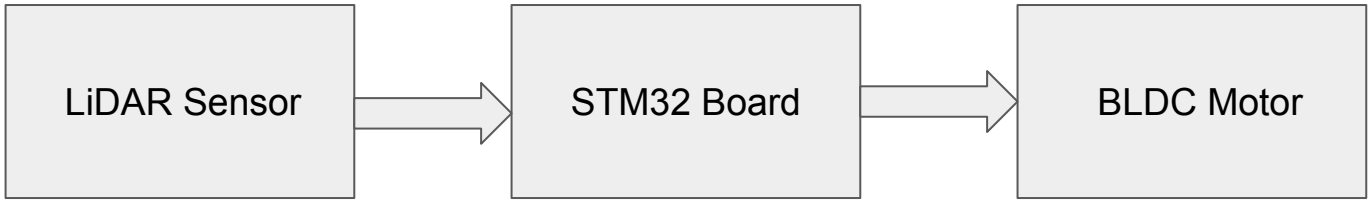
Introduction

- ➢ Our Project focuses on controlling a BLDC Motor, based on the output of LiDAR sensor, using STM32f412ZTx board.
- ➢ It mainly uses the concepts of UART serial communication and PWM using GPIOs.
- ➢ This is the block diagram of our project.



Ideation and Real life Applications

- Our Idea is to interface the LiDAR sensor with STM32 MicroController and thereby Interfacing it with BLDC motor.
- The Motor can be controlled based on the distance metrics that we get from the LiDAR sensor.
- Can be used in:
- Autonomous vehicles
- Geological mappings
- Hazard assessment

BLDC Motor Interfacing

- BLDC- BrushLess DC motor - has got 920 rpm/V
- Max rpm achieved is 11000 (approx)
- We connect using ESC- Electronic Speed controller
- Typically has 2 separate connectors.
- One for Battery Supply (12V supply)
- Second is to connect to the STM board.
    - PWM signal- to modify the duty cycle - rpm affected
    - GND
    - Phase or VCC (5V)

Registers used

GPIO- B,C	TIM4
AHB 1 ENR- to enable clock to GPIO B	APB1ENR- To enable clock to timer4
GPIO B- Moder: PB-14 as output pin	TIM 4- Enable clock for Timer
GPIO B - ODR: On/Off LED	TIM 4-PSC : divide frequency by 16
GPIO C- IDR: Check User push button is pressed or not	TIM 4- CR1: enable timer

Video

LIDAR Interfacing

- TF mini Plus LiDAR (Operating range 0.1m~12m)
- Supply voltage - 3.3V (3V3)
- Single Channel- single phase

Communication interface	UART
Default baud rate	115200
Data bit	8
Stop bit	1
Parity check	None

Byte0 -1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
0x59 59	Dist_L	Dist_H	Strength_L	Strength_H	Temp_L	Temp_H	Checksum

Registers used

GPIO-A	**USART2**
APB1ENR - for enabling clock	AHB1ENR- for enabling clock
PA0- Receiving;	USART2-BRR: setting Baud rate (115200)
PA1- Transmitting	USART2-CR1: control register
	USART2-SR: status register (RXNE) USART2-DR : data register

TIMELINE CHART- generated using Arduino, TFMini plus LiDAR software

Video:

Summary

➢ We could acheive:

Interfacing and controlling BLDC motor using STM32F412	Done
Working with USART and its related registers	Done
Basic model creation for a sensor detection and motor control in mobile systems	Pending

Future Scope

- ➢ Identifying the reason for the failure and finding alternative solutions to overcome the challenges.
- ➢ Exploring other sensors to achieve the desired functionality. Ex: ultrasonic sensors or infrared sensors.
- ➢ Enhancing the project by adding additional features such as real-time data visualization, motor control algorithms, and remote monitoring capabilities to make it more robust and efficient.
- ➢ Further research and development to improve the accuracy and precision of the system by incorporating machine learning and artificial intelligence techniques.

References