**
  - State assignment – assign states to one count as basis for determining direction.



	CHB CH A			
	0 0	0 1	1 1	1 0
State	0	1	3	2

Decoding

- Conditions:
  - If current state is 0 and next state is 1 then in clockwise direction (increment the value of the encoder)
  - If current state is 0 and next state is 2 then in counter clockwise direction (decrement the value of the encoder)



Encoder

Red = +5vdc
Black = Ground
Green = Output A
Yellow = Output B

Encoder functions

```
encoder_init();
```

Initialize the encoder. Global variable `encoder0_val` will have the position of motor 0 and `encoder1_val` will be the position of motor 1.

Note the values of `encoder0_val` and `encoder1_val` are in terms of counts. For example, 20000 counts per wheel revolution.

Counts per wheel revolution = 4* encoder counts per rev * motor gear ratio

Wheel Position (radians) = encoder_val / (counts per wheel revolution)

Test Code

```
#include "mrobot.h”
void setup()
{  encoder_init();
   serial.begin(9600);
 }

void loop()
{
  Serial.println(encoder0_val);
//Serial.println(encoder1_val);
}
```

Encoder

Arduino Pins	Encoder	
2	Encoder 0 CHA	Left Wheel
3	Encoder 0 CHB	
18	Encoder 1 CHA	Right Wheel
19	Encoder 1 CHB	

Note encoders have +5 and GND pins.