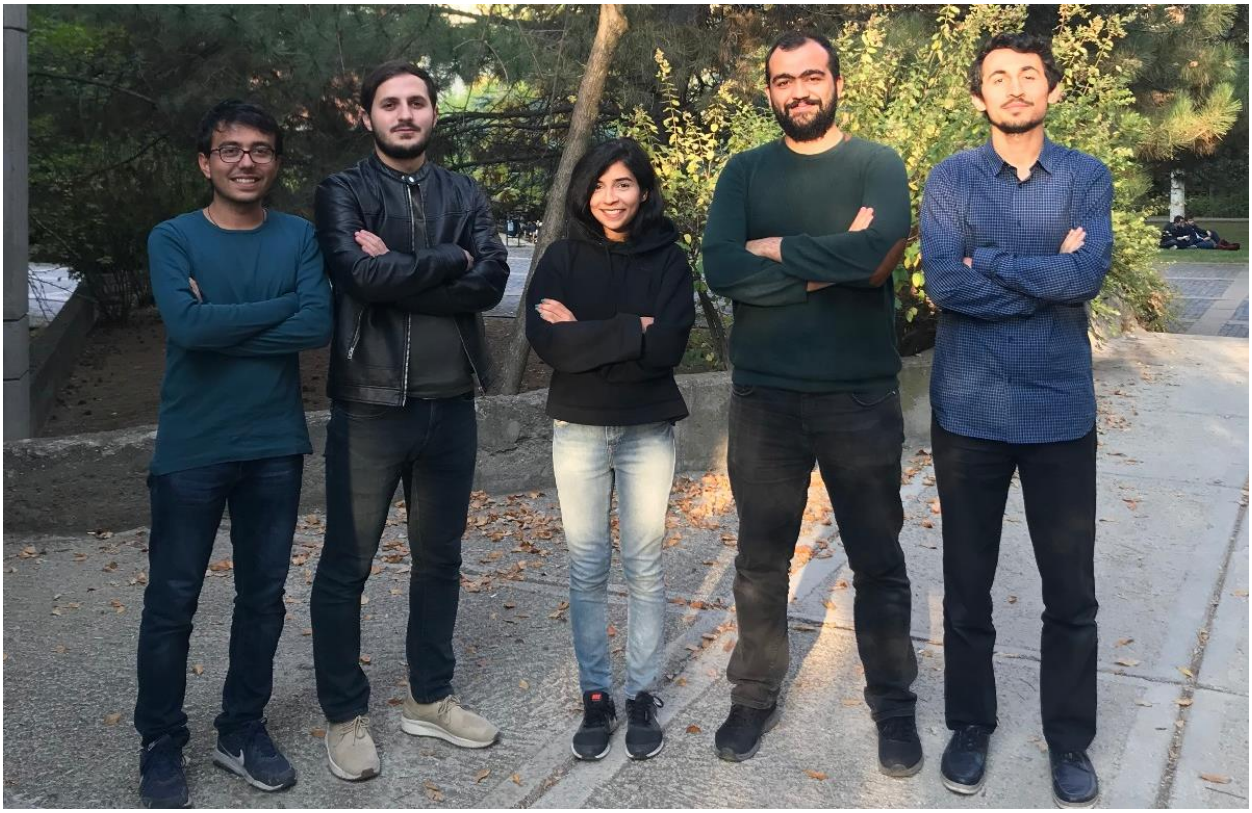
AUTOMATA TECHNOLOGIES

Automata Technologies - Design Studio #4



Partners:

Fatih Çalış
Fatih Çam
Sarah Ilyas
Recep Günay
Huzeyfe Hintoğlu

Introduction

In this document, the main purpose of founding this company will be explained by providing mission and vision statements. Then, the work plan of the project among the partners will be divided in the human resources section and all the capstone design projects will be analysed and restated. Finally, the tentative time table showing the process of the overall project will be provided after the conclusion.

Mission

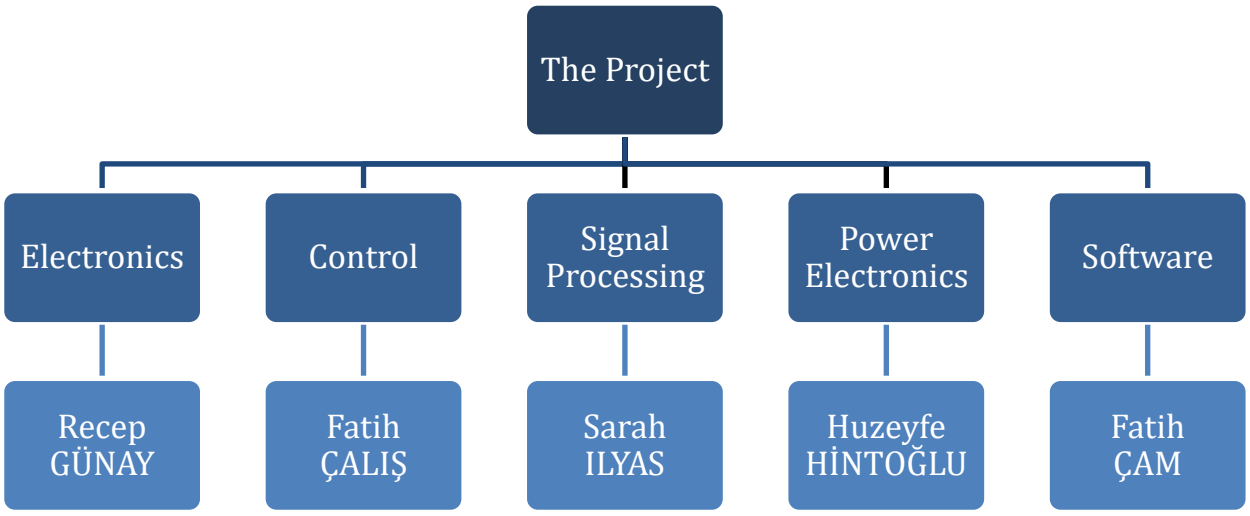
Automata Technologies' mission is to enhance the robotics for inspired robotics solutions, world class support, and an incredible customer experience.

We want to achieve all this in a sustainable and innovative way.

Vision

Automata Technologies' vision is to be the world's leading provider of state-of-the-art but highly robust robotic inspection technology. Collaboration with leading industrial partners and world leading universities ensures a continuous process of innovation.

Human resources



Interpretation of the Projects

Devices competing to catch falling balloons

In this project, two robots try to catch balloons falling from above and the one catching a balloon before the balloon touches the floor and the other wins a point. There will be 5 balloons in total and the device that catches more balloons wins. In horizontal, the length of the robots should not exceed 30 cm in all directions and their height should not exceed 40 cm. Robots can not touch or push each other during the game. Robots should be able to avoid interference from the surroundings such as the opponent's sensor. Also, robots might have an ability to differentiate a balloon that is falling and a balloon that has fallen so that it will not try to catch balloons on the floor.

Devices trying to score in each other's goals

In this project, two robots try to score in the opponent's goal in a hexagon playfield. The robots are teleoperated by an operator from a maximum distance of 30 m through a camera mounted on board the robot. The robots are not allowed to hold and carry the ball to the opponent's goal and they are only allowed to move their own half field. The game starts with ball in the middle. Robots are allowed to touch the ball more than once, but the ball should leave one robot's half field in less than 20 seconds. When 1 robot scores 2 more than the other, that robot wins the game. The video data will be transmitted to the operator's side wirelessly, but Wi-Fi connection is prohibited. The side walls should be 70-75 cm, the ball should have a diameter of 30-45 mm, goals should be as long as the twice of the lateral dimension of each robot. The goal line and the half line are specified by masking tape and the goals are place at the opposite corners symmetrically. Each team should build a teleoperated robot, a ball, a goal, three of the sidewalls and a dummy robot for demonstration purposes.

Vehicles chasing each other around a closed course with varying properties

In this project, two self contained robots would compete on an elliptical, elevated pathway. Initially, both robots would be stationed at locations that would be diametrically opposite. Once the race is initiated, both robots must be capable of traversing in both, clockwise and anticlockwise directions. However, what would differentiate a winning robot from a losing one would be its ability to not only stay on course despite impediments but also have a sufficiently high speed, so as to catch the opponent and 'tag' it. In the race, the only identifying feature of the race course that the robots can witness is the colour of the path. The race would reach completion once one of the robots approaches to within 5 cm behind its opponent and both robots are in

mutual accord about the completion of the race by virtue of a handshake. The whole race course must be traversed in at most 20 seconds. One of the critical factors to be considered is the prevention of collisions. Ostensibly, this project would rely on use of a multitude of sensors, including but not limited to position sensors. A position sensor would not only aid in travelling around the elliptical path but will also avert possible collisions with the opponent by sensing, possibly, the position of the opponent. However, since the position of the opponent would be varying, we will need more versatile sensors, including, possibly, proximity sensors.

Devices trying to extract the plan of their surroundings

In this project, a robot is supposed to map randomly placed objects inside a certain area on computer screen. Its duty is to determine their types, locations, and sizes. The area is surrounded by walls whose height is 50 cm that is the same height of the objects as well. The objects can only be cylinders of 10 cm or 5 cm diameter, Square prisms with 7 cm edge length, and Prisms with an equilateral triangular base of 8 cm edge length. The robot must be autonomous. This means that the robot must move inside the field without external commands. It must determine its own path to be able to recognize all of objects without crashing them. This requires an algorithm for controlling the robot without camera that the robot determines the path using information that comes from distance sensors. This is quite difficult to implement. Another way is using camera to create a path for recognizing all objects that requires image processing because the robot must decide where to move according to information comes with the image. While recognizing the objects, the robot must decide their positions, shapes and types. This part also requires image processing algorithm using information comes with the image again. When these processes are made, the robot must map the objects with another algorithm. After mapping the objects, it is supposed to display the map on computer screen. This can be done easily using communication modules. This is the only part that robot can communicate with outside world for one-way communication. The ultimate duty of the robot is to finish mapping process as early as possible. The robot that provides a better plan of the field in minimum time wins the game.

Conclusion

After the interpretation of the projects, it can be said that we have 4 projects with very different concepts. Three of them require an autonomous algorithm for self-control of the robot while the other one includes a teleoperated robot. Image processing is an important part for the projects of this year since it generates the required feedback for the control system of the robot.

Every project in this course aim for students to get familiar with robotics, discrete time systems and control algorithms. In most of the projects, the students are expected to use image processing methods, various communication protocols and different sensors. These concepts are very important for an electrical and electronics engineering. Thus, students are taking their first step into their engineering career thanks to the projects in this course.

Appendices

Cv's of the Automata Technologies company members are included.

Time Table

1	October 22-24	Choosing project, declaring problem statement
2	October 25-27	Specifying requirements and objectives of project
3	Oct 27-Nov 4	Defining approach to the solution of the problems
4	November 4	Performing tentative cost-budget analysis
5	November 5	Distribution of task for proposal report
6	Nov 6-Nov 9	Preparing the proposal report

FATİH ÇALIŞ

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PERSONAL INFORMATION

Date of Birth:
24.08.1996
Military Service:
Postponed (31.12.2021)
Driving License: B (2015)
Adress:
Güzelkent Mah. 514. Sk. Kurtuluş Sit. 2/12 Eryaman / ANKARA

EDUCATION

HIGH SCHOOL
Kırıkkale Fen Lisesi – 89.97

UNIVERSITY
Middle East Technical University
Electrical and Electronics Engineering
4. Year – CGPA: 3.42

SKILLS

COMPUTER SKILLS
C – Good, MATLAB – Good, LTspice – Advanced
Keycreator – Advanced, Arduino – Good, MS Office – Good
Verilog HDL – Good

LANGUAGE
English: Reading – Advanced, Writing – Advanced, Speaking – Intermediate
Spanish: Reading – Beginner, Writing – Beginner, Speaking – Beginner

PROJECTS

LABORATORY COURSE PROJECTS:
Cricuit Lab. I – Air Conditioner System
Circuit Lab. II – Note Controlled Vehicle
Analog Electronics Lab – FM Continous Wave Radar
Digital Electronics Lab – FPGA Based Oscilloscope

SUMMER PRACTICES

VESTEL / Smart Phone Division:
19.06.17 – 18.07.17

TURKISH AEROSPACE / UAV Systems Division:
01.06.18 – 30.06.18

FATİH ÇAM

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+905308249591

PERSONAL INFORMATION

Date of Birth: 13.04.1995

Military Service: Postponed (31.12.2021)

Driving License: -

Adress: Üniversiteler Mahallesi Dumlupınar Bulvarı ODTÜ 4. Yurt Oda No:206 ÇANKAYA/ ANKARA

SUMMER PRACTICE

Bilgi Teknolojileri ve İletişim Kurumu

17.07.17 – 11.08.17

Mefa Enerji A.Ş.

05.06.2018 – 04.07.2018

EDUCATION

HIGH SCHOOL

İhsaniye Anadolu Lisesi – 91.39

UNIVERSITY

Middle East Technical University

Electrical and Electronics Engineering

4. Year – CGPA: 2.69

SKILLS

COMPUTER SKILLS

C – Average, MATLAB – Average, LTspice – Good

Keycreator – Good,SIEMENS NX – Average, Arduino – Average, MS Office – Good, Quartus- Good

LANGUAGE

English: Reading – Advanced, Writing – Advanced, Speaking – Good

Arabic: Reading – Beginner, Writing – Beginner, Speaking – Beginner

PROJECTS

LABORATORY COURSE PROJECTS:

Circuit Lab. I – Air Conditioner System

Circuit Lab. II – Note Controlled Vehicle

Analog Electronics Lab – Frequency Modulated Continous Wave Radar

SARAH ILYAS

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OBJECTIVE

I am an aspiring Electrical & Control systems engineer. My passion for going beyond conventional means motivates me to explore fields that lie in the intersection of Electrical Engineering, Computer Science, Computational Neuroscience, Biomedical and Control engineering. I am seeking an employment opportunity that will enable me to apply my analytical and problem solving skills in a professional setting.

EDUCATION

B.Sc — **Middle East Technical University, Electrical and Electronics Engineering Department, Ankara, Turkey**

Expected Graduation Date — **June 2019**

High School — **Beaconhouse School Margalla Campus, Islamabad, Pakistan (Ranked First)**

EXPERIENCE

Intern — **Arçelik A.Ş, Research and Development Centre, Istanbul, Turkey** — **July 2018-September 2018**

- Designed Printed Circuit Boards for Arçelik's Reusable Connected Software Platform (RCOS+) Microcontroller in Altium Designer under the tutelage of highly experienced PCB designers at the Embedded Control Technologies Department.
- Acquired hands –on knowledge about Motor Control Algorithms for BLDCs by virtue of Renesas' MCUs and the e^2 studio environment

Intern — **Tekpan A.Ş, Izmir, Turkey** — **July 2017- August 2017**

- Assembled and wired electrical panels for a variety of Turkey's Defense Industry companies including Aselsan and Havelsan
- Worked under the auspices of senior sales representatives to negotiate contracts with prospective clients; visited clients and potential clients to evaluate needs and promote the products of the company, helped in the maintenance of client records

Intern — **Nuclear Medicine Oncology & Radiotherapy Institute** — **July 2016**

- Assisted in the repair and installation of EEG, ECG, MRI and Ultrasound equipment
- Learn hands on about the operation of various medical devices including CT scanners, EEG, ECG, Ultrasound and Mammography equipment
- Researched on the correlation between the efficacy of precautions practiced by doctors and the spread of infectious diseases for quarantined patients
- Learned how to use the Glasgow Coma Scale and evaluated ICU patients based on it under the auspices of trained medical professionals

SKILLS

Programming: C, Matlab, Arduino

Design: Altium Designer, Autocad Mechanical, Autodesk Inventor, LT Spice

Speaking: English, Urdu, Chinese, Hindi

ACHIEVEMENTS AND ACCOMPLISHMENTS

- Attended an Entrepreneurship conference sponsored by The University of Sheffield and the Erasmus+ Program of the European Union, 11-13 May, 2018
- Selected for a Cultural Exchange Program to represent Middle East Technical University in China in June 2018
- Gold Medalist (2012) University of Cambridge International Examinations
- Gold Medalist (2014) University of Cambridge International Examinations-
- Scholastic Aptitude Test (SAT 1) – Score 2200/2400, December 2013
- Beacon house School System, Margalla Campus, Islamabad-100% Merit Scholarship (2012-2014)
- First Position, International Kangaroo Mathematics Contest 2012

HUZEYFE HINTOGLU

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Aiming to gain valuable experiences in the light of my education background.
Especially in
Power Electronics, Power Card design and Control Theory
Hardware design, Microprocessors

PROFESSIONAL EXPERIENCE

TUBITAK SPACE TECHNOLOGIES **Ankara, TURKEY**
Internship *July 2017 – August 2017*

- R&D on Power Electronics and Control Theory
- Design of a Switch Mode Power Supply (SMPS) converter, Flyback Converter
- Developed new skills on PCB design and implementation by using Altium Designer Software
- Improvements on circuit simulation programs, i.e. LTSpice, PSIM
- Participated in meetings about space technologies with senior researchers

TUBITAK DEFENSE INDUSTRIES RESEARCH AND DEVELOPMENT INSTITUTE **Ankara, TURKEY**
Internship *June 2018 – July 2018*

- R&D on Power Electronics and Control Theory
- Design of a Switch Mode Power Supply (SMPS) converter, Buck Converter
- Developed new skills on Motor Driver Circuits and Controller Design with Matlab-Simulink
- Improvements on circuit simulation programs, i.e. LTSpice
- Get a knowledge on defense industry and missile production

EDUCATION

Middle East Technical University (METU) **Ankara, TURKEY**
Electrical & Electronics Engineering, BSc *June 2019(Expected)*
GPA: 2.97/4.00

Adana Science High School **Adana, TURKEY**
Mathematics and Science *June 2014*
GPA: 92.57/100

PROJECTS

Frequency Modulated Continuous Wave (FMCW) Based Distance Measuring System
(Project of Analog Electronics Course)

- Design of a Radar topology
- Principles of Voltage Controlled Oscillators, Power Amplifiers
- Microphone driver circuits and filter designs
- Mixer circuits with MOSFETs

Note Controlled Vehicle
(Project of Circuit Theory Course)

- Design of various filters and amplifiers
- Half-wave and Full-wave rectifier topologies
- Improve in Matlab skills, i.e. Bode Plots
- Developed skills on Agilent VEE graphical dataflow programming language

Analog Air Conditioner
(Project of Circuit Theory Course)

- Design of analog circuits with opamps
- Learned PWM and Duty Cycle concepts
- Worked on heat sensors and amplifiers

SOFTWARE

Circuit Simulation Programs

- LTSpice *Used in electronics courses and design projects*
- PSIM *Get experienced during internship period*

PCB Drawing

- Altium Designer *Had chance to learn and use in power electronic PCB design process during internship period*

Programming

- Matlab *Used in calculations and plotting in engineering problems. Especially in Circuits, Signals and Systems and Electromechanical Energy Conversion courses*
- C/C++ *Had a knowledge on fundamentals of programming*

Computer Aided Design

- KeyCreator *Learned fundamentals of CAD programs and worked on many drawings*
- AutoCad *Can be learned in case of need as it is similar to known CAD program above*

Others

- MS Office
- Agilent VEE *Used in control of different circuit test equipments in projects*

LANGUAGES

English
Full professional proficiency

Turkish
Native proficiency

ACTIVITIES & HOBBIES

Sport Activities	*Team leader in high school basketball team*
Musical Instruments	*Amateur in flute and baglama (local instrument)*
Fine Arts	*Classical music, movie and video production*
Travelling	*Backpacker*

REFERENCES

Available upon request.

Note: Have no restrictions to travel

Recep Günay

Merkez Mah. Köroğlu Cad. No:24/42 Pursaklar/ANKARA
• 05534128404 • gunay.recep@metu.edu.tr

Personal statement

A fourth year undergraduate electrical electronics engineering student aiming to work on semiconductor technologies and IC design to add on to the knowledge and skills gained in the Bachelor's Degree in a respected work environment and gain experience by participating in cutting edge projects.

My eventual career goal is to assume responsibility for the analysis and design of analog and digital circuits in ongoing projects and actively contribute to the overall success of any business I work for.

Education

B.Sc **Middle East Technical University, Electrical and Electronics Engineering**
(2014 –) - CGPA: 3.67

Work Experience

Intern, Darkblue Telecommunications A.Ş. , METU Technopolis *(3rd – 28th July 2017)*

- Designed and printed several PCBs which include microprocessors.
- Programmed the said circuits using C language in PIC C Compiler.
- Finished several projects on communication of microprocessors.

Intern Engineer, TAI *(5th March – 29th June 2018)*

- Designed and implemented a servo motor driver for a test project.
- Prepared a feasibility report on a cargo drone project.

Intern, Mikro-Tasarım Elektronik Sanayi A.Ş. , METU Technopolis *(2nd – 27th July 2018)*

- Designed UART and I2C protocol modules using Verilog.
- Designed modules to test different techniques of histogram equalization to infrared images using Verilog such as Linear HE, Double Plateaus and CLAHE and compared the results.

Technical Skills

Programming : C, Python, MATLAB: Took a course in both C and Python. Used C to program several PIC type microcontrollers and used Python for image processing using OpenCV in a competition.
Tools : Xilinx ISE, Quartus Altera : Used both to design modules and simulate them using testbench.
HDL : Verilog : Learned Verilog in detail in multiple courses and used it to design several projects both in courses and in summer practice.
Circuit Design and Simulation : LtSpice, Proteus, Cadence : Used LtSpice in several projects at school and used Proteus to draw schematics and PCB design of circuits with PIC microcontrollers and simulate them by uploading hex file.