UMM AL-QURA UNIVERSITY
COMPUTING COLLEGE AT AL-QUNFOUDAH
SUMMER TRAINING

PREPARED BY:

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COMPUTER SCIENCES

TRAINED AT:

Smart Methods

FROM 19/06/2022 TO 18/08/2022 A.C

FROM 20/11/1444 TO 20/01/1444 HIJRAH

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Chapter One /Definition about Smart Methods

1.1 Introduction:

At the outset, I would like to express my gratitude to the company responsible for my summer training (**Smart Methods**) for the efforts they made in developing our skills and providing the appropriate environment for all its trainees, This training is on-the-job training where you are treated as an engineer in the engineering field, specifically robotics manufacturing, programming and development, where the trainee is assigned tasks to be carried out, the program includes: making a complete robot and training courses approved by the training authority training is based on 5 tracks:

- mechanical engineering specialization.
- electrical engineering specialization .
- Robotics and artificial intelligence specialization.
- Internet of things and data science specialization.
- engineering Industrial specialization

Smart Methods has 3 branches in Jeddah, Araba Business Center, which I worked in, and another in Riyadh and the Makkah region.

 For me, this training is one of the things in which I discovered many things in different topics,

and I don't forget the experiences I went through in different paths related to computer and

engineering. For this reason, I will mention my unique and enjoyable experience that I had during the training in my main path (**Internet of things**) in particular, and the rest of the sub- paths in general in the Smart Methods Company for the year 2022.

The goal of the training:

- Expertise
- Building and knowing relationships
- Design and build a robot from scratch.
- Continuing to work, not giving up and overcoming difficulties .
- Practical experience by working on real projects.
- Teamwork provides an opportunity to get to know the engineers and be part of a group that performs tasks together.

1.2 Company history:

A national commercial enterprise established in 2010 registered with the Ministry of Commerce and specialized in **Automated equipment**, **Robotics**, and **Artificial intelligence**. It is considered the first commercial facility of its kind in the service of researchers and innovators in the Arab world and is classified by Forbes International magazine as one of the most innovative companies in the Kingdom of Saudi Arabia in the last classification of 2015, and it was nominated as one of the most innovative companies by **Monshaat** in 2021.

1.3 Company achievements:

Smart Methods Company has a very large number of technical and scientific achievements, Such as:

- ❖ 843 of the Innovations implemented and recorded.
- ❖ 675 of the Scientific research supported.
- ❖ 36 of the Robots and mechanical systems manufactured.
- ❖ 1675 of the electronic circuits were implemented.

1.4 Products and Services:

The institution provides several services in the field of industrial production including:

- ❖ Modeling using a three-dimensional printer.
- ❖ Design and Printing of Electronic circuits.
- ❖ Programming smartphone applications.

Construction and Manufacture of interactive robots

Chapter Two/ Training Plan

2.1 Paths: -

There are **five paths** and each path contains its suite tasks.

the trainee chooses only one path to be his main path and is given several tasks after the end of each meeting to work on them throughout the week. Provided that completes 4 tasks in his main path to pass the training. And in the case that the trainee works on two tasks as a minimum from the rest of the paths, he will receive the **Full Stack Engineer Certificate**.
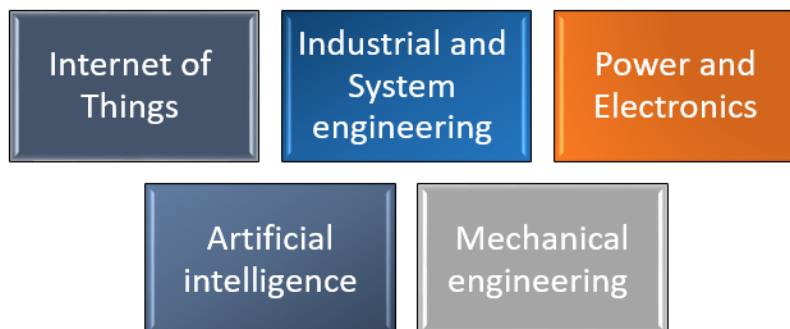

Figure 1 :Summer training paths.

2.2 IoT (Internet of Things) Path

I chose the (**Internet of Things**) path as my main path and the rest of the paths as sub-paths to obtain the certificate.

Therefore, on the first day of the first week, we were introduced to the path, what are its objectives, the nature of the tasks that we will perform, the required skills and the tools that we will use in the future.

The idea of training was also explained, which was summarized into 4 important points, Tasks, learning resources, implementation and submit, and review.

So, Our Tasks will be:

- **Writing an algorithm of running ESP32 by Arduino IDE.**
- **Make a website that has a function to convert Speech to Text**
- **Designing a user interface to control the movement of the robotic arm**
- **Use python language with IBM Watson to convert**

Task list(1):

- Understand how s-m.com.sa/test/ convert ur Speech to text..
- Writing a wisdom ESP32 operating algorithm.

Description:

The first task that we had to do in this project was to design a user interface for converting voice to text, which was shown in the second week. It moves the robot arm after completing all the tasks. I started working on the first part of this task, which is to design a user interface using HTML/CSS/JS to build the interface.
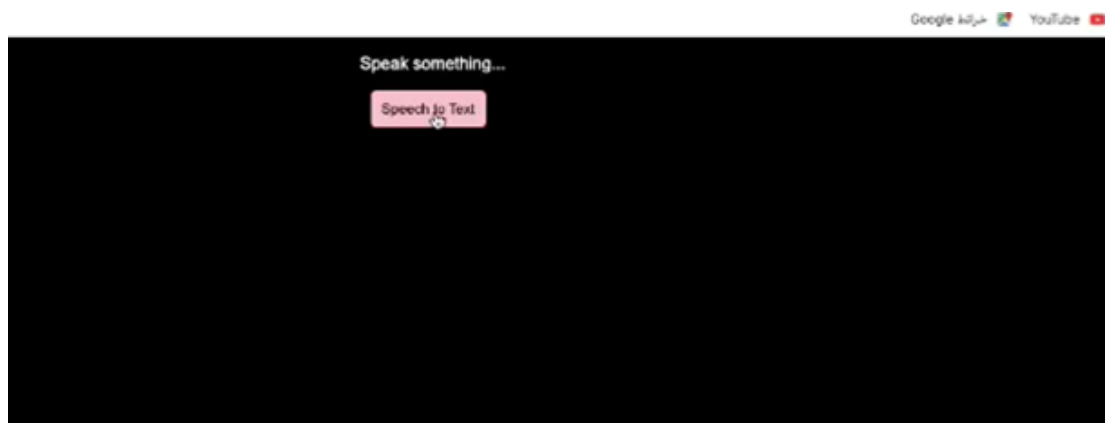

Figure 2 speech to text.

- **Writing a wisdom ESP32 operating algorithm.**

1. Download Arduino IDE from the Arduino website.
2. To see the ESP32 piece, click on File at the top, click on Preferences, add this line https://dl.espressif.com/dl/package_esp32_index.json, and click OK.
3. Click Tools then choose Arduino uno, then click Board Manager, then a screen will appear we are writing ESP32, then click enter and download.
4. Go to the board and find ESP32 Arduino.
5. ESP32 piece, is connected to the USB wire.
6. To connect, we click on the Arduino uno tools, then choose ESP32 Arduino, then choose this type of WEMOS D1 MINI ESP32 controller.
7. Then we go to tools and connect to a piece by going to port "com3" and then clicking on "com3"
8. To turn the lights on and off, we go to the file, then choose examples, then 01.Basics, then blink. After that, the blink example will be opened, we click on the start button and the code will run.


```
    http://www.arduino.cc/en/Tutorial/Blink
*/

// the setup function runs once when you press reset or power the board
void setup() {
  // initialize digital pin LED_BUILTIN as an output.
  pinMode(LED_BUILTIN, OUTPUT);
}

// the loop function runs over and over again forever
void loop() {
  digitalWrite(LED_BUILTIN, HIGH);   // turn the LED on (HIGH is the voltage level)
  delay(1000);                       // wait for a second
  digitalWrite(LED_BUILTIN, LOW);    // turn the LED off by making the voltage LOW
  delay(1000);                       // wait for a second
}
```

Figure 3 Writing a wisdom ESP32 operating algorithm

Task list(2):

- Moving arm from web page which convert audio to text.

Description:

In the third week, I started the second task, which The is how to allow the servo motor of the arm to move to 180 or 0 degree when the user say to the webpage right or left this is basically done by Web Serial API.
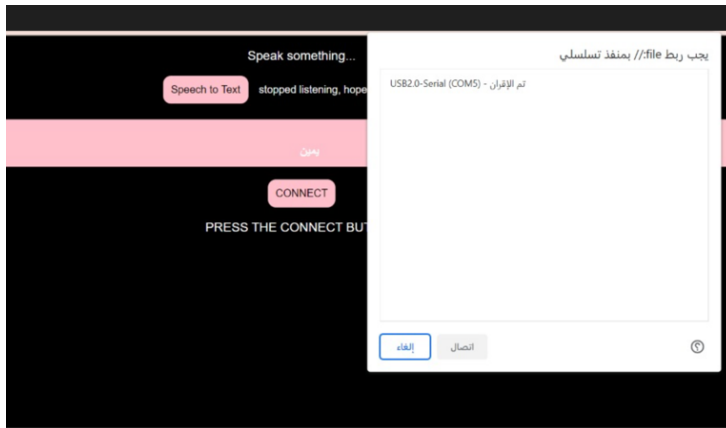
2.3 Multifarious task:

Doing some tasks from another department, which is an optional task, but upon passing those tasks, a certificate approved by the company is obtained:

Mechanical engineering:

This path is the first path in which the structure and parts of the robot are built, and the role of the Mechanical engineer is to know the function of the robot and to search for the best ways to build the robot at the lowest cost and high quality.

Tasks I worked on:

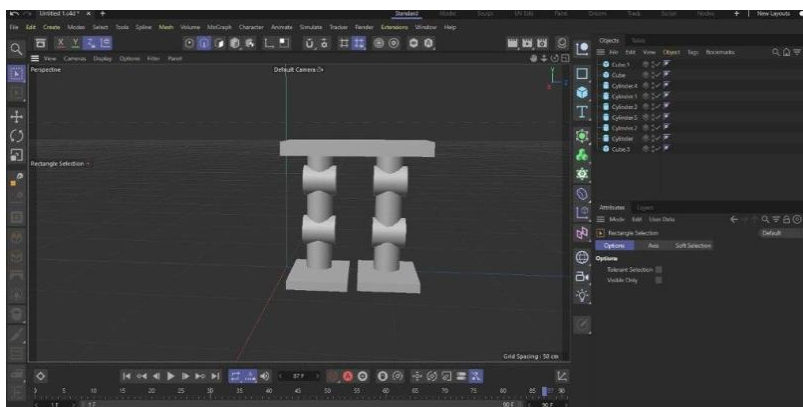- Designing the bottom of the robot in Cinema 4D.

Figure 5 design robot.

Power and Electronics:

In this path, the electrical circuits that are used to make the robot move are designed and programmed. Usually, this path is partly related to the path of Artificial intelligence.

Tasks I worked on:

- Brushless Motor Control System in Tinkercad.
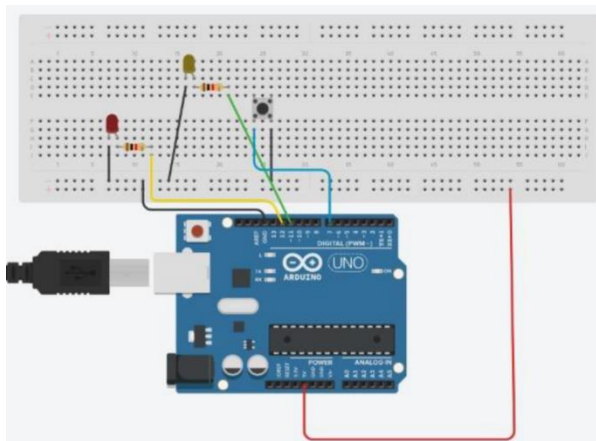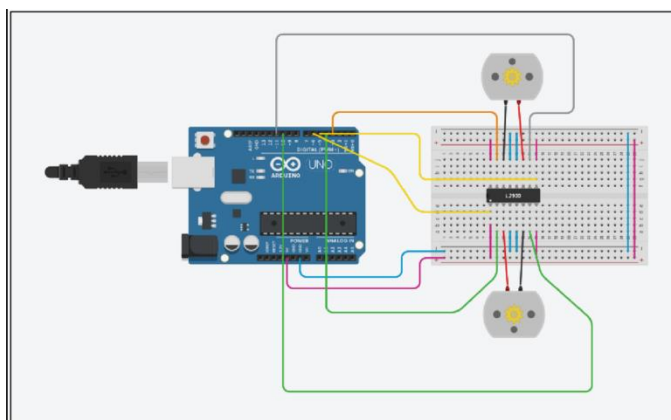- Digital and Analog sensor circuit.

Figure 6 Digital and Analog sensor

Figure 7 Brushless motor

Artificial Intelligence:

In this path, the focus is on making the robot intelligent, so that its movement and how it interacts with its surrounding environment are controlled. Usually, this path is connected to the Internet of Things path in terms of software, and to the path of Power and Electronics in terms of hardware.

Tasks I worked on:

- install rose on Jetson Nano.
- install-arduino-robot-arm.

Install ROS on Jetson Nano

To install ROS on Jetson Nano, follow these three steps:

First step : Download an Ubuntu Image.

Second step : Download the VirtualBox.

Third step : Install ROS on Jetson Nano.

2.4 Simultaneous tasks

Simultaneous tasks are considered the third type of tasks the company has. These tasks depend on individual tasks and those outside the headquarters to try the codes, so the trainees must attend to experiment and operate the pieces, These are some of the tasks**:**

- Building and running undercarriage of the robot using a brushless motor . has been used embedded system.
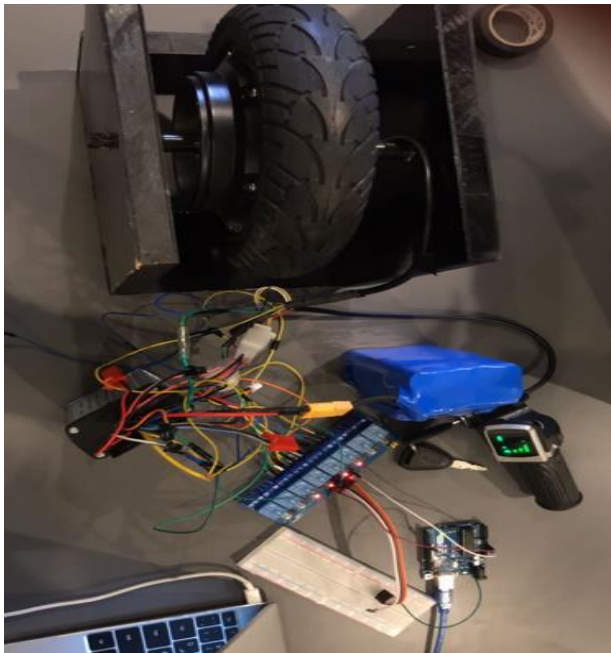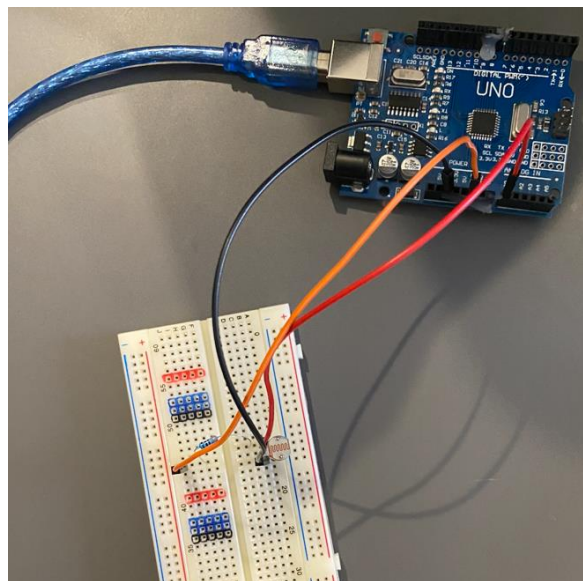

Figure 8 Broch less motor.

- work on the piece ESP32 Connect the piece to the computer And work to the programming needed to turn on its lid blink.
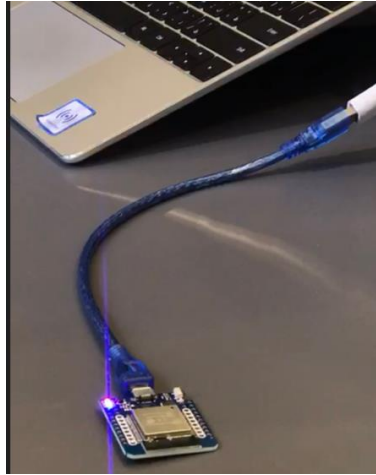
Figure 9 ESP32

- Building an electronic circuit via Arduino in two ways, the first method with a digital sensor, and the second method with an analog sensor.

Figure 10 analog & digital sensor

2.5Training Courses .

Training Courses :

During the training, three training courses were taken in various fields some of:

Mechanics training course:

Some course concepts:

How to use the Cinema 4D application, learn about the basic mechanical parts, how the internal structure and mechanical systems of the robot are designed in 3D, and learn about the types of motors and joints of the robot.

Electronics training course

Some course concepts:

Getting to know the basic electronic parts.

How to choose the right controller, types of inputs, how to design an electrical circuit and its basic elements volt &ohm &amp.

Robotics training course

Some course concepts:

ROS download method, A full explanation of the Android operating system (ROS), clarifying some difficult tasks.

There were also meetings from inside and outside the company

A meeting with Eng. Numan The difference between a professional CV and a personal CV.

A meeting with Eng. Essam : Field track meeting: experience of working as an engineer, direct contact with the field of robot work, and knowledge of the requirements of field tasks.

#A meeting with Eng. Shaima : to explain how to create an account on the IBM website, through which a robot is built and its movement.

*Chapter Three /*Conclusion and Recommendations

3.1Work skills and Experiences:

- Communication and brainstorming skills.
- The skill of managing time and completing work efficiently by working in several different paths.
- Learning about the services provided by IBM Watson and how to benefit from them in several areas.
- How the paths relate to each other to be able to complete work on one project.

3.2Conclusion:

At the end of the summer training experience at Smart Method, I indicated that I had the honor of doing this experience, which carries a lot of benefits and fun, starting with programming and ending with engineering ،I learned a lot during my summer internship, especially regarding the Internet of Things, as I was passionate about this path from the beginning.

3.3Recommendations:

Good work environment.

I would also like to alert the trainees to the importance of self -learning and acquiring the skill of searching for information so that the training is more beneficial to them.

3.4Appendices

-This is my GitHub link that contains all the tasks I've done.

https://github.com/HananB2?tab=repositories

-Some of the computer programs used in the summer training: arduino lde, php, Ros, Tinkercad , Cinema4d,html,Css,Js

-This is the code for the first task in the Internet of Things path:

```
<!doctype html> <head>

<style>

}

button {

padding:10px; background-color:pink; border: 0px; cursor:pointer; border-radius:
5px;

}

#output {

background-color:pink; padding:10px;

width: 100%; margin-top:20px; line-height:30px;

}

.hide {

display:none; }

.show { display:block;

} </style>

<title>JavaScript Speech to Text</title> </head>
```

```
<body>

<p>Speak something...</p>

<p><button type="button" onclick="runSpeechRecognition()">Speech to
Text</button>   <span id="action"></span></p> <div id="output"
class="hide"></div>

<script>

/* JS comes here */

function runSpeechRecognition() {

var output = document.getElementById("output");

var action = document.getElementById("action");

var SpeechRecognition = SpeechRecognition || webkitSpeechRecognition;

var recognition = new SpeechRecognition(); recognition.onstart = function() {

action.innerHTML = "<small>listening, please speak...</small>"; };

recognition.onspeechend = function() {

action.innerHTML = "<small>stopped listening, hope you are done...</small>";
recognition.stop();

}

recognition.onresult = function(event) {

var transcript = event.results[0][0].transcript; output.innerHTML = "<br/> <b>" +
transcript ; output.classList.remove("hide");

}; recognition.start();

}

</script> </body> </html>
```
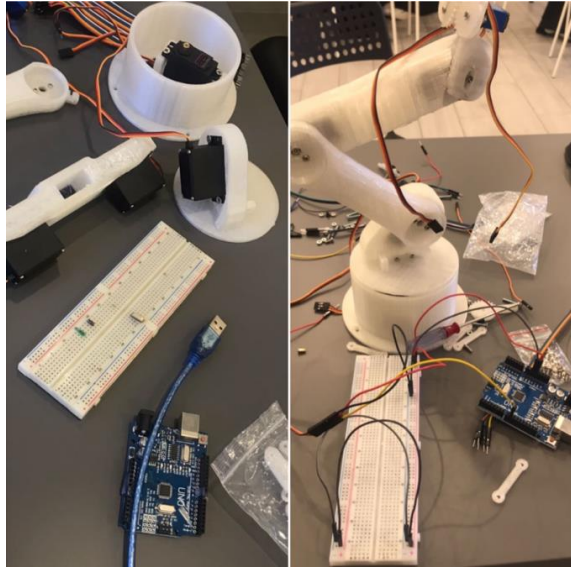
Figure 11 robot arm