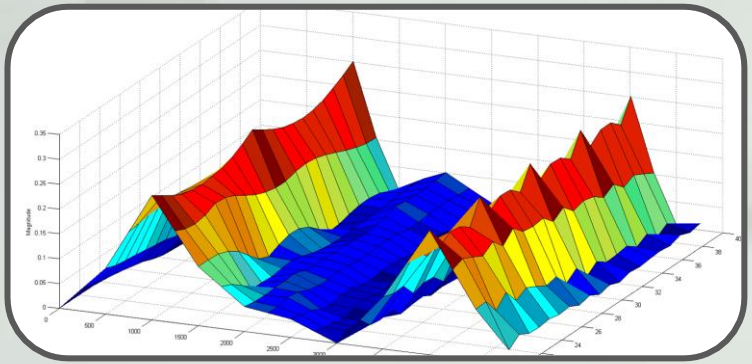
Project Topic:
Designing of 2D polar space scanner system



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Nguyễn Đắc Quy 17TDH2

Nguyễn Tài Duy 17TDH2

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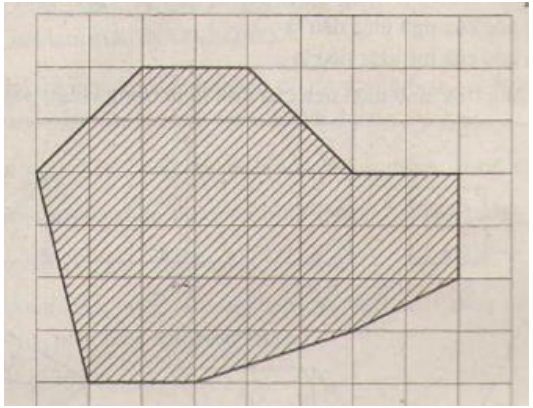
1. Overview

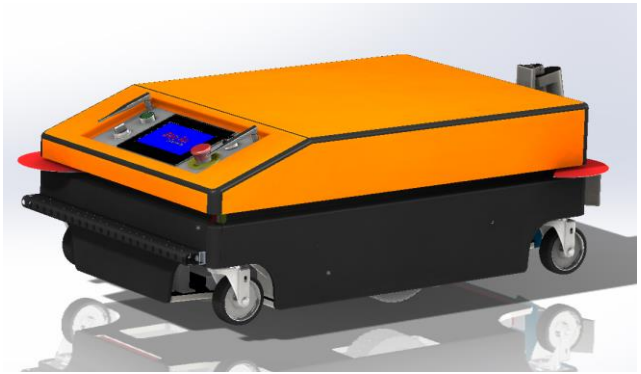
1.1. From real-life issues:

How can we measure s.t



Calculating acreage

Exploring dangerous areas

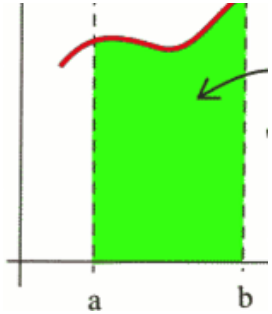


Self-driving system

1. Overview:

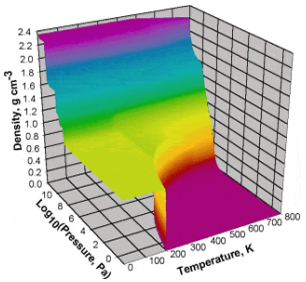
1.2. Idea:

Automatic measurement



Data analysis & calculation

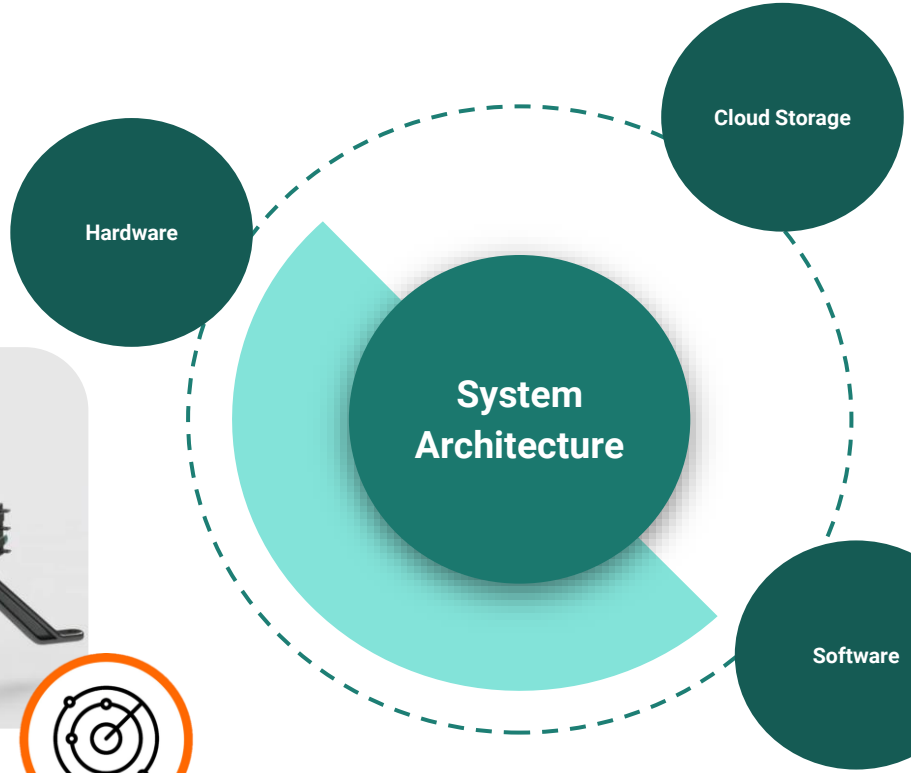
Management & Storage



Simulation & description

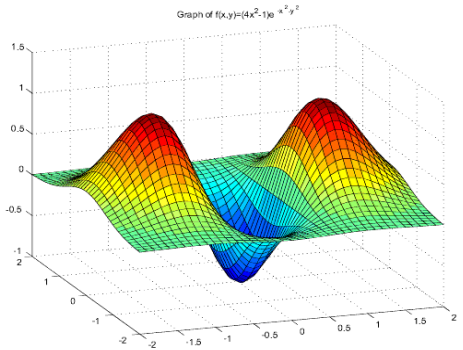
2. Design plan:

2.1. System architecture:



Google Cloud

(Device model)



Phần mềm hiển thị

2. Design plan:

2.2. Working principle:

1 2 3 4

Sensor measurement module

- Measuring & data converter
- Executing the requirement from MCU
- Response

Central processing unit

- Receiving data from sensors
- Converting & processing data
- Data encapsulation and forwarding

Human – Machine interface

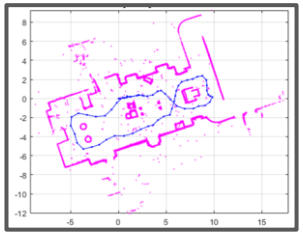
- Display information & simulation
- Statistics and display of measurement results

Cloud storage

- Store data
- Allow extraction when required

Distance data(I2C)

Coordinates data (UART - USB)



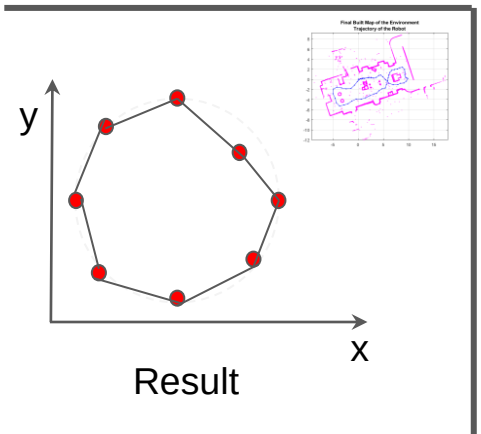
MQTT protocol

Angle & speed (Digital)

Coordinates data (UART - USB)

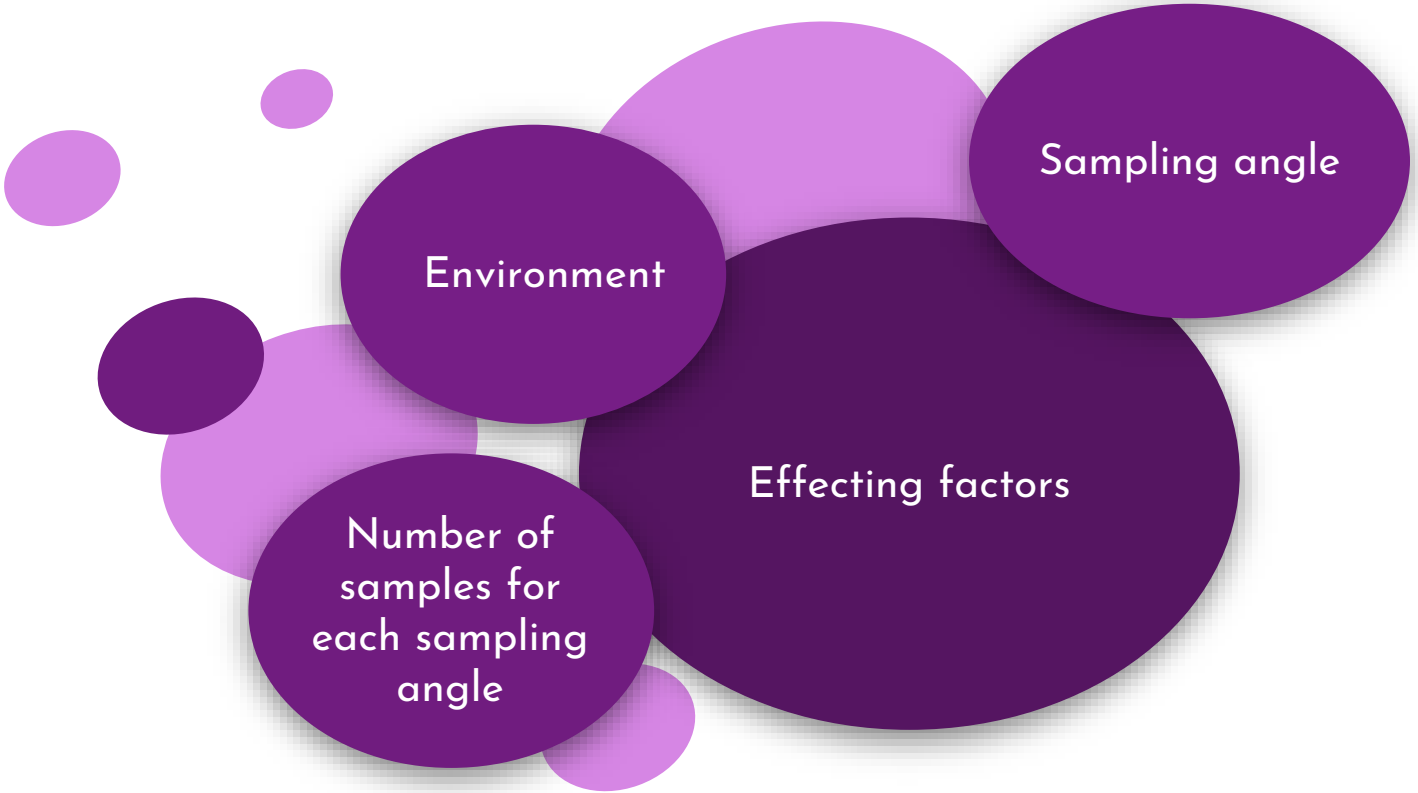
3. Detailed design:

3.1. Reconstruction method:



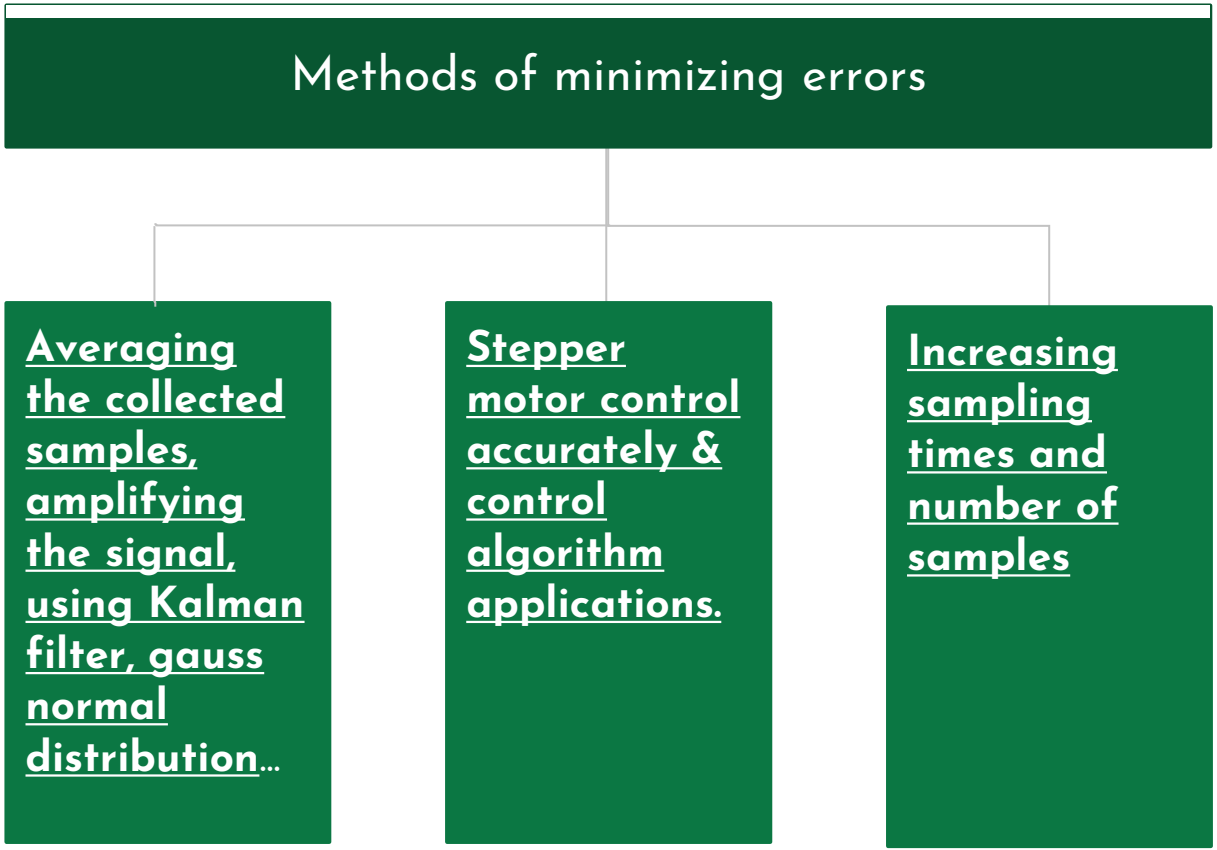
3. Detailed design:

3.2. Effecting factors:



3. Detailed design:

3.3. Data & errors processing:



4. DEMO

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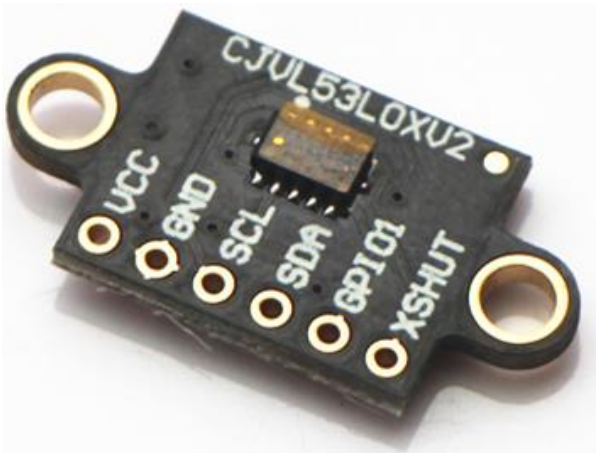
2. Design plan:

Hardware parameters:



VL53L0X V2 distance sensor

- Operating voltage: 2.6 - 3.5 V
- Laser wavelength : 940 nm laser VCSEL
- High accuracy .
- Maximum range : 2m
- FOV (Field of View) = 25 degrees

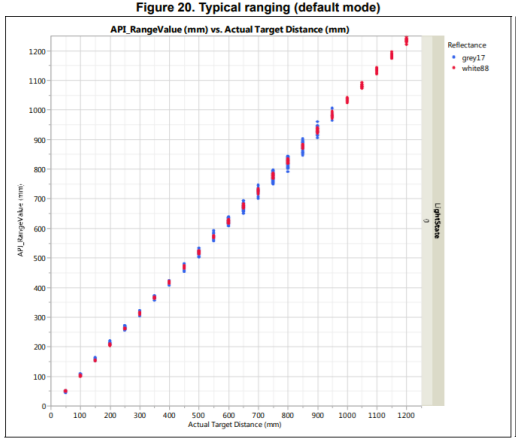
Table 11. Max ranging capabilities with 33ms timing budget

Target reflectance level (full FOV)	Conditions	Indoor (2)	Outdoor overcast (2)
White target (88%)	Typical	200cm+ (1)	80cm
	Minimum	120cm	60cm
Grey target (17%)	Typical	80cm	50cm
	Minimum	70cm	40cm

Table 12. Ranging accuracy

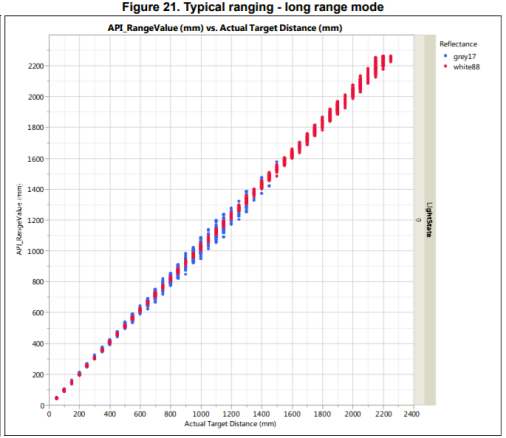
	Indoor (no infrared)			Outdoor		
Target reflectance level (full FOV)	Distance	33 ms	66 ms	Distance	33 ms	66 ms
White Target (88%)	At 120 cm	4 %	3 %	At 60 cm	7 %	6 %
Grey Target (17%)	At 70 cm	7 %	6%	at 40 cm	12 %	9 %

Figure 20. Typical ranging (default mode)



Sai số đo tầm ngắn

Figure 21. Typical ranging - long range mode



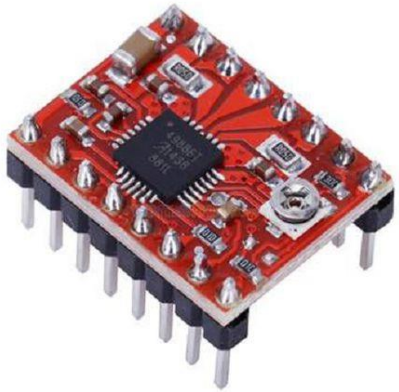
Sai số đo tầm xa

2. Design plan:

Hardware parameters:

Stepper motor: Nema 17 42HS3414A4

- Stepper motor type: 2 pha 4 dây
- Step angle: 1.8 độ
- Momen : 0.31 N.m
- Current on each phase: 1.4A



Driver A4988

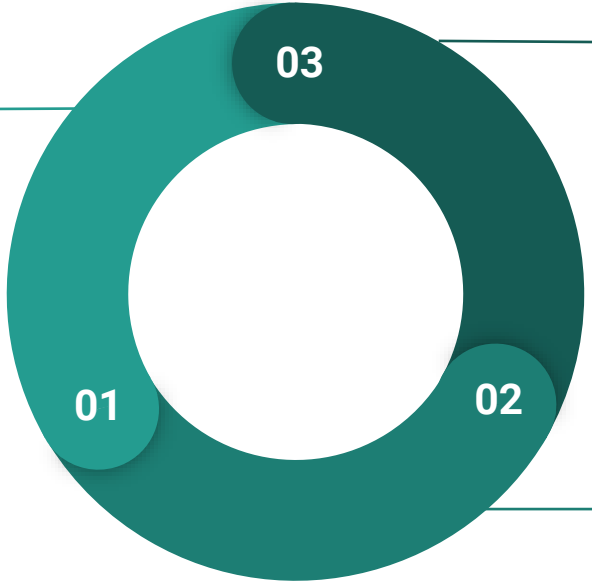
- Operating voltage: 8V~35V
- Continous current on each phase: 1A~2A
- Logic 1 voltage: 3V-5.5V
- Control mode : 5

3. Detailed design:

Principle:

Receiving data from MCU

Display objects by pixel on 2D coordinator



Data processing and reconstructing 2D object