



Prince Mohammad Bin Fahd University  
Department of Electrical Engineering

# INDOOR POSITIONING GUIDANCE SYSTEM

Advisor Name:  
Mr. Saifullah Shafiq

Student Name	Student ID
Thamer S. Alkhamis	201600091
Muath S. Alshehri	201402847
Yazeed Albishri	201501268
Abdullah Alhajri	201303910
Abdulrahman Alrowaily	201300157



# OUTLINES

- ❑ PROJECT DEFINITION
- ❑ PROJECT OBJECTIVES
- ❑ PROJECT SPECIFICATIONS
- ❑ PROJECT CONSTRAINTS
- ❑ PROJECT ARCHITECTURE
- ❑ PLANNING
- ❑ BACKGROUND PROBLEM AND SOLUTION
- ❑ DESIGN: SUBSYSTEMS AND COMPONENT SELECTION
- ❑ COMPLETED AND REMAINING WORK
- ❑ PROJECT MANAGEMENT & TEAMWORK
- ❑ PROJECT RISK MANAGEMENT
- ❑ IMPACT OF PROJECT
- ❑ NEW SKILLS ACQUIRED AND APPLIED
- ❑ COST
- ❑ REFERENCES



# PROJECT DEFINITION



Design and implementation of an indoor positioning guidance system which is capable of assisting new students or visitors on campus, especially Electrical Engineering students (EE). The system will be implemented with advanced technologies to help guide visitors or students inside the department.



# PROJECT OBJECTIVES

01

• Provide an assistance

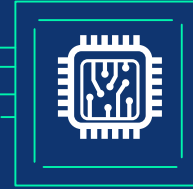
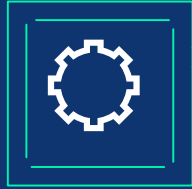
02

• Increase public awareness

03

• Help Engineering Students.

# PROJECT SEPECIFICATION



## Specifications

To display motion graphics and/or images of labs & offices on a capacitive LCD-screen

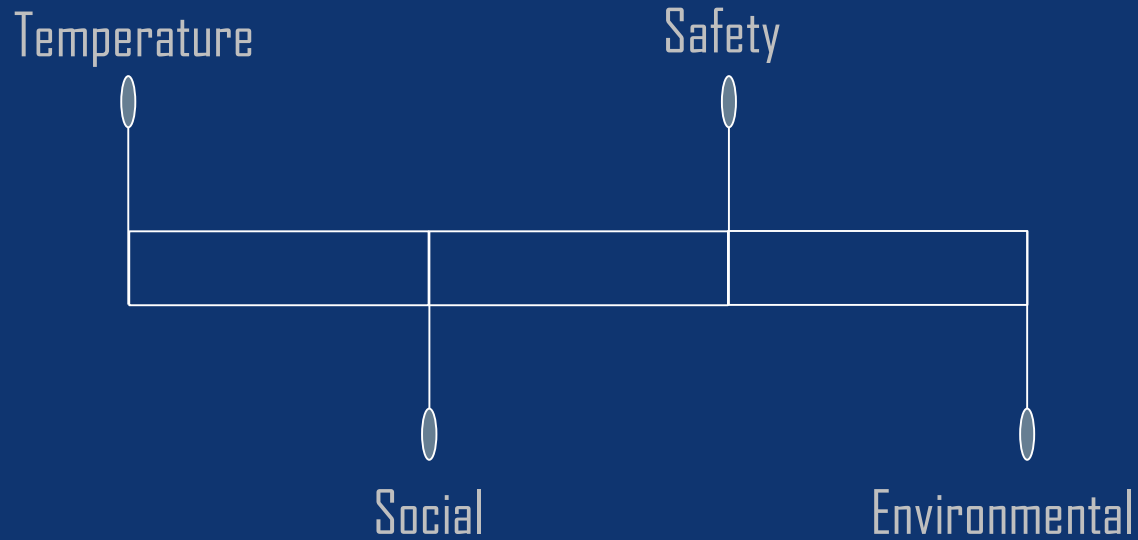
To guide and assist new students or visitors by using maps and interface pictures of laboratories, or faculty members' offices

To be controlled by a wireless remote to change its location

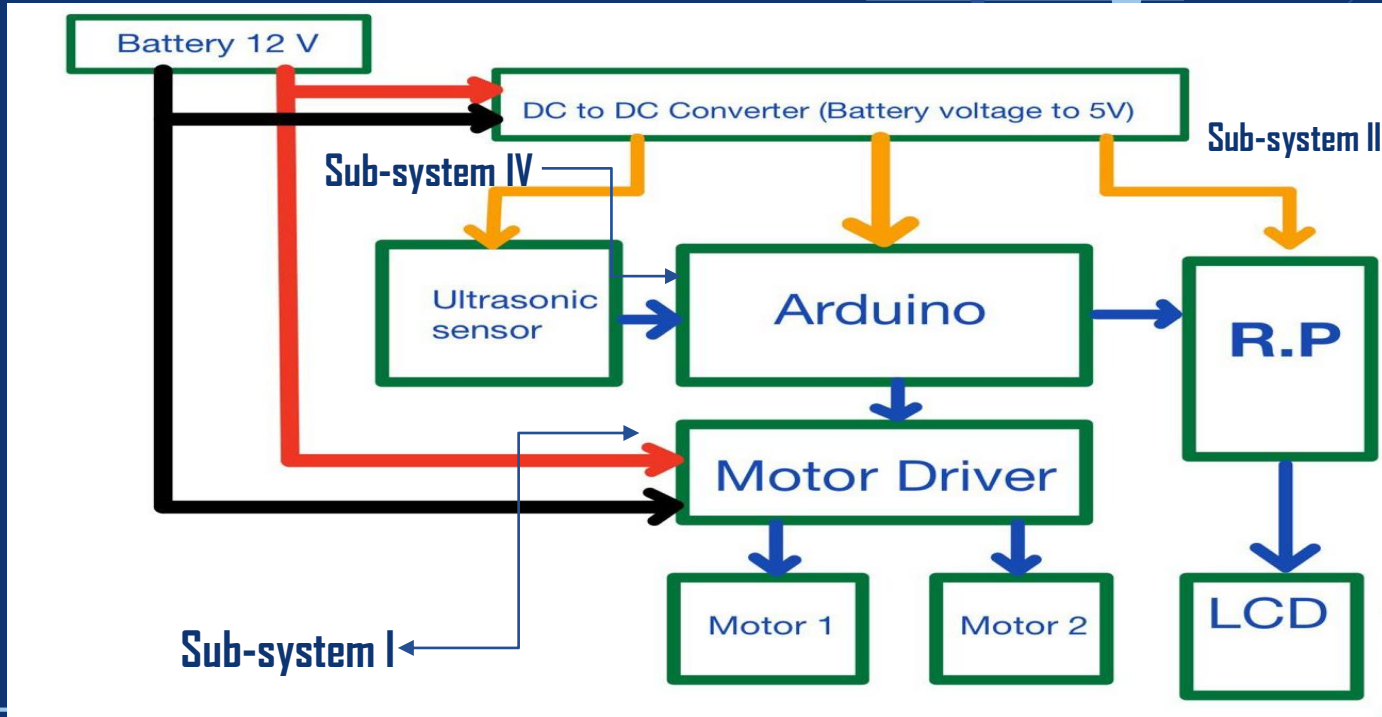
To detect objects or barriers/obstacles

To have a normal time traveling from one place to another

# PROJECT CONSTRAINTS



# PROJECT ARCHITECTURE

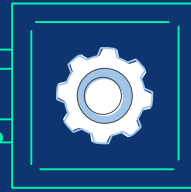


# PLANNING

Title: Indoor Positioning Guidance System		Advisor: Mr. Saifullah Shafiq					Design II (ASSE 3)		Spring 2021													
Thamer Alkhamis (TM) 201600091							Project PLAN & Progress															
Yazeed Albeshri (YA) 201501268							ProgRpt No. 6															
Abdulahman Alrowaily (AA) 201300157							Plan updated (Date): April 21, 2021															
Muath Alshehri (MA) 201402847							Instructor: Dr. Sadiq Alhuwaidi															
Abdallah Alhajri (AH) 201303910							Period Highlight: <input type="checkbox"/> 1 <input type="checkbox"/> Plan <input type="checkbox"/> Actual															
							Actual (beyond plan) <input type="checkbox"/> % Complete (beyond plan) <input type="checkbox"/>															
ACTIVITY							Periods (Weeks 1-15)															
	PLAN	PLAN	Assigned	ACTUAL	ACTUAL	PERCENT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
	START	DURATION	To	START	DURATION	COMPLETE																
Write a plan for entire term	1	1	ALL	1	1	100%																
Design subsystem 1-2 and Testing (Designing)	2	4	ALL	5	7	100%																
Ordering sub-systems parts	2	1	AH,AA	4	10	100%																
Measuring required power ( V and I )	3	2	AH, YA	4	9	100%																
Measuring total weight of system	3	5	AH, YA	6	13	100%																
Designing and implement chassis	4	5	ALL	6	8	100%																
Implementing coding for Motor Driver	2	6	AA,MA	6	13	100%																
Design user interface (Capacitive Screen R.Pi 3)	6	7	TM	5	13	100%																
Prepare midterm presentation and video	7	6	ALL	6	8	100%																
Working on Motion Graphics videos and GIFs Pics	8	5	TM	6	7	100%																
3D/Laser Printing	9	6	TM,AH	8	8	100%																
Test all subsystems	10	9	ALL	11	12	100%																
Implement industrial design/ prototype	11	1	TM	10	13	100%																
Prepapre final report	12	1	TM	11	12	75%																
Prepapre final presentation	13	1	ALL	12	13	100%																
Prepare project demo	14	1	ALL	13	14	100%																
Submit Rpt/PPT/Brochure/Video...etc.	15	1	TM	14	14	100%																
<b>Progress Details:</b>							<b>Issues (delay, etc.):</b>															
Writing the final reprot																						
Prepare th eproject for demo-day																						

# BACKGROUND PROBLEM

Difficult to Guide Visitors



Inefficient

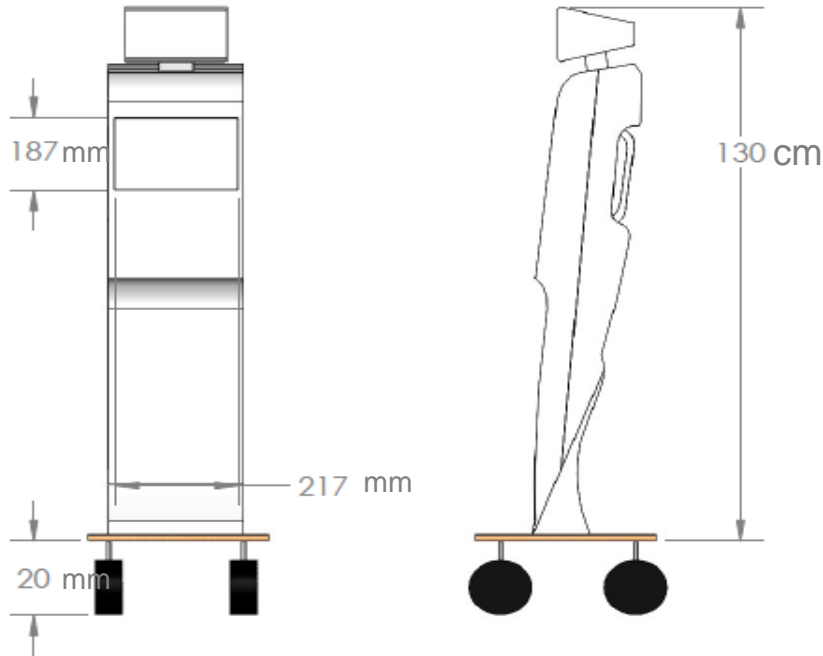
Consuming a lot of time



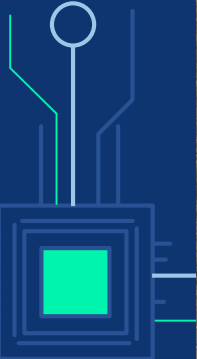
# BACKGROUND SOLUTION



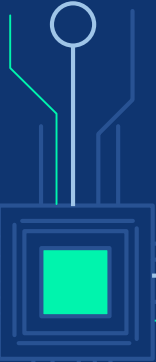
# INDUSTRIAL PROTOTYPE DESIGN 1/3



# INDUSTRIAL PROTOTYPE DESIGN 2/3



# INDUSTRIAL PROTOTYPE DESIGN 3/3



# SUB-SYSTEM I SPECIFICATION PART 1 OUT OF 2

## Technical Specifications of Motor

Technical Specifications of Motor	
Motor Type	High Torque Geared Motor
Operation voltage	12V DC
Motor speed at Output shaft (HPM)	60 RPM
Stall Torque (Kgcm)	38Kgcm (20Kgcm is gearbox Breaking Torque)
Rated Torque (Kgcm)	19 Kgcm
Gear Ratio	1.270
Weight	200gm

# SUB-SYSTEM I SPECIFICATION PART 2 OUT OF 2

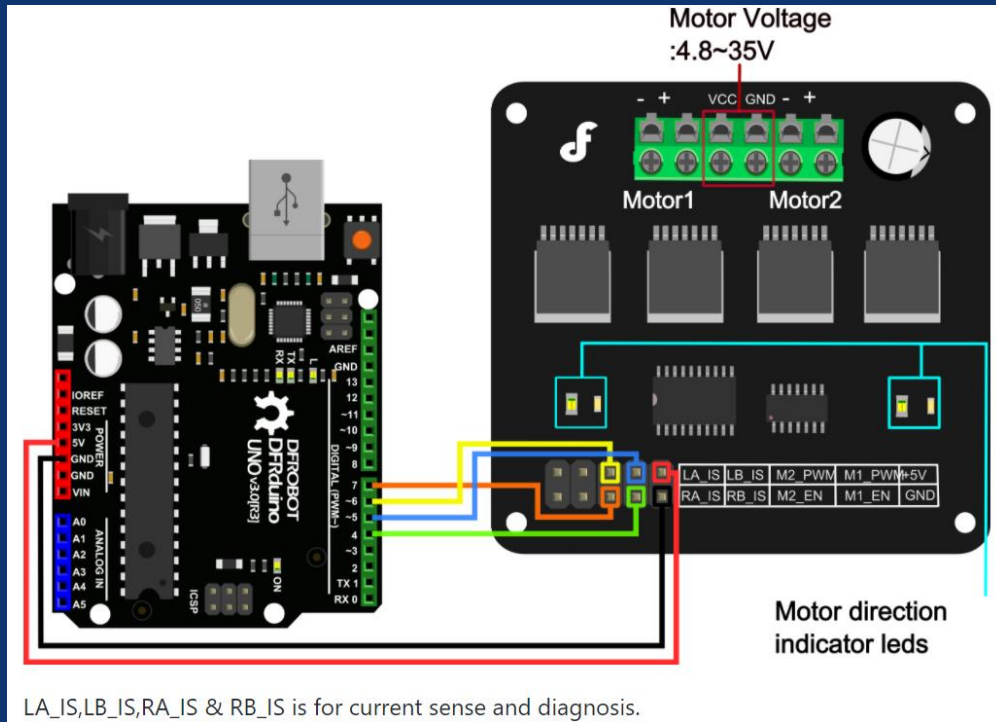
## Base Motor Specifications

Nominal voltage (V)	12V
No-load Speed (RPM)	18000
Rated Torque (gcm)	151
No-load current (A)	0.8A
Load current (A)	Up to 7.5 A(Max)

<https://robokits.co.in/motors/high-torque-dc-geared-motor-60rpm>

# DESIGN SUB-SYSTEM I

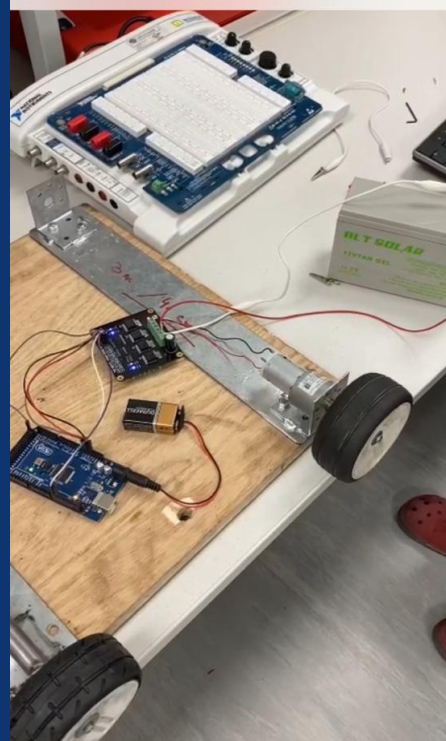
PART 1 OUT OF 6



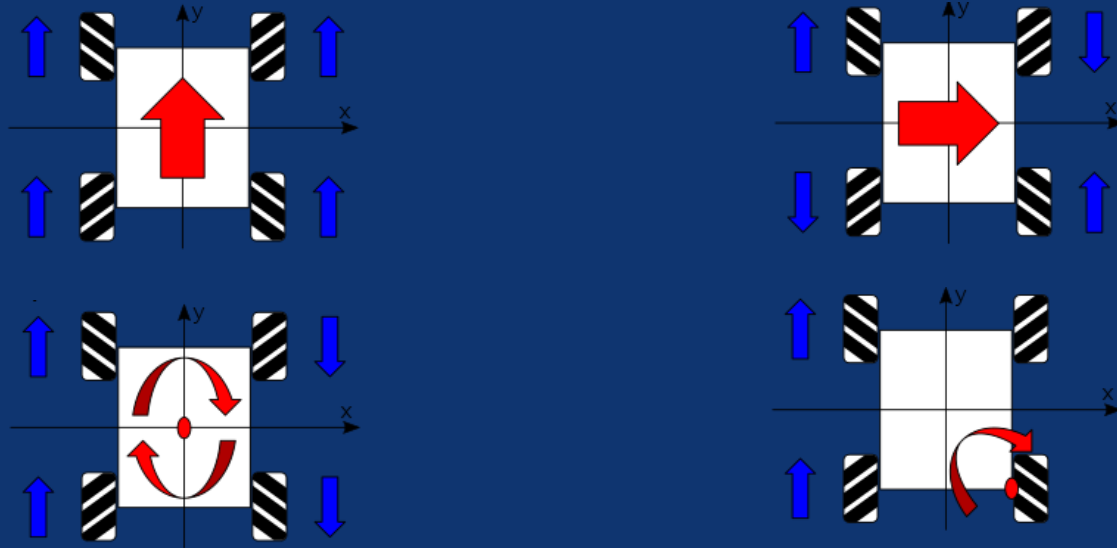
LA\_IS, LB\_IS, RA\_IS & RB\_IS is for current sense and diagnosis.

# DESIGN SUB-SYSTEM I

PART 2 OUT OF 6



# DESIGN SUB-SYSTEM I PART 3 OUT OF 6



**MOVEMENT OF THE SYSTEM ( FOUR DIRECTIONS )**

# DESIGN SUB-SYSTEM I

## PART 5 OUT OF 6

```
Code_test $
int E1 = 5;    //M1 Speed Control
int E2 = 6;    //M2 Speed Control
int M1 = 4;    //M1 Direction Control
int M2 = 7;    //M1 Direction Control
int counter=0;

void stop(void)           //Stop
{
    digitalWrite (E1,0);
    digitalWrite (M1,LOW);
    digitalWrite (E2,0);
    digitalWrite (M2,LOW);
}

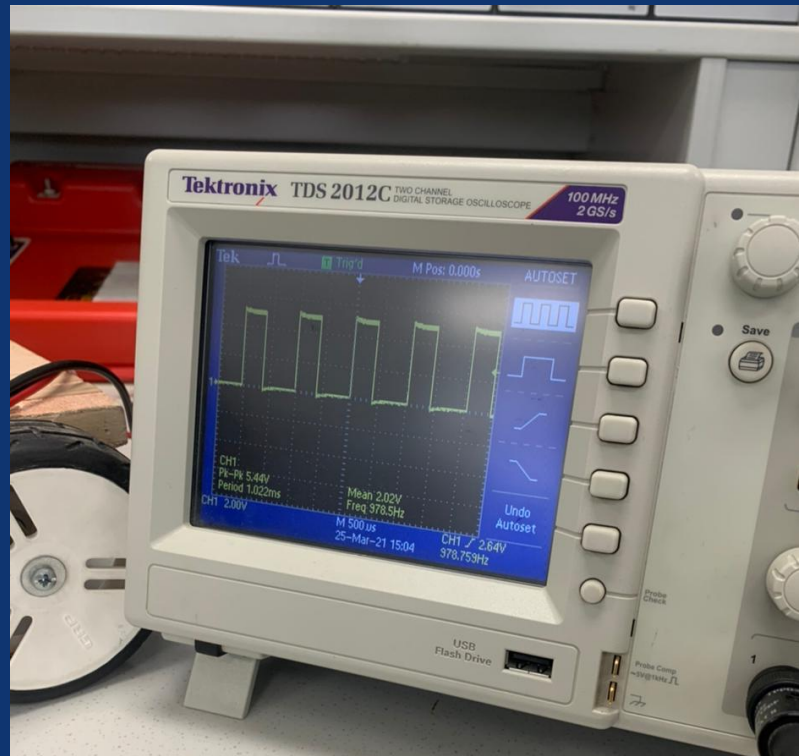
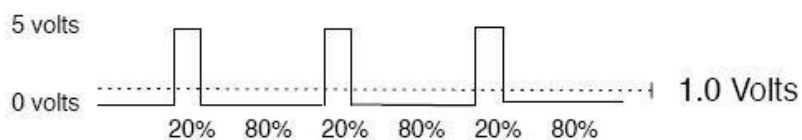
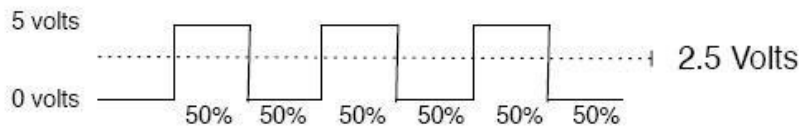
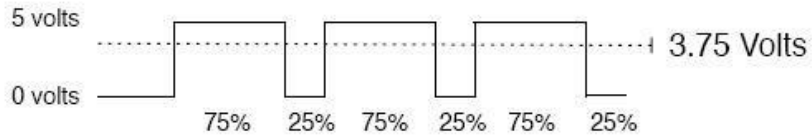
void advance(char a,char b) //Move forward
{
    analogWrite (E1,a);    //PWM Speed Control
    digitalWrite (M1,HIGH);
    analogWrite (E2,b);
    digitalWrite (M2,HIGH);
}

void back_off (char a,char b) //Move backward
{
    analogWrite (E1,a);
    digitalWrite (M1,LOW);
    analogWrite (E2,b);
    digitalWrite (M2,LOW);
}
```

# DESIGN SUB-SYSTEM I

PART 6 OUT OF 6

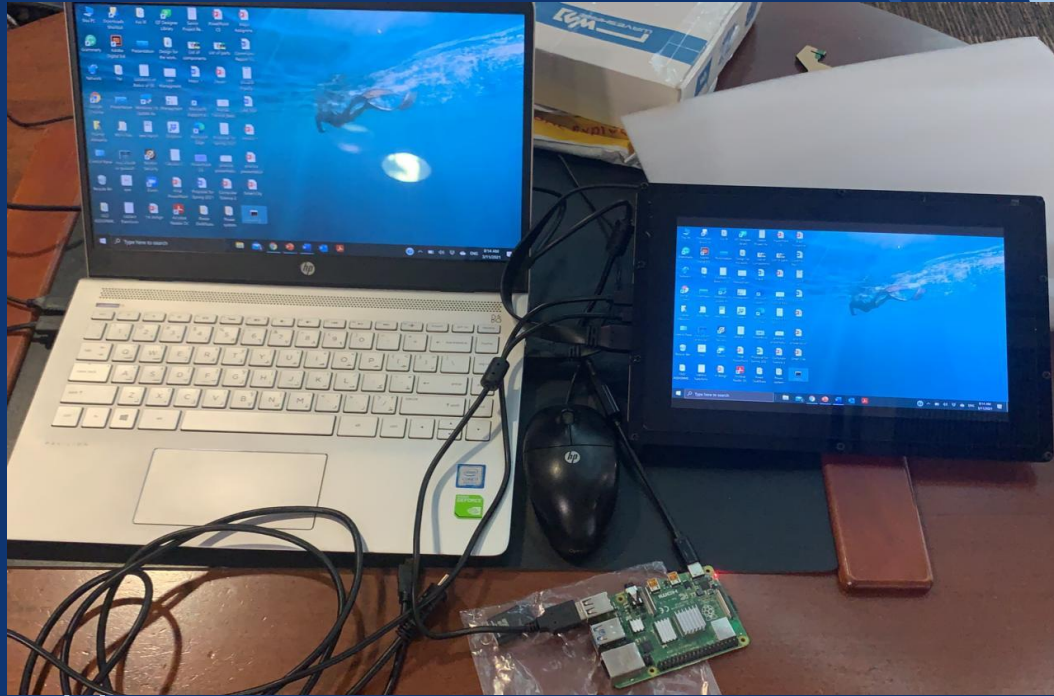
$$\text{output\_voltage} = (\text{on\_time} / \text{off\_time}) * \text{max\_voltage}$$





# DESIGN SUB-SYSTEM II

PART 1 OUT OF 4



# DESIGN SUB-SYSTEM II

## PART 2 OUT OF 4

```
Python 3.9.0 (tags/v3.9.0:9
Type "help", "copyright", "credits" or "license()" for more information.
>>> from PyQt5 import QtWidgets, QtGui, QtCore
from PyQt5.uic import loadUiType

def load_dr_image(image_path):
    pix_map = QtGui.QPixmap(image_path)
    ui.dr_map_viewer.setPixmap(pix_map)
    timer.start(10000) # 7000ms

def load_lab_image(image_path, icon_path):
    pix_map = QtGui.QPixmap(image_path)
    ui.lab_map_viewer.setPixmap(pix_map)
    pix_map = QtGui.QPixmap(icon_path)
    ui.logo_image.setPixmap(pix_map)
    timer.start(10000) # 5000ms

design, window = loadUiType("final_design.ui")
app = QtWidgets.QApplication([])
w = window()
ui = design()
ui.setupUi(w)
pix_map = QtGui.QPixmap(r"images/map4.jpg")
ui.main_map.setPixmap(pix_map)
ui.tabWidget.setStyleSheet("background-image: url(images/1.jpg);")
# callbacks
ui.dr_samir_btn.clicked.connect(lambda : load_dr_image(r"images/map1.png"))
ui.dr_sadiq_btn.clicked.connect(lambda : load_dr_image(r"images/map2.gif"))
ui.mr_shafiq_btn.clicked.connect(lambda : load_dr_image(r"images/gif"))
ui.dr_jawad_btn.clicked.connect(lambda : load_dr_image(r"images/gif"))
ui.mr_ahmed_btn.clicked.connect(lambda : load_dr_image(r"images/gif"))
#labs
ui.lab1_btn.clicked.connect(lambda : load_lab_image(r"images/map2.gif", r"images/panda.jpeg"))
ui.lab2_btn.clicked.connect(lambda : load_lab_image(r"images/map2.gif", r"images/panda.jpeg"))
ui.lab3_btn.clicked.connect(lambda : load_lab_image(r"images/map2.gif", r"images/panda.jpeg"))
ui.lab4_btn.clicked.connect(lambda : load_lab_image(r"images/map2.gif", r"images/panda.jpeg"))
ui.lab5_btn.clicked.connect(lambda : load_lab_image(r"images/map2.gif", r"images/panda.jpeg"))
# create timer
timer = QtCore.QTimer()
timer.setSingleShot(True)
timer.timeout.connect(lambda : ui.tabWidget.setCurrentIndex(0))
w.show()
app.exec_()
```

USER INTERFACE ( UI ) CODE

# DESIGN SUB-SYSTEM II

## PART 3 OUT OF 4



HOME

OFFICES AREA

LABORATORY AREA



DEAN'S OFFICE,  
DR. JAMAL

CHAIRMAN'S  
OFFICE, DR. SAMIR

DR. SADIQ'S  
OFFICE

MR. SAIFULLAH  
SHAFIQ'S OFFICE

21/04/2021 :13:55

### Indoor Positioning Guidance System

#### PROJECT DEFINITION:

Design and implementation of an indoor positioning guidance system which is capable of assisting new students or visitors on campus, especially Electrical Engineering (EE) students. The system will be implemented with advanced technologies to help guide visitors or students inside the department.

#### PROJECT OBJECTIVES:

- Provide assistance to visitors and students
- Increase public awareness
- Guide engineering students inside the EE department

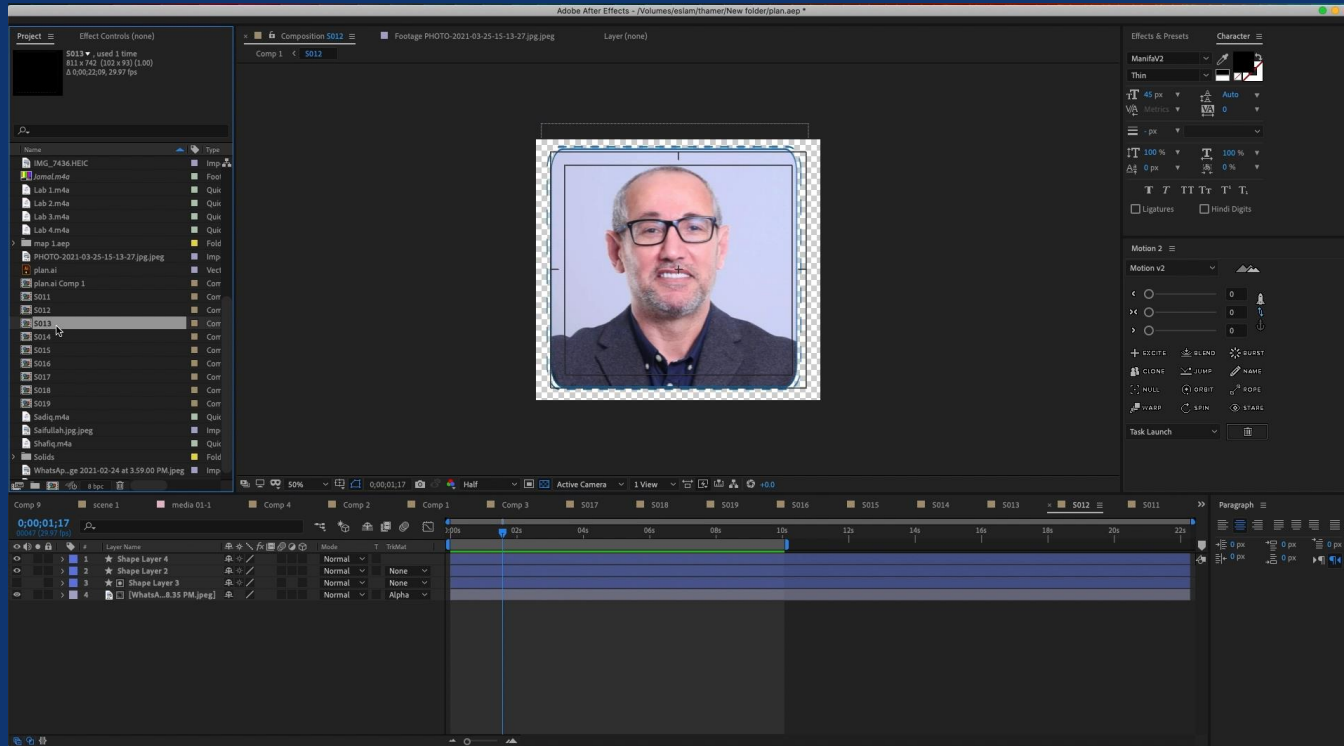
#### PROJECT IMPACT:

- An interactive environment
- Modernize with a new technology
- Productive & Efficient
- Dynamic tour experience

USER INTERFACE ( UI )

# DESIGN SUB-SYSTEM II

## PART 3 OUT OF 4



# DESIGN SUB-SYSTEM II

PART 4 OUT OF 4



# COMPLETED WORK

- Ordering required parts and components
- Completed industrial prototype Designe
- Testing and completed Motor Driver Circuits
- Finalized system's interface (UI)
- Integrated all sub-systems together
- Completed programming for Motor driver



# REMAINING WORK

- Print Poster and brochure
- Prepare the project for demonstration day
- Ordering remaining parts & components (if needed)
- Completing UI Maps (Guidance) Motion Graphics with a voice over



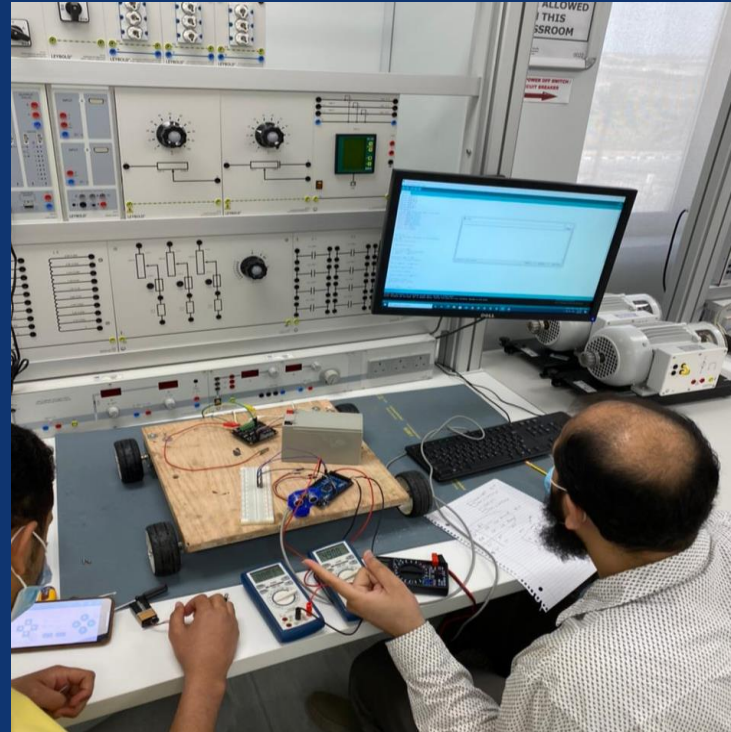
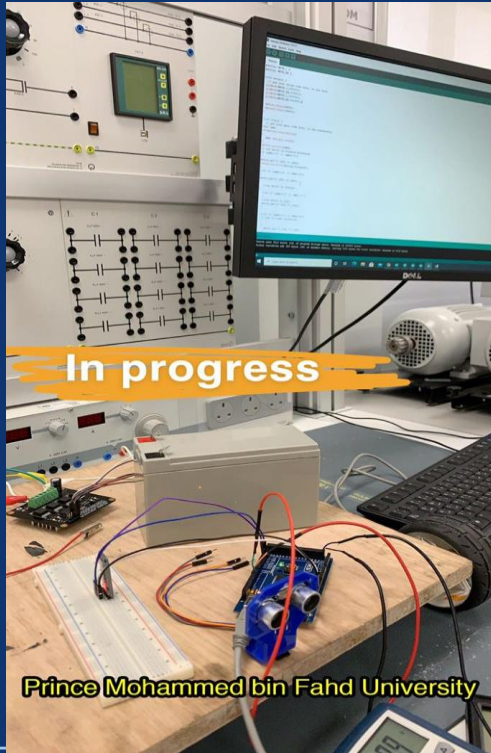
# PROJECT MANAGEMENT & TEAMWORK

Task	Thamer	Yazeed	Abdullah	Abdulrahman	Muath
Search & acquire components	20%	20%	20%	20%	20%
Design & Implement Subsystem 1	10%	10%	20%	15%	10%
Design & Implement Subsystem 2	25%	15%	20%	20%	20%
Testing	15%	20%	20%	20%	20%
Write Reports & editing Presentations	30%	20%	20%	20%	15%

# PROJECT MANAGEMENT & TEAMWORK



# PROJECT MANAGEMENT & TEAMWORK



# PROJECT MANAGEMENT & TEAMWORK



# PROJECT MANAGEMENT & TEAMWORK



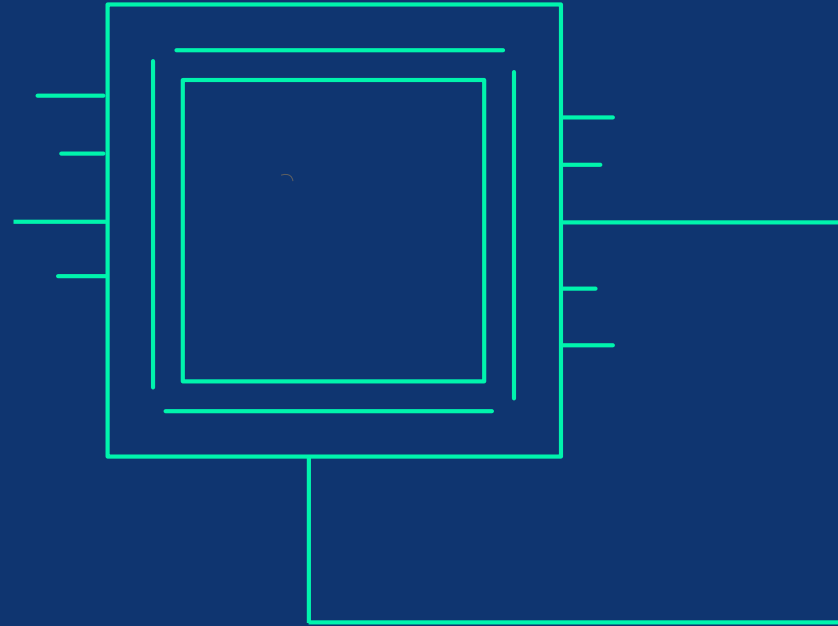
# PROJECT RISK MANAGEMENT

#	Risk Description	Risk Management	Impact
1	Programming language (Python)	Planning and having regular meetings with advisor	Project scope
2	Material arrivals	Getting in touch with suppliers	Delays and running out of time
3	Budget Management	Cheaper alternatives	High quality and matching needs

# IMPACT OF PROJECT



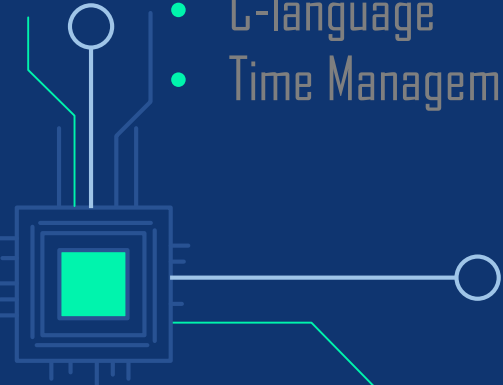
- Interactive environment
- Modernize with a new technology
- Productive
- Efficient
- Dynamic tour experience



# SKILLS ACQUIRED AND APPLIED



- Motion graphics (adobe illustator)
- Adobe and QT5 designer
- SolidWork
- C-language
- Time Management



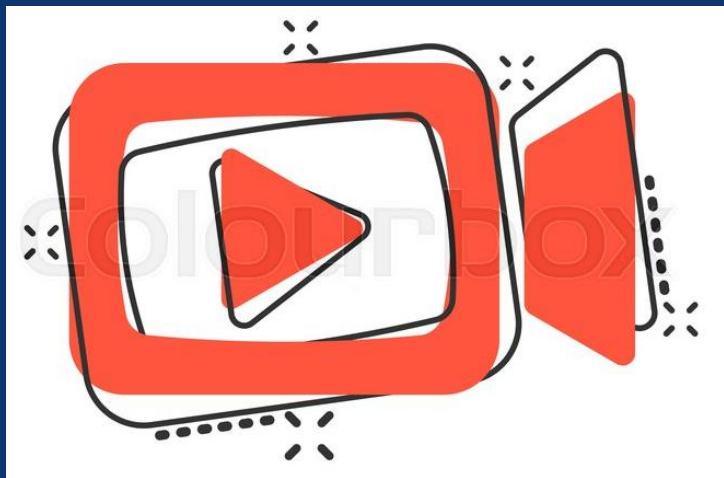
# COST

No.	Description	Quantity	Unit Cost (SR)	Total Cost (SR)
1	Microcontroller	1	195	195
2	Package , includes (Bluetooth, ultrasonic)	1	400	400
3	Breadboards	2	50	100
4	Conductor wires	3	75	225
5	Welding	2	15	30
6	Buttery	1	120	120
7	Base fabrication	1	650	650
8	LCD Screen	1	500	500
9	Raspberry pi	1	380	380
			<b>Totals</b>	2600



**THANK YOU!**





<https://youtu.be/BOI1zE7dSz0>



Any Question ?



# REFERENCES

J.D.TardGs,J.Neira,P.M.Newman,andJ.J.Leonard,"Robust mapping and localization in indoor environments using sonar data," International Journal of Robotics Research, vol. 21, 2002, pp. 311-330.

[2] R.A.Brooks,"AspectsofMobileRobotVisualMapMaking,"in Proceedings of the Second Int. Symp. Robotics Research, Tokyo, Japan. 1985.

[3] B.Kuipers,"Spatialsemantichierarchy,"ArtificialIntelligence,vol. 119, 2000, pp. 191-233.

[4] H.Choset,andK.Nagatani,"Topologicalsimultaneouslocalization and mapping (SLAM): Toward exact localization without explicit localization,"IEEE TransactionsonRoboticsandAutomation,vol.17, 2001, pp. 125-137.