



Design Real Elevator & Prototype Implementation

New Engineers Basic Training MITSUBISHI ELECTRIC

Project Members

Ahmed Abdelhamed

Aviation **Mechanics Engineer**

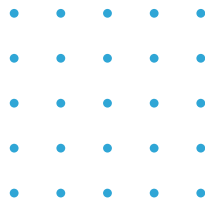
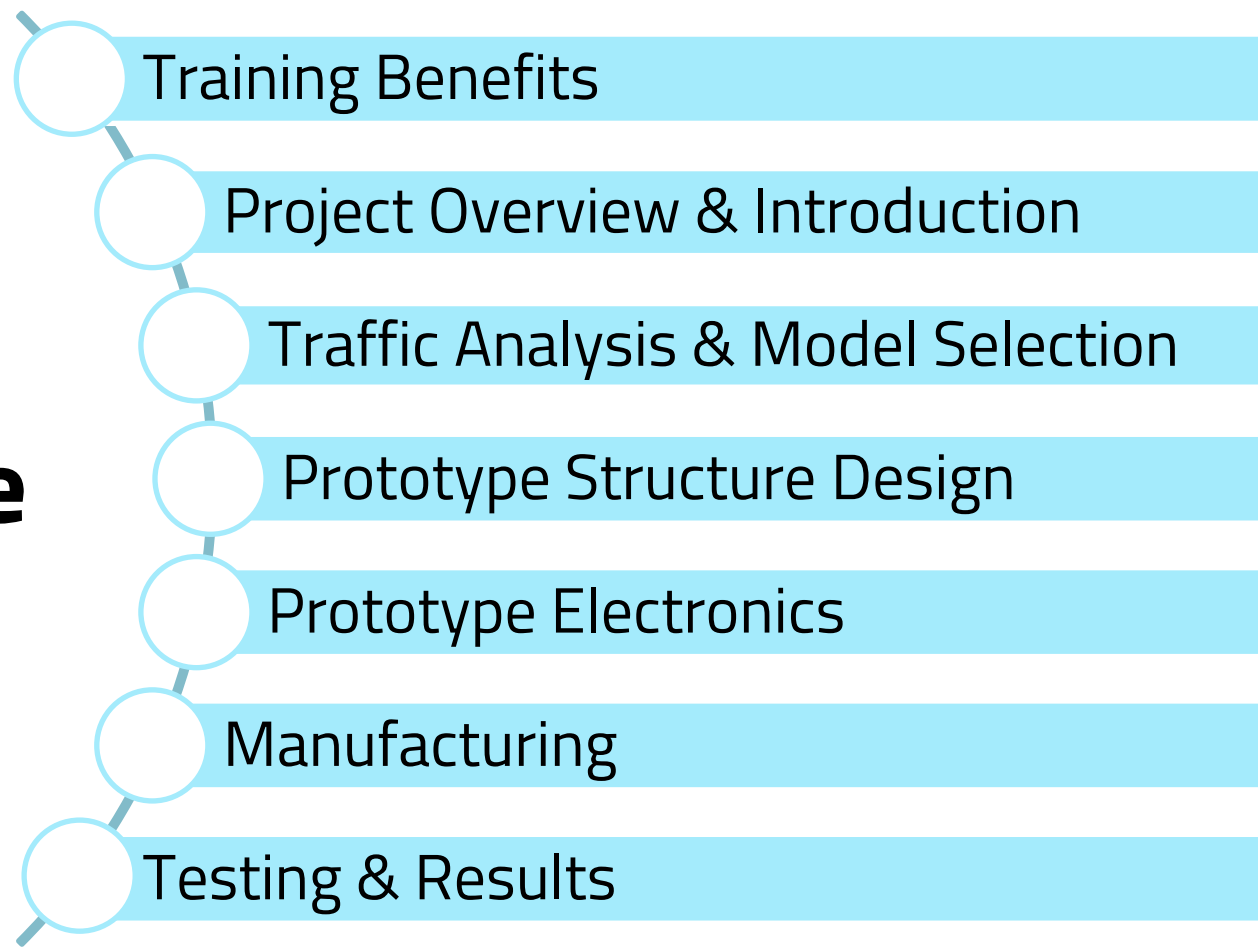
Graduate from **Zagazig** University
2024

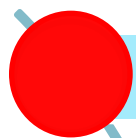
Mohamed Ashraf

Electric Power Engineer

Graduate from **Cairo** University
2024

Outline





Training Benefits



Project Overview & Introduction



Traffic Analysis & Model Selection



Prototype Structure Design



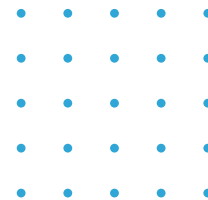
Prototype Electronics



Manufacturing



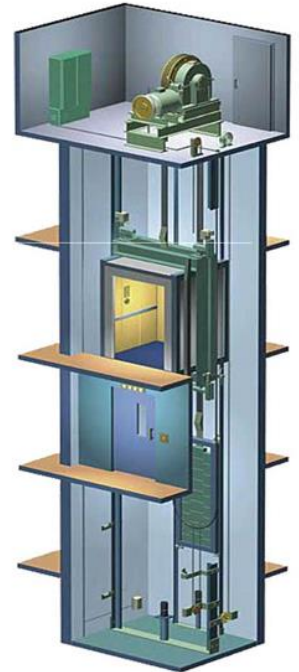
Testing & Results



Training Benefits

Technical Skills

- Elevators **mechanical system**.
- Elevators power system and **control unit**.
- Project management (planning & scheduling and cost study.
- **Safety tools**.



Training Benefits



Soft Skills



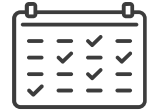
Leadership



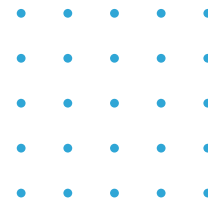
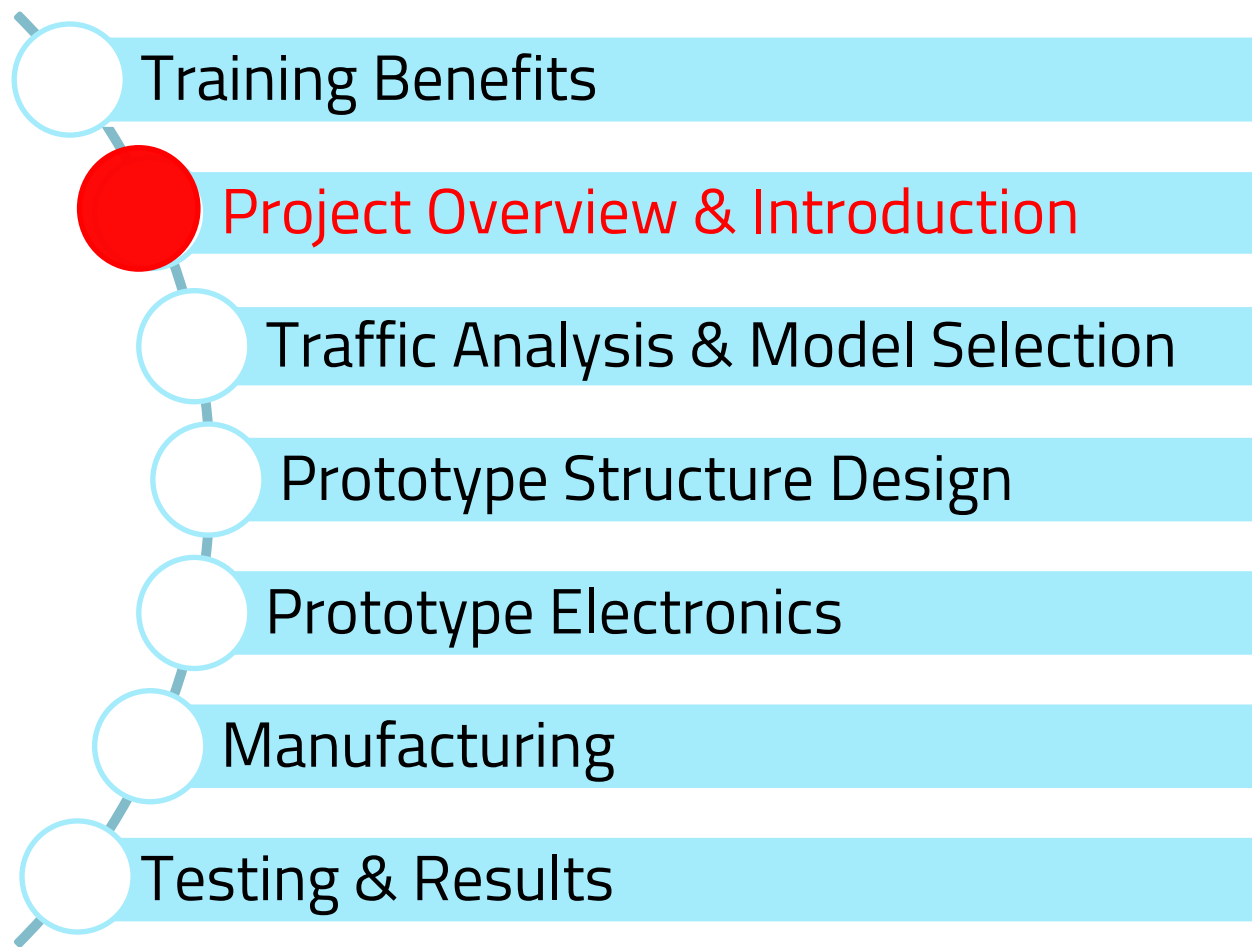
**Decision
Making**



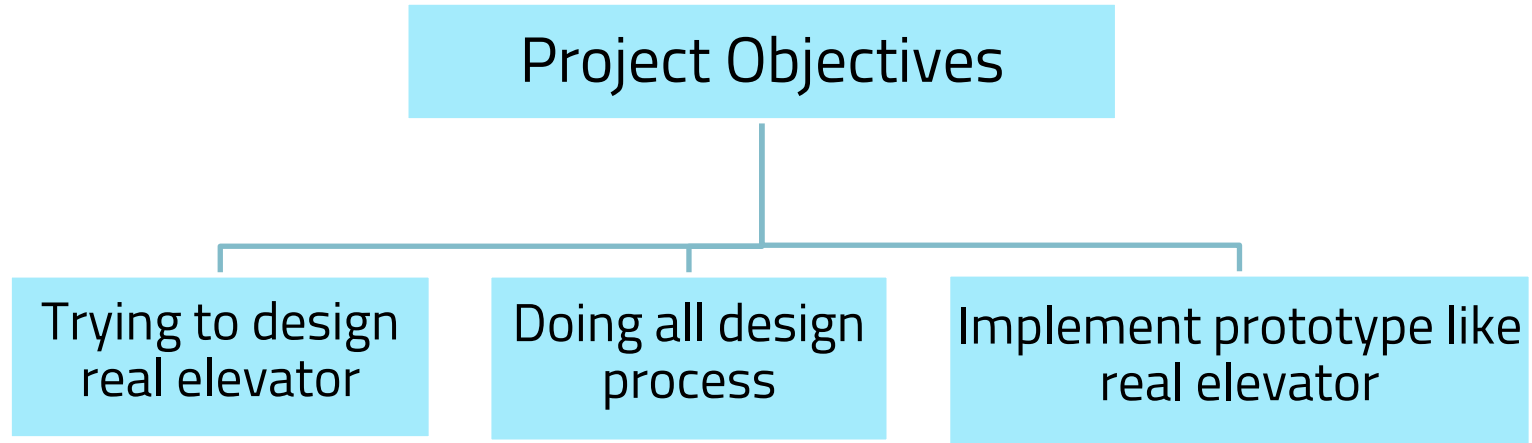
Teamwork



**Time
Management**

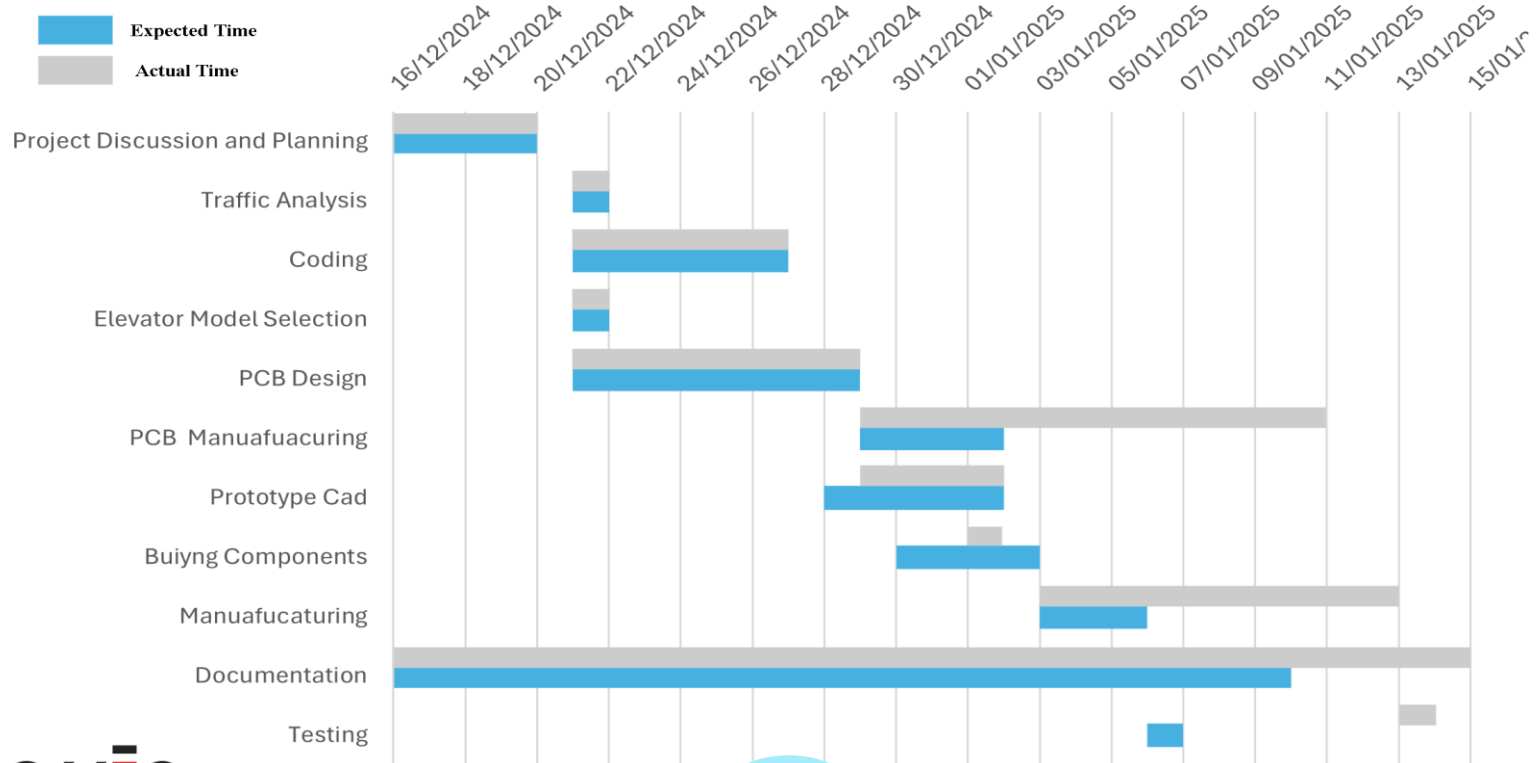


Project Overview & Introduction



Project Overview & Introduction

Project Schedule

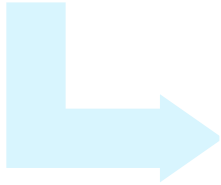


Project Overview & Introduction

Literature Review



Reading
Books

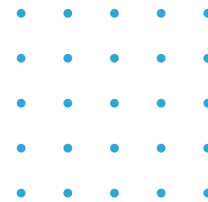
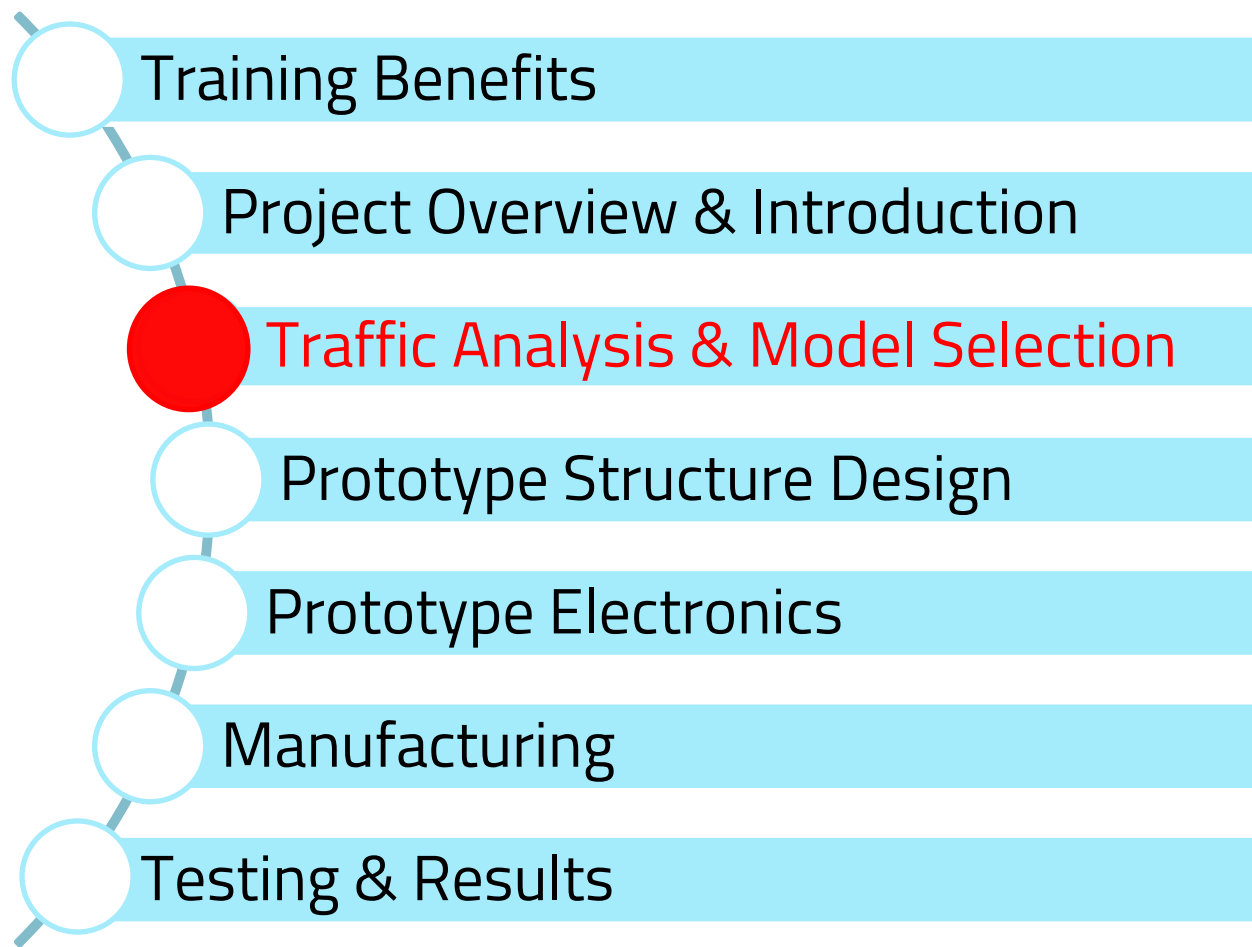


YouTube
search



Last
Projects





Traffic Analysis & Model Selection

Mitsubishi EZ-Assist System



- Traffic calculation
- Choose elevator model
- Layout drawings
- Product specifications

Traffic Analysis & Model Selection

Input Specifications

1. Traffic information

Building usage	Residence
Traffic ratio Up:Down	1:1
Loading rate	30
Transfer time	Mitsubishi standard

2. Elevator specification

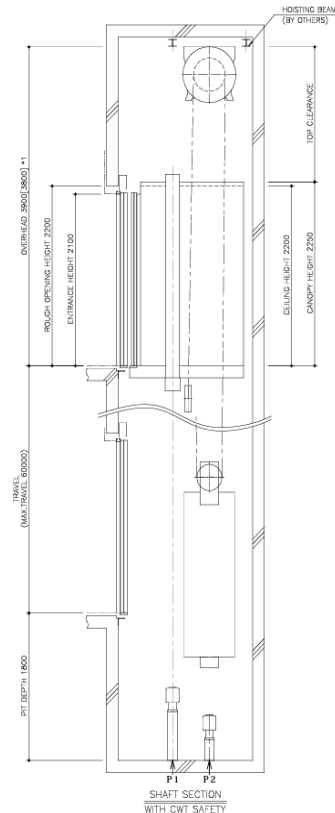
Area	General
Model name	NEXIEZ-MRL
Door type	2S
Landing open	Yes

Bank	1
No. of passengers	6
Speed[m/s]	1.00
Entrance width[mm]	800
No. of units	1

3. Building specification

Name	Height[mm]	Population	Group	Departure ratio
4		20	1	
3	3000	20	1	25
2	3000	20	1	25
1	2500	0	D	50

Output File



SPECIFICATIONS	
SERIES	NEXIEZ—MRL (MODEL CODE : GQXL2)
LOAD	450 kg
NO. OF PERSONS	6
SPEED	1.0/1.6 m/s [60/96 m/min]
REGULATION / CODE	EN81-1
TRAVEL	MAX. TRAVEL : 60 m
DOOR TYPE	25 (B5)
CAR CEILING TYPE	S60 (STD)
ENTRANCE FRAME TYPE	E-102 (STD) LINTEL AND NARROW JAMB
GUIDE RAIL	775-3/B
	CWT
CWT SAFETY	1775-3/B
	APPLIED

The diagram illustrates the vertical dimensions and load application for the rail load detail. Key dimensions and components include:

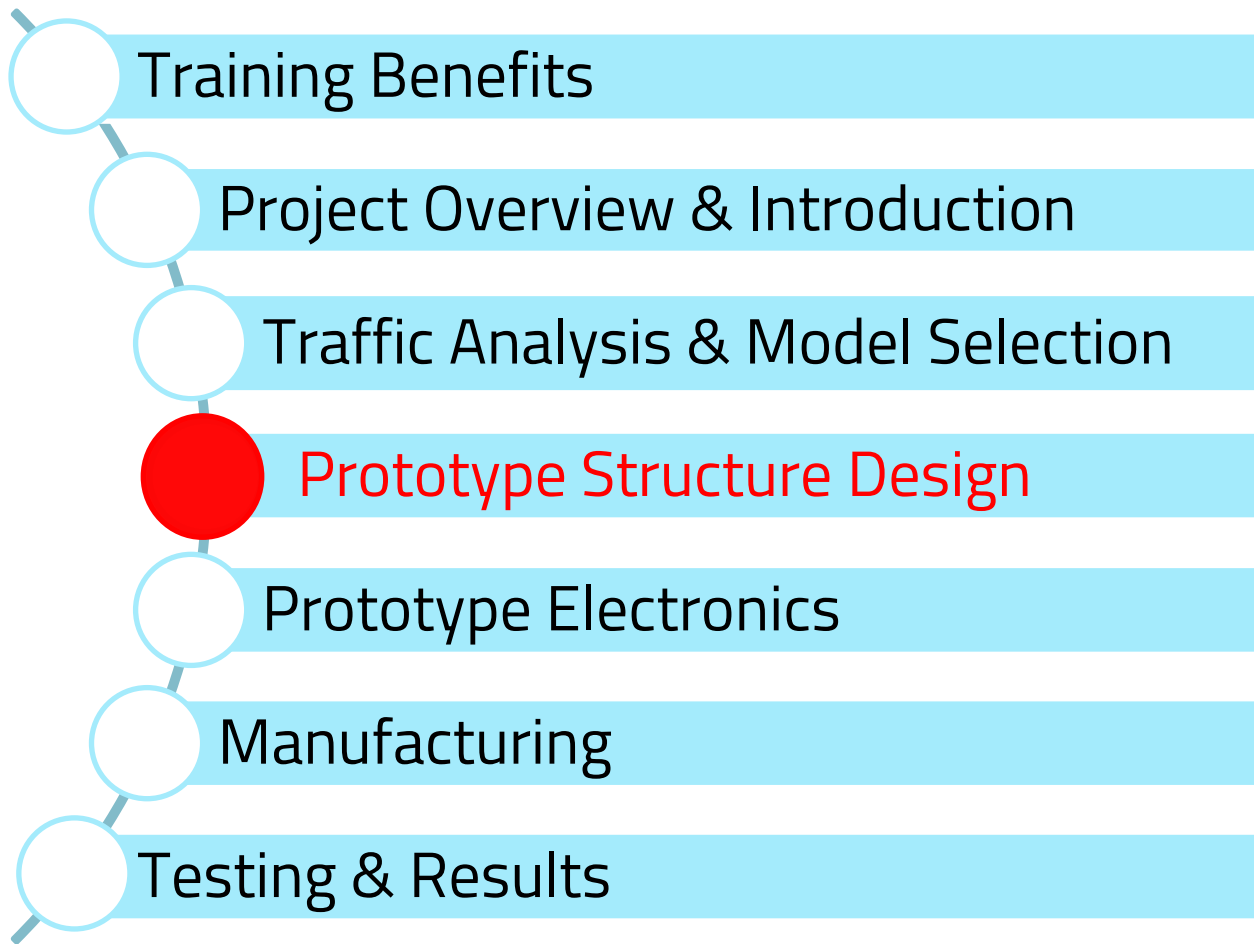
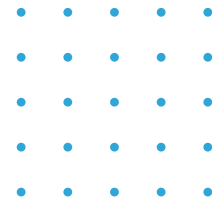
- Vertical Dimensions:**
 - 1950 (from TOP BRACKET to SECOND BRACKET)
 - 3400 (from TOP BRACKET to THIRD BRACKET)
 - 3240 (from SECOND BRACKET to THIRD BRACKET)
 - 2000 (from TOP FLOOR to THIRD BRACKET)
- Horizontal Dimensions:**
 - 2000 (from TOP BRACKET to SECOND BRACKET)
 - 2000 (from SECOND BRACKET to THIRD BRACKET)
- Components and Labels:**
 - CEILING
 - TOP BRACKET
 - CAR RAIL A
 - CAR RAIL B
 - CWT RAIL D
 - CWT RAIL C
 - SECOND BRACKET
 - TOP FLOOR
 - THIRD BRACKET
- Load Application:**
 - Vertical load F_{1Y} is applied downwards at the TOP BRACKET.
 - Horizontal load F_{1X} is applied to the left at the TOP BRACKET.
 - Vertical load F_{1Y} is applied upwards at the SECOND BRACKET.

CAR RAIL				CWT RAIL			
A (ROPE HITCH SIDE)		B (CWT SIDE)		C (FRONT)		D (REAR)	
FTX	FTY	FTX	FTY	FTX	FTY	FTX	FTY
1427 N	3953 N	1427 N	1323 N	1571 N	3947 N	1571 N	3947 N

	RAIL REACTION LOAD				BUFFER REACTION LOAD	
	R1	R2	R3	R4	P1	P2
WITH CRT SAFETY	31000 N	22000 N	35000 N	32000 N	61000 N	52000 N

MOTOR [kW]	STANDARD VOLTAGE 200V				STANDARD VOLTAGE 400V				POWER SUPPLY CAPACITY [kVA]	HEAT EMISSION [W]
	CURRENT		BREAKER IN CONTROL PANEL	CURRENT		BREAKER IN CONTROL PANEL				
	FLU [A]	FLAcc [A]		FLU [A]	FLAcc [A]					
2.5	15	25	20	5	1.3	15	4	740		

$$= \text{EACH CURRENT (FLU or FLAcc)} [\text{A}] \times \frac{\text{STANDARD VOLTAGE (E1 or E2)} [\text{V}]}{100}$$



Prototype Structure Design

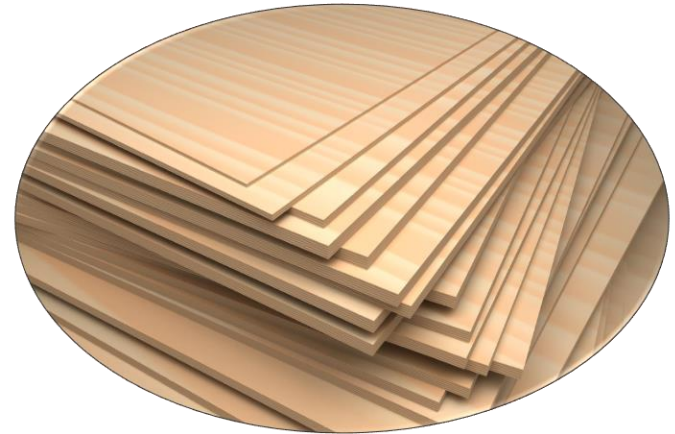
Structure Material(Plywood)



Low cost

Hight strength

Ease of manufacturing



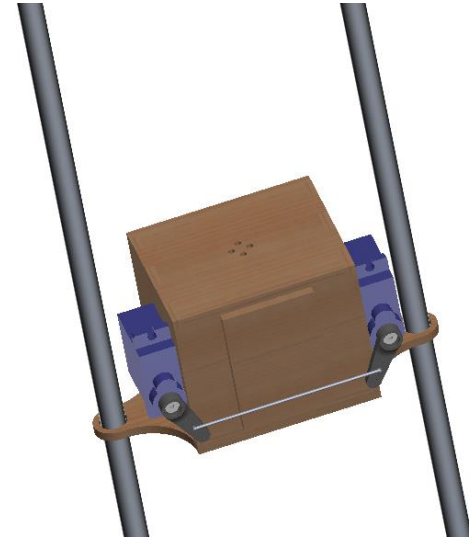
Prototype Structure Design

Cabine & CW Guide Rails(Circular Rodes)

Smooth Movement

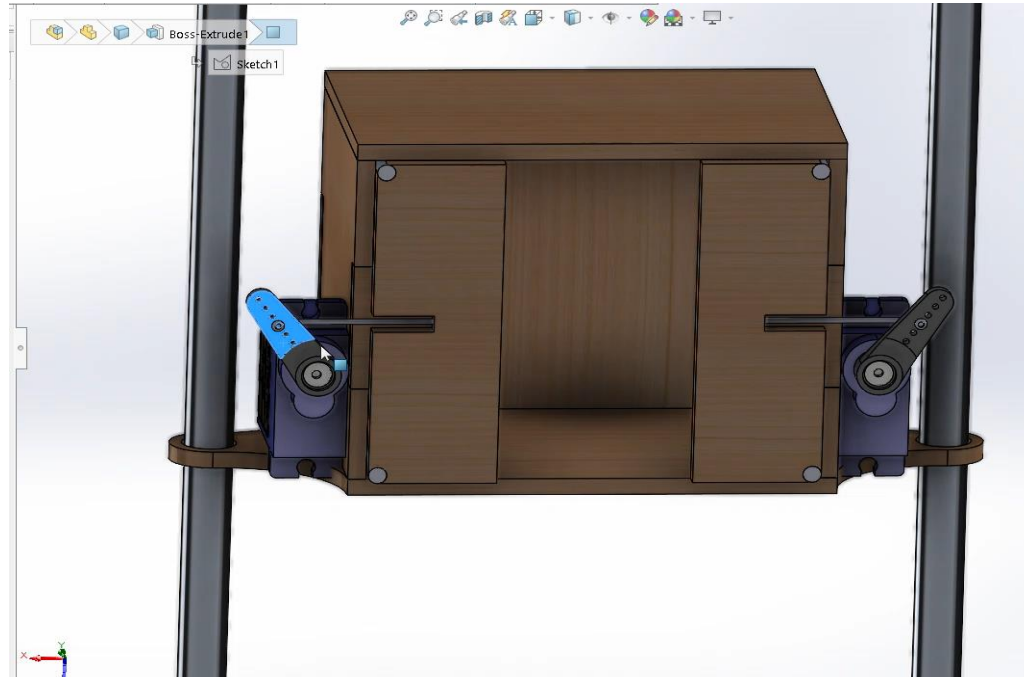
Hight strength

Ease of manufacturing



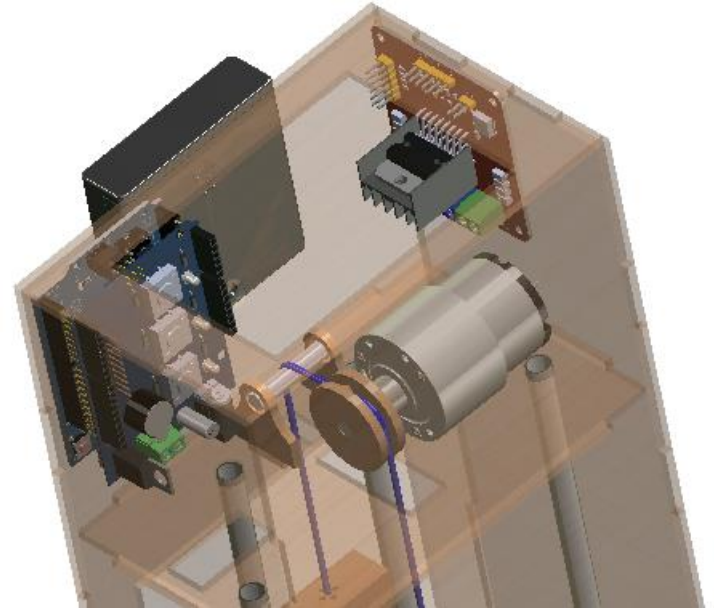
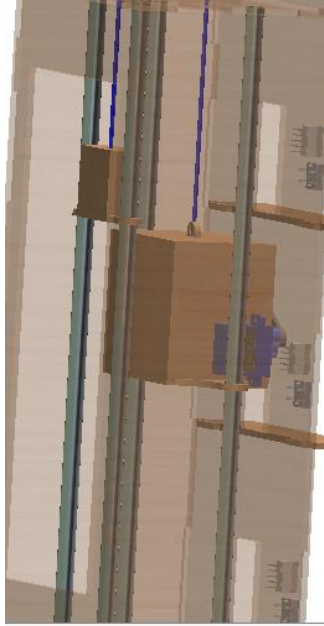
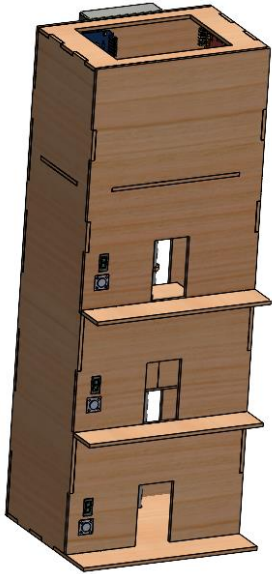
Prototype Structure Design

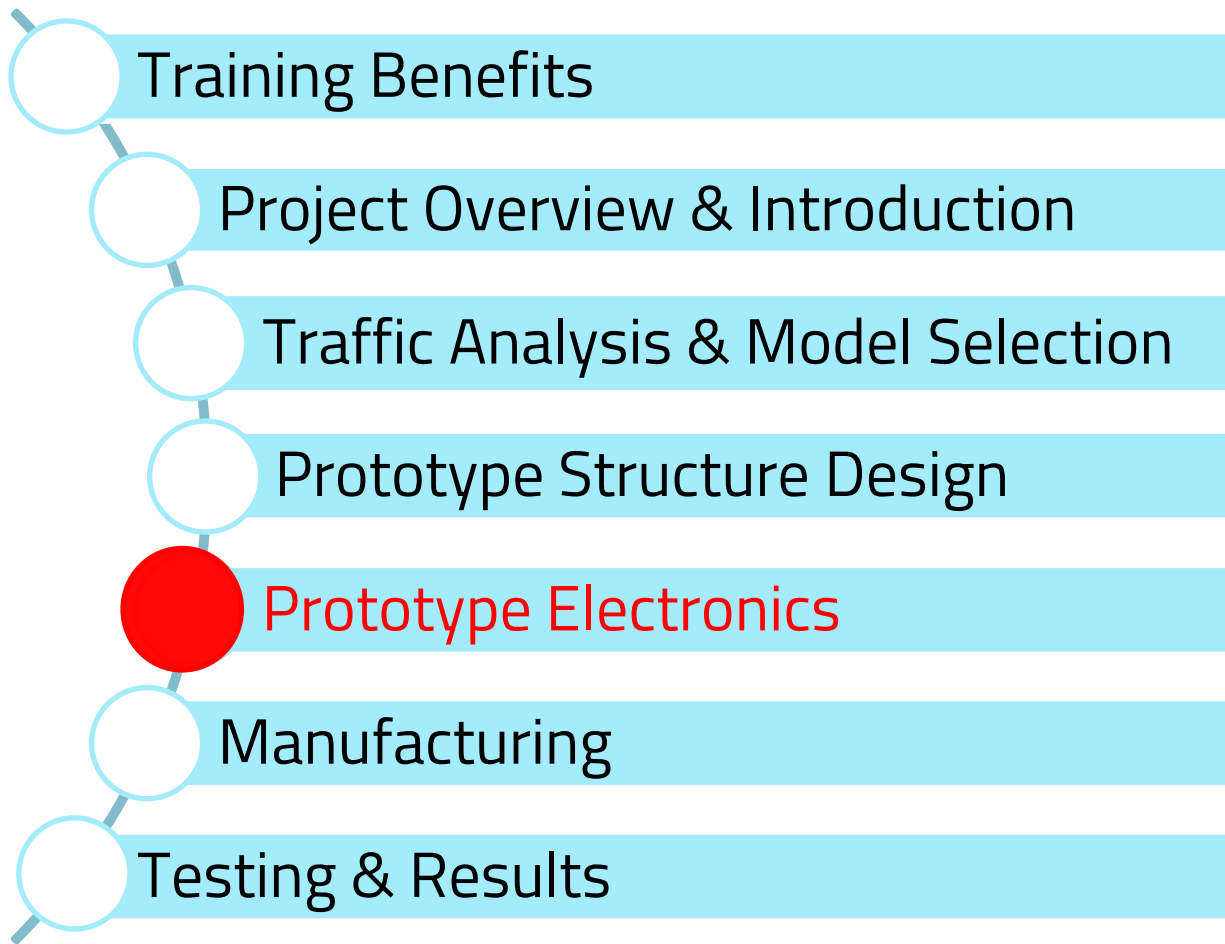
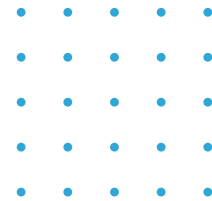
Cabine Door Mechanism



Prototype Structure Design

Final Structure





Prototype Electronics

PCB Board

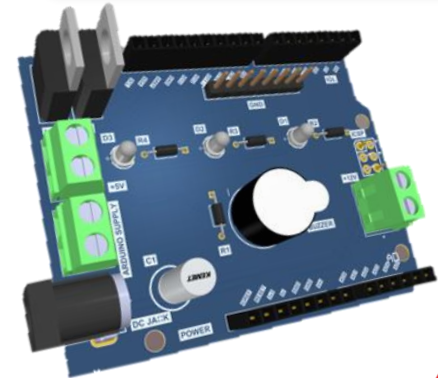
Single layer PCB

Using shield technique

- Robust design
- Easily assembled
- No need for wires

Printed locally & assembled manually

Tested for malfunctions



Prototype Electronics

Microprocessor (ARDUINO UNO)

Features

- Cost effective
- Easily programmable
- Error checking capabilities

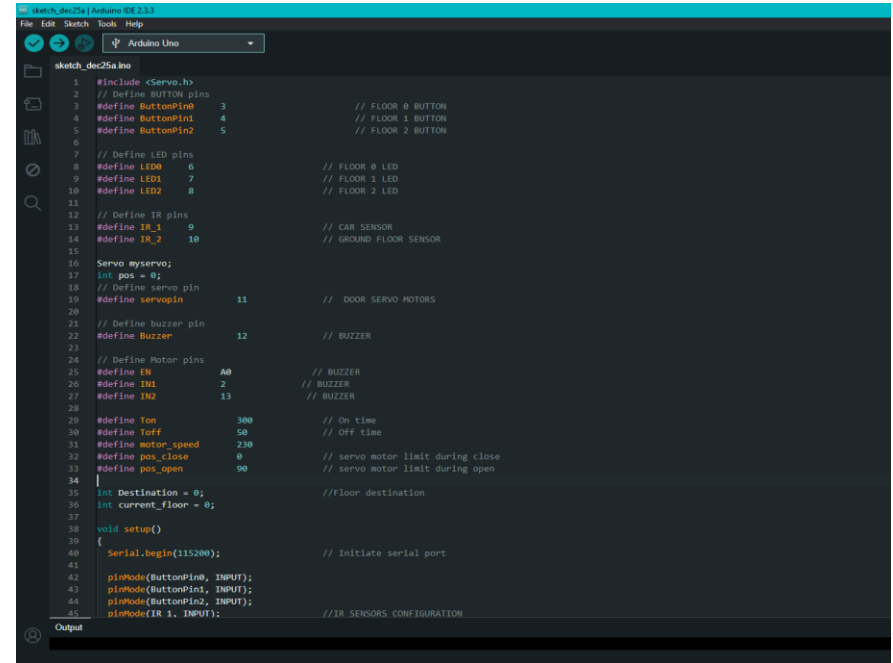
Using sensors which are available in the market



Prototype Electronics

Programming

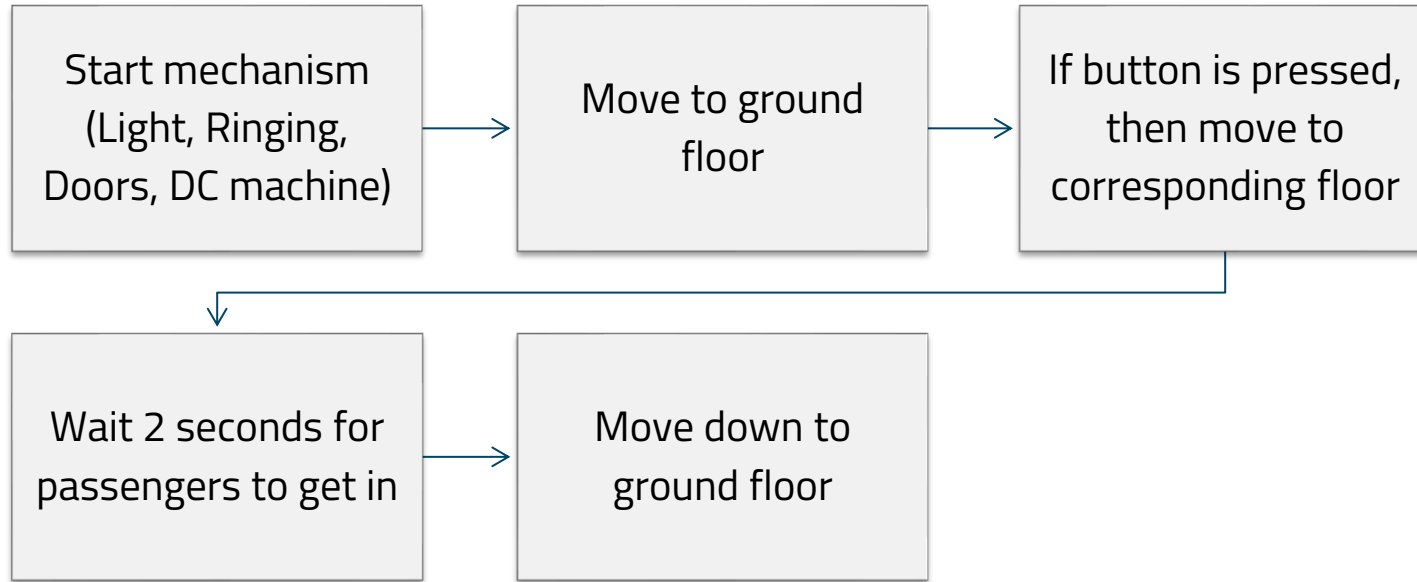
- C++ language offers relatively easy syntax and fast response
- 250+ lines of code
- Using modular code for easy debugging and testing
- The code is simulated before implemented on the hardware for error prediction
- Low storage usage



```
1 #include <Servo.h>
2 // Define Button pins
3 #define ButtonPin0 3 // FLOOR 0 BUTTON
4 #define ButtonPin1 4 // FLOOR 1 BUTTON
5 #define ButtonPin2 5 // FLOOR 2 BUTTON
6
7 // Define LED pins
8 #define LED0 6 // FLOOR 0 LED
9 #define LED1 7 // FLOOR 1 LED
10 #define LED2 8 // FLOOR 2 LED
11
12 // Define IR pins
13 #define IR_1 9 // CAR SENSOR
14 #define IR_2 10 // GROUND FLOOR SENSOR
15
16 Servo myservo;
17 int pos = 0;
18 // Define servo pin
19 #define servopin 11 // DOOR SERVO MOTORS
20
21 // Define buzzer pin
22 #define buzzer 12 // BUZZER
23
24 // Define Motor pins
25 #define IN_A0 2 // BUZZER
26 #define IN1 2 // BUZZER
27 #define IN2 13 // BUZZER
28
29 #define Ton 300 // On time
30 #define Toff 50 // Off time
31 #define motor_speed 230
32 #define pos_close 0 // servo motor limit during close
33 #define pos_open 90 // servo motor limit during open
34
35 int Destination = 0; //Floor destination
36 int current_floor = 0;
37
38 void setup()
39 {
40   Serial.begin(115200); // Initiate serial port
41
42   pinMode(ButtonPin0, INPUT);
43   pinMode(ButtonPin1, INPUT);
44   pinMode(ButtonPin2, INPUT);
45   pinMode(IR_1, INPUT); //IR SENSORS CONFIGURATION
```

Prototype Electronics

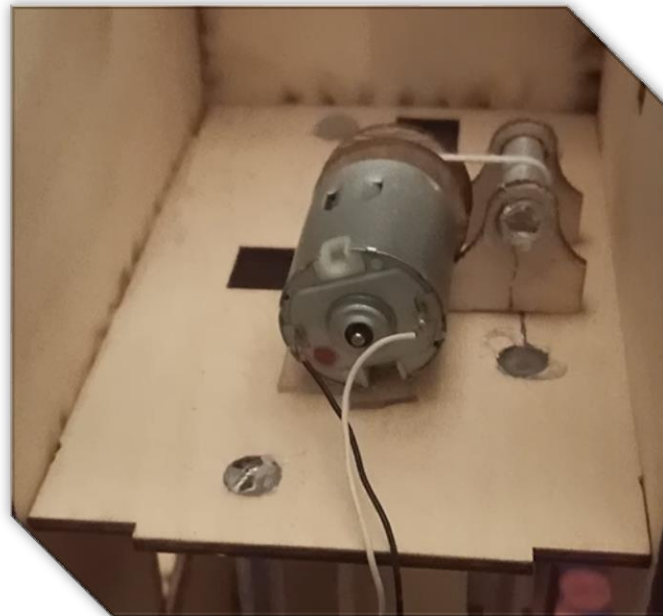
Operating Mechanism Steps



Prototype Electronics

Motor

- 1:1 Mounting mechanism
- Speed controllable
- Small size and weight
- **No gearbox required**
- **Low noise** or vibrations

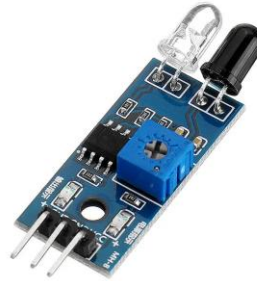


Prototype Electronics

Sensors and Actuators



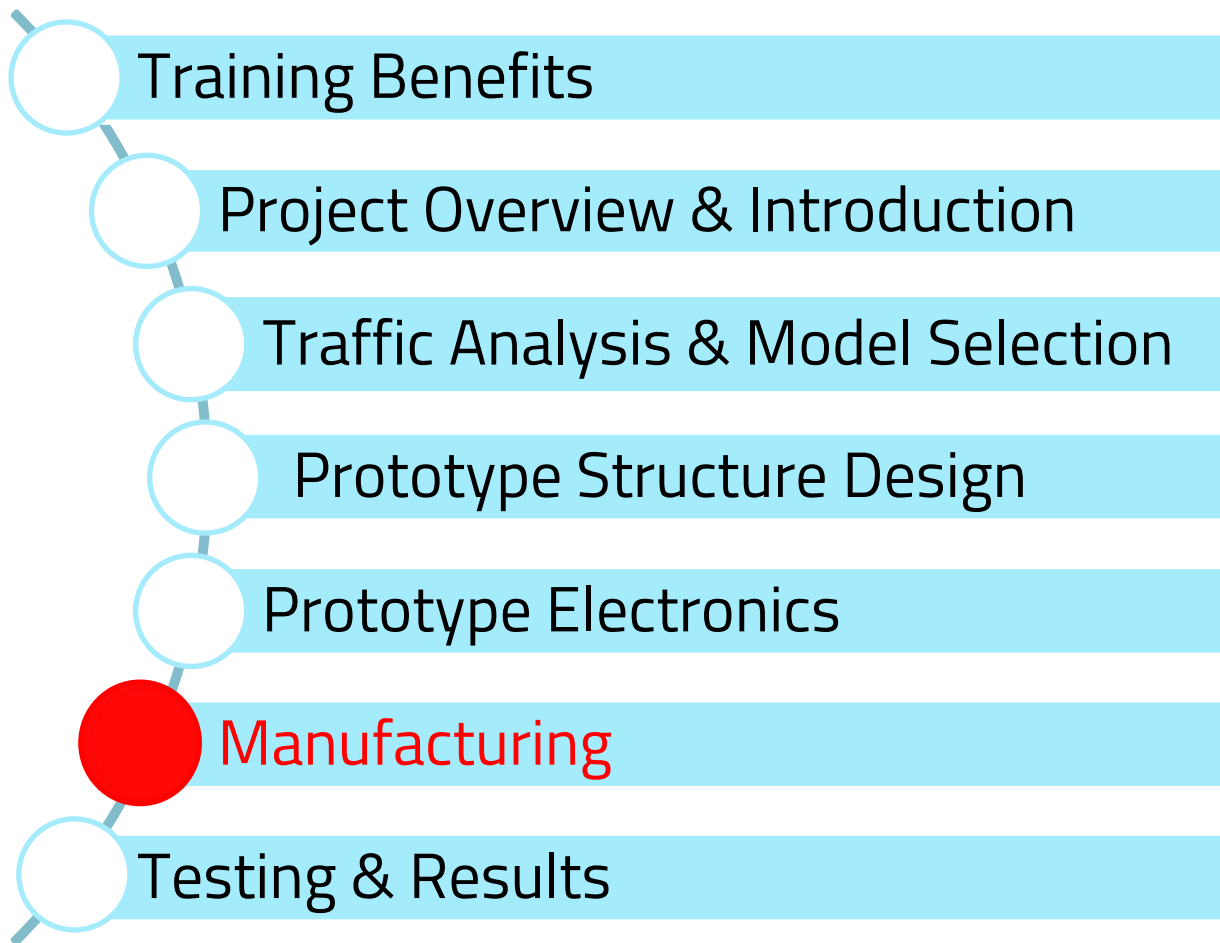
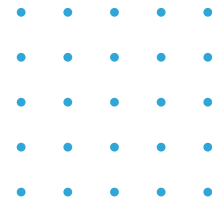
Ring buzzer for alarms
when closing and
opening doors



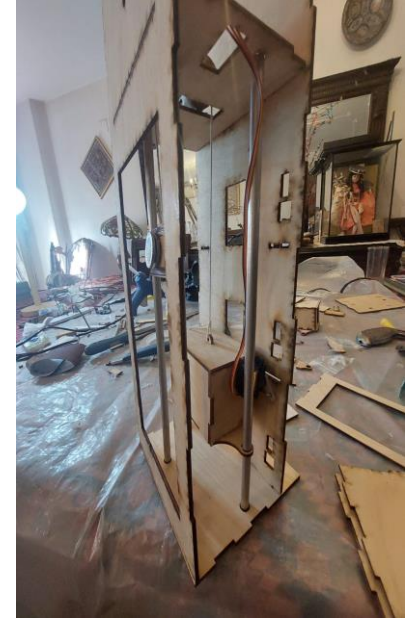
Infrared sensor for
car detection

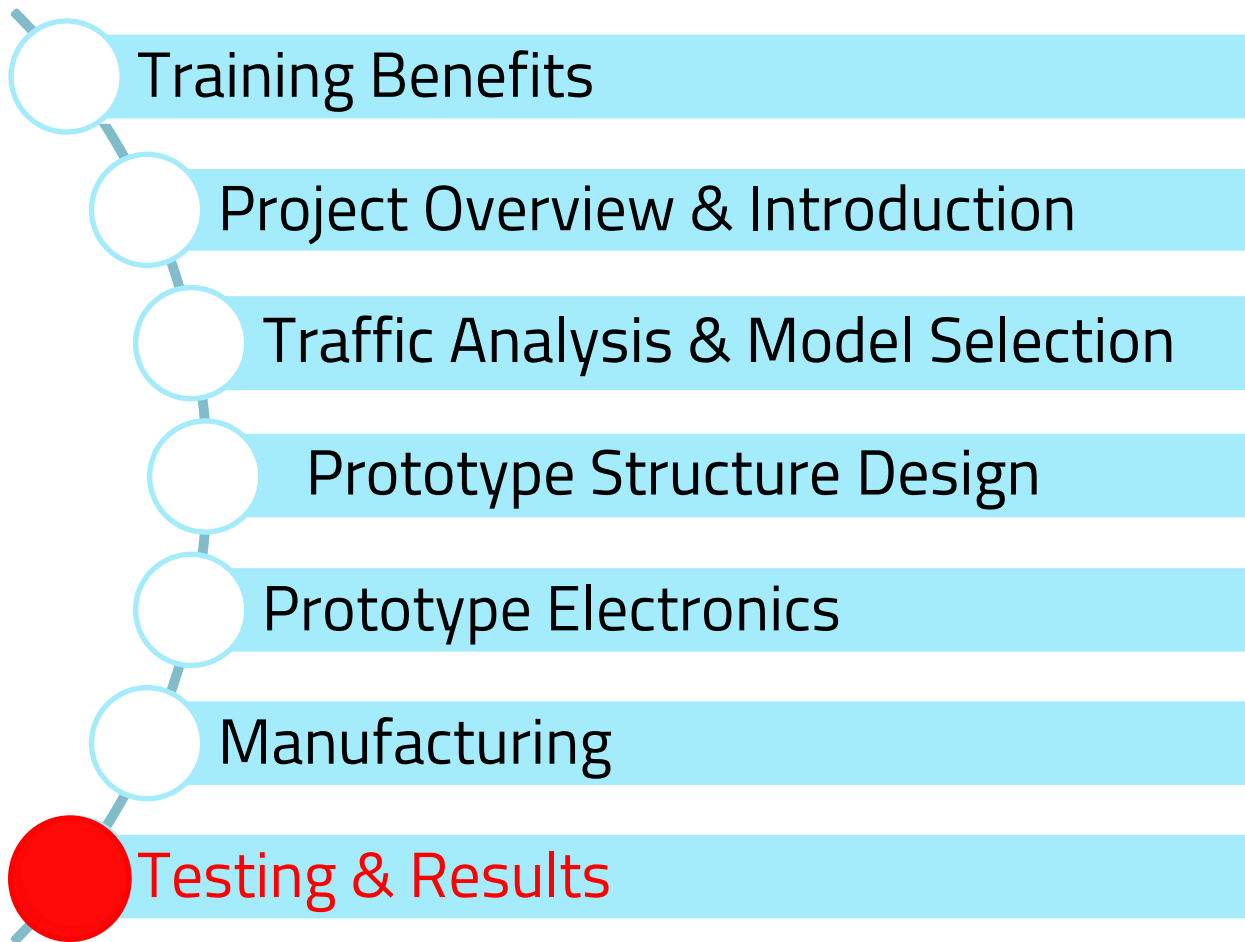
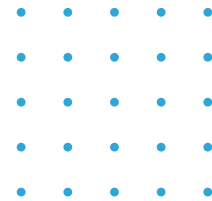


LED lights for floor
indication



Manufacturing





Testing & Results

Door mechanism



Conclusion

Work experience

The training help us to increase our work experience

Model Selection

Select real model elevator to real application

Hardware implementation

Increase technical skills by implement this prototype

Thank
you !