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MECHATRONICS ENGINEERING

As everybody know that nowadays we are in the real accelerated revolution of technology and innovation, and there are a lot of fresh, fuzzy, and common fields that anyone cannot have idea about it .I am going to summarize and explain some details about Mechatronics space where some students have misunderstanding during their first thought of going through this department. When you google the word of mechatronic, you will directly find that this words(Electrical and Electronic, Mechanical, Programming ,and software engineering).The game is not like that , if you have apple ,sugar ,and water but you do not know what to do with them ,they will stay separated until you learn the working principles of the system in order to make apple juice .In mechatronics engineering ,if you would like to be comfortable with this department ,you have to start with ideas directly .You have to think that I want to run in marathon this year .Then, you can think how to do it .You have to think about helping children to study smart ,then you can think about the mythology of how to approach to that task. For example, you can introduce for them demonstrated sketches with simulated mechanism which can show them how to deal with their problems in smart condition. In real environment there are a lot of tricks, risks, and harmful actions, as engineers we can solve make them really close to familiar to human being usage and in make the life simple and going in quick manner. Below, you can find all projects and idea which I done in during all my previous years .For more details ,you can DM me any time .Or you can visit my YouTube channel

AIBO Mechatronics

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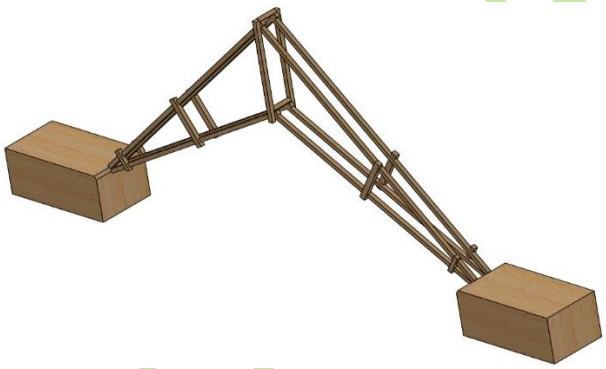
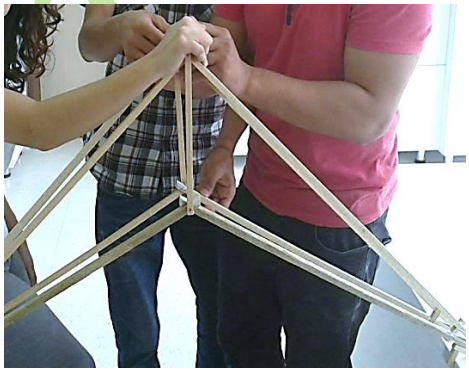
The projects which I did them during my bachelor degree in mechatronics engineering are as follow

First year:

As a beginner student at university I started my first year with basic courses which are necessary for any undergraduate student, so that I with my group we create a bridge structure which aim to carry more than 20 kilograms where we will elevate it from the middle of the bridge. The materials of this project were decided by the professor of the subject so we could not add or get rid of some materials. Finally, we constructed our project depending on theoretical calculation which we sophisticate from the nature and real world problems so that we started to load it from 20kg and rise the load until it came to 100 kg and at the end it could be broke down, we were the winners of first class of mechatronics engineering.



The project scheme (1)



side of group work (1)

Note: this project was based on static university course

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Second year:

In this year we were taking dynamic course, so that we aimed to do a projectile motion project. Therefore, the target was specified by the doctor of the subject and depending on some of theoretical calculations we have to prove that we hit the target where we aimed for.Consequently, we constructed the project by using aerodynamically elements like spring, nails, aluminum, which have to be flexible, and easy to change its condition with respect to the controller.

Note: this project was based on dynamic university course .

Third year :

In this year we had lots of projects which combined with CPU and controlling principles so we started to live mechatronics as it was described for us. therefore, the projects were as follow

1-Reading and measuring linear and angular displacement from potentiometer and show that reads on serial port from Arduino in small accuracy and precession.

2-Automobile obstacle avoidance (in this project we investigated all materials which are dealing with sensing properties like temperature sensor, ultrasonic sensor, LDR sensor, and Bluetooth module requirements which aims to connect between two systems like master and slaves . The automobile was free to be adjustable for task configuration, therefore we used different approach to reach same results. Figure (4)

3-Constructing a garage automatic gate, so that we usually use this application in our daily life. for instance, some companies gate is opening, and closing automatically when automobile come closer to that gates. The work principles of this system is sensing properties so that, by seeing the object coming toward the gate, it can be opened automatically.

4-Flying robot, in this case we aimed to design a robot which can fly to limited level and it can be controlled online by using mobile phone or any other device.Therfore, in this condition we used a Bluetooth module to control its direction. Figure(5)

5- Constructing a steering system, we aimed to construct a mobile robot which has to differentiate and change its directions with respect to the mechanism being installed inside the system. Moreover, by synthesizing the task we could find the links length of four bar mechanism which we assembled them together and attached the required motors to it that we can derive the object for and backward, also left and right about the pole point. Figure (3)

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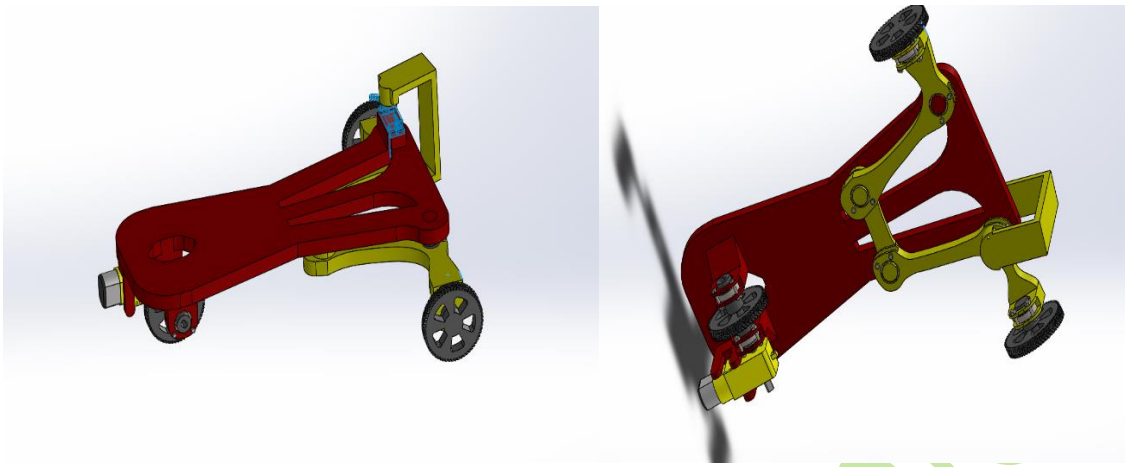
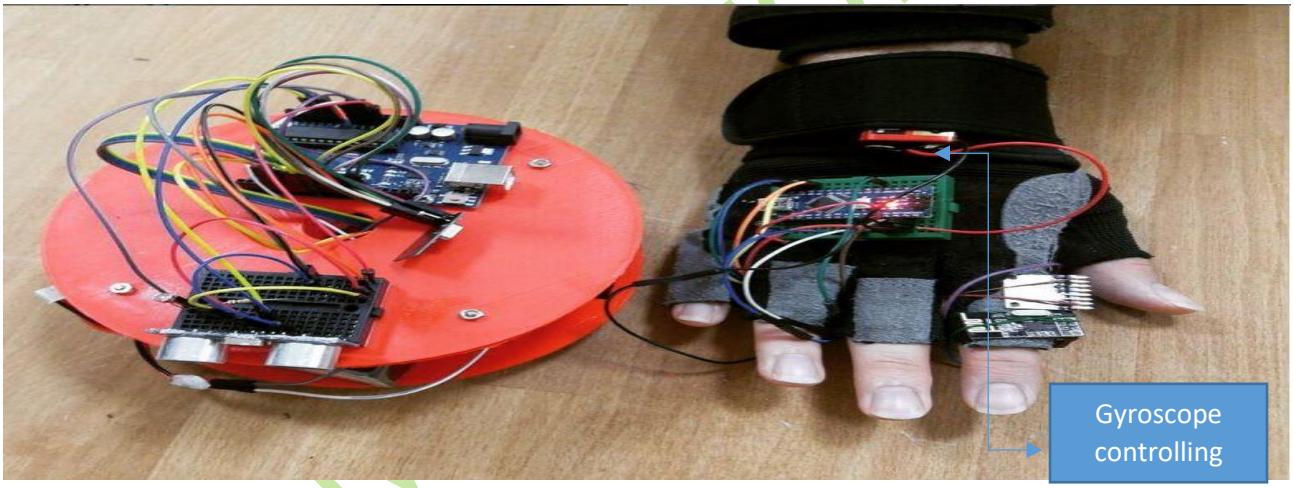
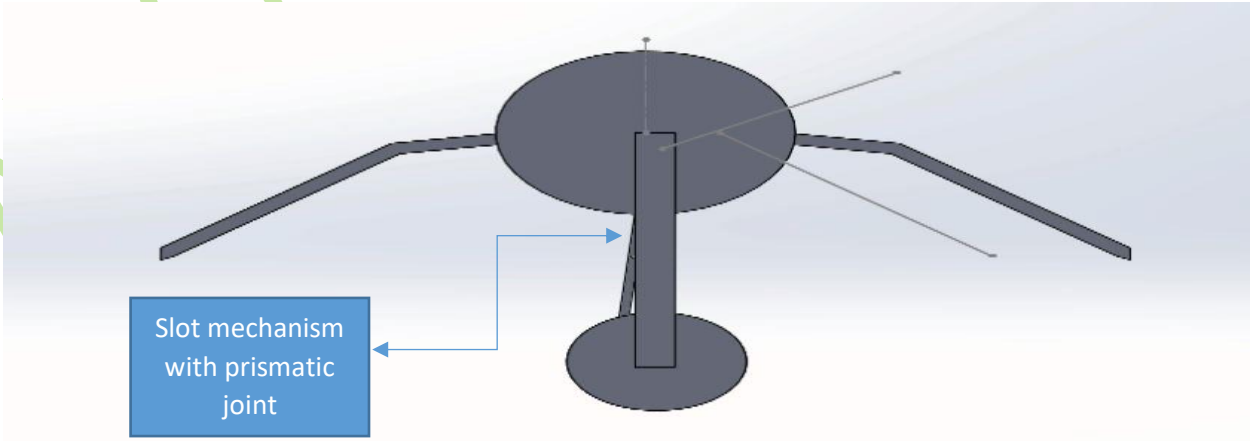


Side of steering system project. Figure (3)



Side of obstacle avoidance mobile robot. Figure (4)



Side of flying robot mechanism. Figure(5)

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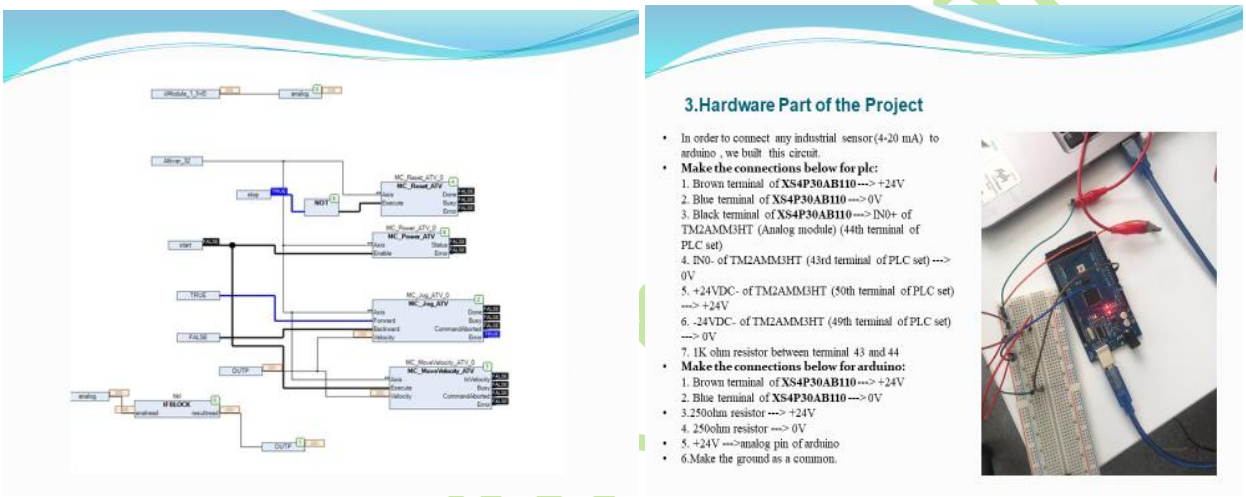
Note:The projects from 1 to 5 were based on sensor and systems, theory of machine(mechanism design) ,mechatronic system design , machine elements, and electrical machines university courses .

Fourth year:

First project:(PLC Controlling) *Industrial automation course*

In this project we did some of modification on AC motor controlling because we in industrial area controlling of the motors is the most important ,and critical topic to the system to be work in the perfect and safe condition .Consequently , we tried to use analog and digital sensors in order to minimize and maximize the speed of the motor with respect to the task requirements.Furthermore,we use Arduino microcontroller and Python interface to show the real environment on computer screen that we can be sure we are going in the right way. Figure(6)



PLC program Arduino program

AC motor controlling. figure (6)

-Engineering design and problem solving class: It was one of the valuable course which is directly relating with fresh engineers real life applications. In this class, our professor was giving us some trick that exist in our daily life .Then, he required from us to do sympathize in order to define the problem and present it to him as somebody presents his/her product to the costumers .After that, we could find perfect solution for that problem by following technical methods. These methods are applied in Stanford university to teach engineers how to approach to the problem delivered to them .Finally, by experience that methods, we could gain the idea which any engineer needs in order to solve the tricks that will be in front of him/her after graduating .With a group members, I can completely do any work in a least of errors and huge of success ,if we work in any kind of project together. I honestly believe in myself, and I can prove with my teamwork members

Image processing and Raspberry Pi with python programming language:

Another important application course was directly related with Raspberry Pi microcontroller. In this course we learnt image processing procedure ,and we use it as part of our task applications with

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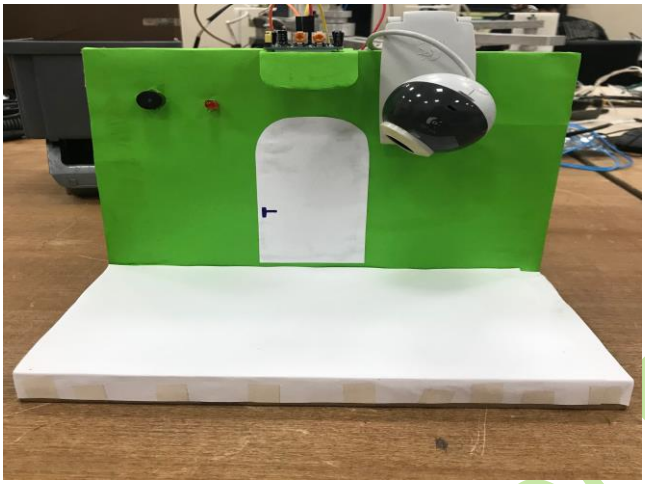
graduation project .As a result of obstacles that will be placed randomly in front of end effector,we have to avoid them as much as possible we can .In this case ,we suggest to place camera that can observe that obstacle and process them ,after that the microcontroller can decide how to give signal for actuators so that they will actuate end effector where it should not be any objects .In image processing we have used open CV with python programming .Second application was designing a home smart alarm system that can detect the object and send message with pictures for the owner of the house.This project is really applicable in real application environment so that you can leave your house ,and it will be kept on safe conditions whatever you still away from it also everything will come to you instantaneously .Look at figure (7).



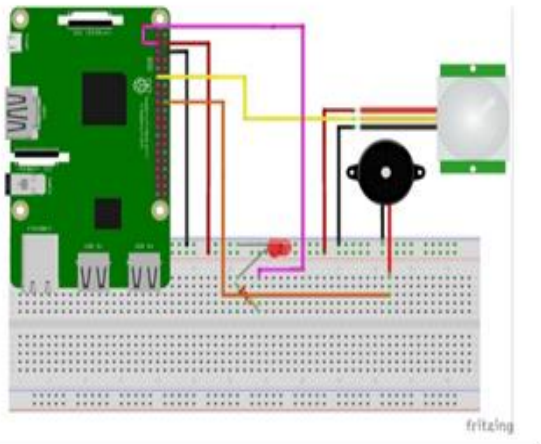


Figure (7)

Designing a hydroponic system

we designed the perameters that will be need to build hydroponic plant so that as a group members ,everybody take part from project and deal with it until getting the idea of that part.Then ,we discussed them together in order to start system designing .we designed light controlling plant that will control the light emitting ,we design electric conductivity ,and other parameters which are necessary to any hydroponic plant system. Finally, we combined this project with our graduation project to make the system work automatically without any interaction of human being.

Graduation project: modifying a Scara robot manipulator

As a graduation project all the time covering all information be studied before, they reveled to us a complex task that we dealt with it which is designing attachable and detachable reconfigurable serial robot manipulator. In this case, we constructed three serial manipulator with two degree of freedom working separately, so that it can reach a desired place as precise as possible in a very large workspace area .Then, we tried to combined the work of manipulators together on a single and combact shape .A hexagonal platform placed in the middle of the mechanism .Therefore, we can do whatever we want on that platform depending on the gripper placed on the middle of it. In addition to that ,our project could do its job in a perfect manner . The purpose of it is to be used in industrial, medical,

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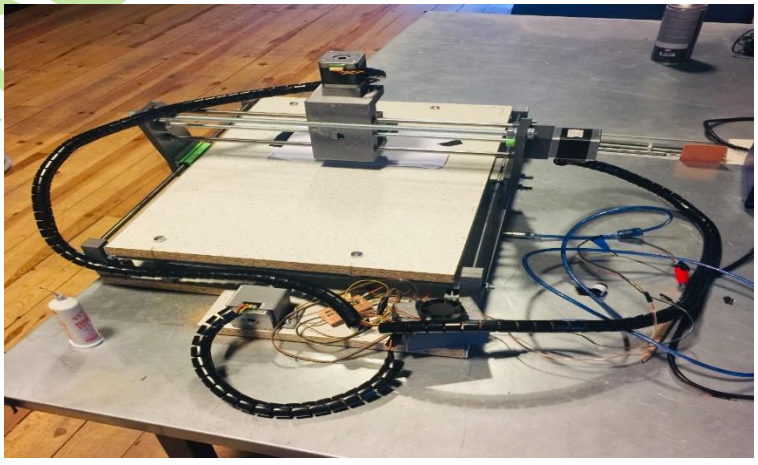
manufacturing, and planting applications. So that, it can work as serial or parallel version with respect to the aim of costumer where we want to use it. In graduation project I worked as a leader for the group members. During that period, I created really perfect plan which can guarantee our work to go in a perfect condition, and we absolutely could do that ,so we won Tubitak as a sponsor and they give us 3000 Turkish Lira .See figure (8).

Robot compact shape **Figure(8)**

-Designing CNC machine that can be used in three basic industrial operating system

We design CNC machine that can be used in different purposes like welding ,drawing,and laser cutting .Firstly,we print out the 3D parts of the machine.Then,assemble all mechanical parts like screws,nuts,and belts together in order to make system more sensible and being work in law amount of errors.After that ,we calibrate the machine with respect to motors features of servo motors.Normally the cost of this machine in the market is closely 3000 TL .However,we completely designed and assembled it with nearby 350 TL. This project was totally done in İzmir municipality (**İzmir FabLab**).



CNC Machine Figure (9).

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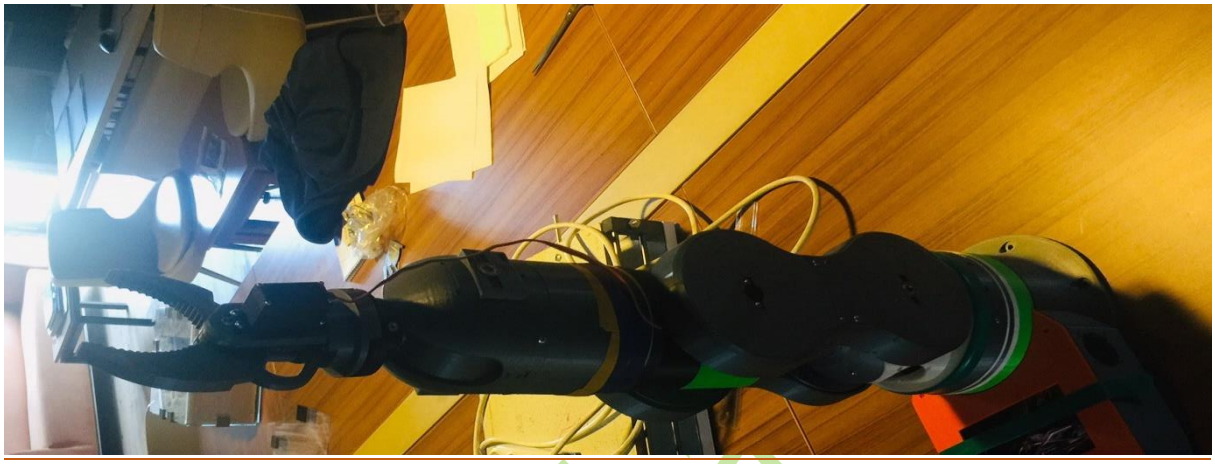
-Designing 6DoF Serial Robot Manipulator

Starting from kinematic ,dynamic and control analyses ,we designed robot manipulator that can be used in multi kind of purposes in industrial areas .In this progect we used NEMA 17 servo motors to actuate the system .The Project cost us closely 750 TL in order to build its mechanism .However ,in robotic marketing its normal cost is more than 7000 TL .This project also has been done in İzmir municipality (**İzmir FabLab**).Look at figure (10).



6-DoF Robot Manipulator FIGURE (10).