T.C.

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Contents

1 ANALOG REALIZATION OF MEMRISTIVE ELEMENTS

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2017502004

Advisor: Assoc. Prof. Dr. Selçuk KILINÇ

ABSTRACT

Memristor, whose name means ”memory resistor”, is a type of resistor that changes its resistance value depending on the current flowing through it. This resistance, denoted by the letter M, in other words memristance, explains the relationship between charge and flux, and completes the quaternary formula together with the passive elements of resistance, capacitance and inductance.

The first idea of the memristor was put forward in 1971 by Leon Chua, an electrical engineer at the University of California, with an article titled ”Missing Circuit Element: Memristor”. The memristor was developed at HP laboratories in 2008, almost 40 years later.

TiO 2 , which is obtained from titanium semiconductor and oxygen atoms, is generally used in the internal structure of the memristor. Pure TiO 2 and doped TiO 2 plates change volume due to the current passing over them. This occurs by the displacement of oxygen atoms. As a result, the resistance value decreases. As a result of reverse current flow, the volume of pure TiO 2 increases and the resistance value increases.

The memristor can be used in various areas. Field programmable gate arrays (FPGA) are used more and more in the aerospace and defense industry. It is used for self-destruct to prevent the design from being exposed, especially in military applications. The memristor is also used in biological and neuromorphic applications.

The realization of this important element using analog elements is the main subject of this thesis.

2 VERIFICATION OF ALGAE GROWTH MODEL WITH GRASSHOPPER SOFTWARE FOR A PHOTOBIOREACTOR SYSTEM

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Advisor: Asist.Prof.Dr.Gülter Gülden KÖKTÜRK

ABSTRACT

Although microalgae production has been the focus of attention in the past years, there are many difficulties in its use in industry. Growth, one of the most important characteristics of microalgae cultivation, constitutes an important issue for modelling [1].

As part of the Tübitak project, an algae growth model was created for a photobioreactor system. This growth model was simulated with the MATLAB program. In this thesis, there are studies on converting the mathematical model in MATLAB to the python programming language. Then, these converted codes are intended to be integrated into the Python-based Grasshopper program.

First, the model created in MATLAB was simulated. The functions and loops used were examined. Numpy, Matplotlib, and Math modules of Python programming language were used to convert it to Python programming language. After the codes in MATLAB were transferred to the Python programming language, they were simulated and the results were compared. After the results were verified, the converted codes were assigned to the Grasshopper program using the GhPython Remote plugin and the GhPython component.

3 ANOMALY DETECTION FOR PREDICTIVE MAINTENANCE

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2017502005

Advisor: Assist. Prof. Dr. Hatice Doğan

ABSTRACT

Anomaly detection in the digital environment has become the dominant method for predictive maintenance and predictive maintenance has become a necessity rather than an option for all the areas working through machines. Vibration data analysis is one of the ways for condition monitoring. However, anomaly detection in vibration data is hard to diagnose because of the nonlinear and complex characteristics of the vibration data. This study contains two different approaches for fault detection which are the Kullback-Leibler importance estimation procedure (KLIEP) based outlier detection and Variational Autoencoder (VAE) based anomaly detection. The advantage of the KLIEP based anomaly detection is that the time-series data can be used directly without the need for any preprocessing dimensionally, also this method is easy to operate. The reason behind the construction of a VAE structure is an effort to find an alternative neural network method for CWRU dataset anomaly detection. Since the VAE is frequently used for audio processing and audio is actually a vibration data, the thought is about to usefulness of the VAE for this purpose. The dataset that is taken from the Case Western Reserve University (CWRU) Bearing Data Center is used to test the validity of the mentioned methods. In application, different vibration signals are used to classify them as normal or faulty by the fault levels.

4 DIRECTIONAL COUPLER DESIGN

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Advisor: Assist. Prof. Dr. Özgür TAMER

ABSTRACT

Radio Frequency signals are actively used in many IOT applications, 5G technology, radars and many different systems. In all these applications, it is necessary to monitor and control the RF power without loss on the line. In addition, in some applications, it is desired to have a high output power of the transmitter. In this case, the devices may be damaged by high power, so designers need to monitor the signal without connecting devices directly to the transmitter. Another problem encountered is the determination of the characteristics of the radio freguency signal load in the wide frequency range, especially in antenna applications. While performing this operation, it is necessary to monitor the change of load and measure the standing wave ratio without damaging the amplifiers. The most common use of directional couplers is to solve specified problems.

The operating characteristics of directional couplers can be determined according to all types and needs. There are also many different designs available. In this study, directional coupler design designed with transformer, resistor and capacitors is mentioned. The design was first implemented theoretically, then the simulation and finally the practical implementation. The theoretical, simulation and experimental results of this design are shared. MATLAB RF Toolbox was used as the simulation program. The frequency range of the designed directional coupler is between 1.5 Ghz-3 Ghz. The coupling value is 10 dB. While creating the design, it is aimed to apply the most efficient and cheapest method.

5 WALKING CONTROL OF FOUR LEGGED ROBOT FOR COMPLEX SURFACES

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Advisor: Assoc.Prof.Dr. Ahmet OZKURT

ABSTRACT

Today, robots are used for many purposes. Robots are designed according to the purpose used. Undoubtedly, if robots are expected to move on the surface, it is now expected from almost every robot to find their own way, overcome obstacles and even do all of these by learning themselves. The thing that makes everything a challenge in these developed robots is that the robots can move on complex surfaces and even make mistakes and learn to walk in a near-perfect manner.

In this study, a 4-legged spider robot was designed by taking the spider leg anatomy as an example, and it was aimed to progress on complex surfaces. ESP32 was chosen as the microcontroller. The purpose of choosing this card is to wirelessly control the spider robot designed in the following stages. Thanks to ESP32, there will be no need for independent modules such as LCD, Bluetooth and Wi-Fi.

This project is progressing in two different areas. The robot's movements are exemplified by the Webots program. All these samples are taken by considering the center of gravity and general physical structure of the robot. All these steps are studied and developed by another student and the data is obtained.

6 COVID-19 DETECTION FROM X-RAY IMAGES USING SEMI-SUPERVISED LEARNING

Furkan ALKAYA

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Advisor: Assist. Prof. Hatice DOĞAN

ABSTRACT

he Covid-19 disease began to spread rapidly from the moment it emerged and continues to have a devastating impact on the health and well-being of the world's population. Different vaccines have been developed to combat the disease until now such as Pfizer/BionTech, Sinopharm, Sinovac, COVAXIN, AstraZeneca/Oxford vaccine, Johnson and Johnson. However, since the effect of vaccines on the new Covid-19 variants that will emerge is not known, early detection methods are gaining importance. RT-PCR test is used for the diagnosis of Covid-19, but the test takes a long time, and it has high false negative rate. Therefore, different early detection methods are needed. Covid-19 detection with deep learning methods was put forward after it was found that the Covid-19 disease caused abnormalities in the people'slungs. In the literature, different CNN structures based on supervised learning method have been used in the detection of Covid-19 from X-Ray images and different performances have been reported. Although there are studies with high accuracy rates, they are practically useless since they need a large amount of correctly labelled data. It is not always possible to obtain large data sets due to patient confidentiality. Because diseases such as SARS and MERS cause similar damage, radiologists may mislabel. In contrast, semi-supervised algorithms are able to learn from partially labelled dataset and this ability reduces the need for large training sets. In this study we are going to use Autoencoders for the detection of Covid-19 from X-Ray images. Autoencoders are the semi-supervised methods that can learn the new representation of the normal data as a first step then detect anomalies based on the reconstruction error derived from the learned representation. The data set (COVID-19 RADIOGRAPHY DATABASE) awarded by the Kaggle community will be used in this study. Also, different pre-processing methods will be applied to the data set to increase the success rate.

7 EARTHQUAKE SENSOR NODE IMPLEMENTATION

Bilgi ALP

2016502006

Advisor: Assist. Prof. Dr. Özgür TAMER

ABSTRACT

Earthquake is one of the disasters that mankind has been trying to prevent since prehistoric times, and even if it cannot prevent it, to take precautions. Since the 1990s, systems have been tried to be produced in order to give early warning in case of earthquakes. Earthquake early warning systems were developed as a result of the efforts focused on detecting and giving warning as soon as possible in the event of an earthquake. Thanks to earthquake early warning systems, measures were taken to prevent this disaster, which could lead to loss of property and life.

Earthquake early warning systems give warnings by trying to detect the P and S waves of the earthquake. When earthquake early warning systems detect the earthquake waves that occur at the source of the earthquake, they automatically send a warning to the relevant institutions and help the facilities that may be affected by the earthquake such as factories, nuclear reactors and hospitals to take precautions. In addition, it is beneficial to take measures that can save many lives in public transportation systems such as metro lines and trams.

In this project, I will examine what an earthquake early warning system is, how it works, and how we electrical-electronic engineers create the electronic side of these systems. The creation of an information network consisting of earthquake detection sensors and the conversion of analog data from earthquake sensors into digital signals that can be interpreted by geology/geophysics engineers will form the backbone of this project.

8 SEQUENCE BASED PREDICTION OF PROTEIN-PROTEIN INTERACTION USING DEEP LEARNING ARCHITECTURE

Yücel ASAN

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Advisor: Assoc. Prof. Dr. Güleser KALAYCI DEMİR

ABSTRACT

Bu tezde, derin öğrenme yöntemleri kullanılarak Protein-Protein Etkileşimi (PPI) incelenmiştir. PPI, sinyal iletimi, bağışıklık tepkisi ve hücresel organizasyon gibi hücrelerdeki birçok aktivitede çok önemli bir role sahiptir. Hücre dinamiğindeki hayati önemi nedeniyle, önce PPI verilerini üretmek için birçok biyolojik deney yapılmış ve daha sonra PPI'ı daha verimli bir şekilde tahmin etmek için birçok hesaplamalı tahmin yöntemi önerilmiştir. Bu tahmin yöntemlerinde, yüksek doğrulukta sonuçlar elde etmek için özellikle derin öğrenme mimarileri en umut vadeden yaklaşım olarak görülmektedir.

Bu çalışmada, öncelikle protein-protein etkileşiminin ne olduğu, neden önemli olduğu ve etkileşimin sonuçlarının bize neler sağladığı gibi temel konular ele alınmıştır. Sonrasında çalışmanın odağı dizi tabanlı PPI tahminine geçmiştir. Makine öğrenmesi algoritmaları kullanılarak PPI tahmini ile ilgili, ilk çalışmalardan güncel çalışmalara kadar detaylı bir literatür taraması yapılmıştır. Çalışmalarda önerilen yöntemlerin avantajları veya dezavantajları göz önünde bulundurularak güçlü derin öğrenme algoritmaları belirlenmiştir. Siyam Ağları ve Kontrastlı Öğrenme Ağları gibi belirlenen algoritmalar detaylı olarak incelenmiştir. Projenin uygulanacağı programlama ortamı araştırılmış ve öğrenme süreci başlamıştır. Ayrıca derin öğrenme algoritmasının eğitimi için gerekli veri setleri araştırılmış ve sistemin performansını test etmek için 5 farklı açık kaynaklı verisetinin kullanılmasına karar verilmiştir.

9 ANALYZING EFFECTS OF DIFFERENT MUSIC TYPES ON MOOD BY HRV & PASSIVE BCI

Burak ATAYOĞLU

2017502014

Advisor: Prof. Dr. Mehmet KUNTALP

ABSTRACT

Undoubtedly, music is a indispensable part of our lives. We live together with music at every moment of our life, whether we are doing business, on the going any place, starting or ending the day, in ceremonies (marriage, death, birth, etc.). Therefore, what makes music such indispensable for human beings? Ancient Greek philosopher Socrates explains this question with a well-known phrase, ”Music is the food for the soul.”. Through this phrase, it can be revealed that music appeals to the soul, that is, to the cognitive processes of the person, and emotions (or mode). From this point of view, this study is about determining the mode by analyzing the effects of brain and heart signals arising from physiological processes in the human body with the presence of music on cognitive and behavioral processes by two different methods (passive brain computer and heart rate variability). The feature that will make this study different from the equivalent studies in the literature is the use of music genres that have not been used in previous studies and the diversity of social status in the people to be selected for the experiment (for instance, the inclusion of music science student and engineering student in the same sample).

10 TOOL MEASUREMENT AND CONTROL IN CNC MACHINES

Resul ATICI

2015502013

Advisor: Assoc. Prof. Dr. Mustafa Alper SELVER

ABSTRACT

The aim of this project is to provide high production quality and reduce time loss by automatically performing some of the manual controls and measurements on the production lines. Normally, these operations are carried out under the control of the operator. However, many operator errors occur in high working tempo. In order to prevent such errors and work accidents, minimizing the human factor in production and making these controls at high speed is a very important situation in terms of human health, production quality and speed.

In this project, especially the tool measurement and the determination of tool wear will be studied. With the help of a camera that will be fixed to a point outside the processing area of the CNC machine to be measured, tool measurement and condition will be checked before each new operation. Thus, the human factor in production will be reduced and high quality, safe and fast production will be ensured.

In this project, thanks to the models trained using various artificial intelligence algorithms, all problems such as wear and breakage in CNC tools will be determined, the maximum expected quality in production will be ensured, and the efficiency in production will be increased by increasing the speed of mass production lines. In addition, the project can be converted to be used in any machine in the CNC machinery sector and can be used in different types of machines and tools.

11 EVALUATION OF HUMAN BALANCE USING CENTER OF PRESSURE

Gamze AVCI

2017502015

Advisor: Assoc. Prof. Dr Ahmet ÖZKURT

ABSTRACT

People want to continue their lives with a good quality of life throughout their lives. One of the most important problems that negatively affect this quality of life is the balance problem. Especially people over a certain age and athletes have the most complaints about balance. In this project, it is aimed to design a low cost mechanical system that can diagnose people's balance problem and to explain the analysis method obtained.

The mechanical system consists of a load cell that can detect the weight placed on it, a load cell amplifier that can increase the voltages obtained from the load cell output as much as we can use, and a microprocessor part that can transfer this information to the computer environment.

The obtained pressure center signals will be transferred to the computer or phone using the WiFi module of the microprocessor, and these signal data will be plotted using MATLAB. The obtained MATLAB figure will be evaluated by the experts of the subject according to the shape formed after.

12 DETECTION OF COVID 19 WITH MACHINE LEARNING METHODS

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2015502016

Advisor: Asst. Prof. Dr. Reyat YILMAZ

ABSTRACT

With the emergence of Covid 19 in the city of Wuhan, China, the all of the world has entered into a relentless struggle with this disease. The Covid 19, which causes severe damage to the body, also causes death. Thousands of people die daily. In addition, countries are adversely affected economically and sociopolitically. When this is the case, the disease that is a very high contagiousness should be detected in a short time and the individual should be isolated and treatment should be started immediately.

Today, antigen and antibody tests are used for the detection of Covid 19. The most commonly used antigen test is the PCR test, which is done by swab from the nose and throat. The most commonly used antibody test is the detection of disease by detecting ImG and ImM antibodies formed as a result of the immunity of the disease in the body. While PCR Tests result in an average of 6-7 hours, this sometimes takes 1 day. The antibody test gives results within 7-14 days. The possibility of taking a long time for disease detection pushes us to seek new methods.

Our main goal in this project is to detect the disease in a short time through machine learning methods by using the blood test. While doing this project, we will work on the dataset [2] that is loaded from the Zenado platform. On the data set, there are 15 types of blood cell values from 279 patients and sick and healthy individuals were specified with 0-1 values. However, while defining these values, it was observed that there were missing data on the dataset. These missing data reduce the accuracy of classifications.

Our aim is to first complete this data by using the most appropriate missing data completion method and then to design a successful classifier model by applying the classification method that can maximize the accuracy rate with the completed data.

In this direction, the missing data were completed in the data set with imputation using mean / median values, which can give faster results, and the classifier was designed with the random forest algorithm, which has a strong algorithm and reaches high accuracy values.

13 LEARNING LOCOMOTION FOR LEGGED ROBOTS BASED ON REINFORCEMENT LEARNING

Enes AYDURAN

2016502016

Advisor: Assoc. Prof. Dr. Guleser Kalaycı Demir

ABSTRACT

We need algorithms and mathematical models to be able to move robots. With these mathematical models, we can figure out where robotic mechanisms will move and build structures that will make our lives easier.

When constructing these mathematical models, we may not be able to predict the unknown difficulties in the real world. We need to create dynamic algorithms for these variable environments. Even if we can construct dynamic systems, it is very difficult to calculate variable world environments. For example, It is very difficult to create an algorithm for a humanoid robot in a dilapidated environment and simulate all joints to walk. We can use reinforcement learning algorithms to make these robotic movements. There are agent and environment building blocks under reinforcement learning. Reinforcement learning is split into two main branches which are Model-Free Reinforcement Learning and Model-Based Reinforcement Learning. In this project, we will try to teach the legged robot to move in a simulation environment with actor-critic methods, which are subcategories of Model-Free Reinforcement Learning. In this project, libraries such as Tensorflow, Numpy, PyTorch, Gym will be used together with the Python programming language.

14 CLASSIFICATION OF COVID-19 ELECTROCARDIOGRAMS BY USING HIERARCHICAL CLASSIFICATION

Oğulcan Benli

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Advisor: Dr. Hatice Doğan

ABSTRACT

Reliable and rapid identification of COVID-19 has become crucial to prevent the rapid spread of the disease, ease quarantine restrictions, and reduce pressure on public health infrastructures such as hospitals and health centers. For this reason, a great deal of work has been done recently on the diagnosis of COVID-19. The fact that PCR tests, which is one of the most reliable methods known, can only be performed by experienced personnel in certain centers and the test results take a long time, such as 4-6 hours, have led researchers to find different methods for diagnosing the disease. One of these methods is disease diagnosis with artificial intelligence, which is widely used for traditional diseases.

At the time of the COVID-19 epidemic, healthcare professionals did not have the experience to identify and diagnose the effects of this new disease. This experience was only created by observing the effects of the disease on humans in the process, but artificial intelligence can gain much more experience in a short time than a human can. When the studies are examined, it has been observed that COVID-19 can be diagnosed in many different ways with artificial intelligence. For example, there are artificial intelligence applications in the literature that diagnose this disease by using medical data such as lung X-Ray, CT scan, hemogram (blood cell test). Findings in the studies that COVID-19 causes abnormalities in heart rhythm have made electrocardiography a logical method that can be used in the diagnosis of this disease. In this project, it was preferred to use the diagnostic method with ECG (electrocardiography). The most important factor in choosing this method is that it is more accessible and cheaper compared to other methods, since ECG images can be obtained by portable devices and even because it is an advanced and widespread technology that can be even used in smart watches. There are currently different artificial intelligence applications that use ECG in the diagnosis of COVID-19. The

aim of this project is to increase the accuracy of the test diagnosis by classifying ECG images with a hierarchical classification method.

As a result, the success of this method will reduce the burden on the health personnel to some extent and contribute to the prevention of the spread of the disease by making the diagnosis of the disease widely and quickly. All these will indirectly and directly contribute to public health and the economy

15 DESIGNING A PRECISE POWERMETER TO MEASURE THE POWER CONSUMPTION

Halil İbrahim BUHUR

2016502024

Advisor: Assoc.Prof.Dr. Özge CİHANBEĞENDİ

ABSTRACT

In today's living conditions, it is undeniable that energy consumption in homes has an increasing effect on world energy consumption. Appliances such as water heaters, lighting, washing machines, dishwashers and refrigerators continue to be a burden on the electricity bill. Considering both the electricity consumption in household areas and general electricity consumption, all these consumptions should be made a little more controlled in terms of the ecological environment and the world's energy resources, intervention and improvement activities should be carried out when necessary, and the people in the surrounding should be informed about these issues.

Of course, for improvements to be made on issues such as reducing energy consumption or increasing energy quality, first of all, electrical power must be accurate and measurable. The aim of this project is to design a prototype that can make more precise measurements compared to the powermeters currently on the market, more cost-effective, and open to development and integration. In this final report, the necessary literature was searched for the design of the system, the method was determined, the materials in the system were researched, then the analyzes were made with the determined materials and the powermeter was designed.

In this report, the final report for this project has been created and the measurements, power consumption tests, studies and measurements necessary for the operation of this precision power meter are included.

16 DESIGN AND IMPLEMENTATION OF MULTIROBOT BASED SMART AGRICULTURE SYSTEM

Ceren BULAN

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Advisor: Dr. Neslihan AVCU

ABSTRACT

The concept of multi-robot systems is based on the fact that more than one device stays in communication and performs a certain task by providing the necessary coordination, and it is formed by taking the behavior patterns of natural beings moving in the form of a herd as an example. Particularly, it is an advanced technology that is important in terms of pioneering studies in areas where people cannot enter and performing multiple tasks in a shorter time with the help of agents. Accordingly, the use of multi-robot systems for the innovative solutions of various problems in different areas, especially in daily life, is becoming more common day by day. In this Project, multi-robot systems will be used in smart agriculture applications to increase water efficiency.

In order to cope with the drought, which has become one of the biggest problems of our age, it is of great importance to minimize the amount of water used unnecessarily in agricultural areas. In accordance with this purpose, the Project has been developed to ensure the applicability of multi-robot systems to the agricultural field of tasks such as field mapping, data collection and obstacle detection. The focus of the project is to develop a fuzzy logicbased smart agriculture application with a multi-robot system that performs customized mapping and collects moisture data in order to combat drought by reducing excess water consumption in agriculture. By using the collected moisture data, it is aimed to save water by irrigating only the areas suitable for planting or automatically irrigating the areas below the moisture requirement of the cultivated crop. In the project, a smart agriculture application system designed in which information about agricultural land can be presented to the user through the mobile phone application to be developed with a multi-robot system consisting of at least two robots. With the help of the sensors on the robots, physical mapping of the agricultural land, humidity mapping according to the moisture content of the soil, and mapping of the irrigated areas made. Fuzzy logic based algorithms developed in communication and control algorithms.

17 MODEL-BASED TESTBENCH CODE GENERATOR FOR EMBEDDED SYSTEM WITH NODAL ANALYSIS

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2015502085

Advisor: Asst.Prof.Dr. Özgür Tamer

ABSTRACT

Embedded systems have a massive global impact. Software integrated in automotive, transportation, medical equipment, communication, energy, and a variety of other systems is rapidly triggering innovation. Few test techniques, approaches, tools, and frameworks have been studied by practitioners and researchers in the last several decades to test an embedded system in a cost-effective way.

Thanks to the model-based test method, faults are found by comparing the behavior when the system is under test with the expected behavior when the system is under test.

This project generates code for another device that acts as a testbench to test embedded systems on the target device. The generated testbench software imitates the system to which the controller to be tested will be connected, applies all possible inputs to the controller , and collects the outputs and compares them with the expected outputs. This method can be used if there is a cause-and-effect relationship between behaviors.

The purpose of this project is to take advantage of embedded system tests that often repeat each other and have certain patterns. These repeated patterns are reused. Instead of a manual system, an automatic system was used for the reuse of the patters. This automation reduces the time and effort spent on testing.

18 PREDICTION OF THE CLINICAL SIGNIFICANCE OF PROSTATE LESIONS FOUND IN MRI DATA

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2500502013

Advisor: Assoc. Prof. Dr. Alper SELVER

ABSTRACT

Prostate cancer is one of the most common cancer types. Prostate cancer occurs when the bladder wall's thickness increased and due to increased size, urethra gets smaller due to that urine thrown out forcefully and causes pain in the body. There are some factors which cause prostate cancer like age, race, family history and weight (being obese). Prostate cancer first found in 1853 and it became a significant disease for the men who are older than 50. The prostate cancer is dangerous because it can primarily causes urethral pain and it can even spreads around body and causes other diseases, pain or even broken bones. The number of the cases of the prostate cancer is also important factor for importance because the number of case keeps increasing with the number of the human population. Due to danger level and the number of the cases prostate cancer is one of the most of important cancer types.

In this project, to decrease the burden on the medical staff and to diagnose the prostate cancer; Mri images which are belong to different patients have been processed in the computer. To create models, it is necessary to process datasets because there are a lot of kind of factors which affects the result of the model. To decrease these factors, data sets first pass through window level window width algorithm. After window level window width; comes in order unsharp filtering, contrast stretching, equalizing image quantity, limiting the size of the datapool and other a few more algorithms which helps in process come in order. After preprocessing application is done, datasets are used as input for model which has one input layer, one convolutional layer, three hidden layer and one output layer. After models created, these models can be used to diagnose prostate cancer, and during the experimentation models have reached the accuracy between %60 to %70.

19 HARDWARE DESIGN AND IMPLEMENTATION OF 3-kw 144-vdc THREE-PHASE TRACTION INVERTER FOR LIGHT ELECTRIC VEHICLES

Ö.Samet ÇAKIROĞLU

2016502091

Advisor: Dr. Erhan DEMİROK

ABSTRACT

Motor Drive is a system that controls an electric motor. While designing the motor driver, a method suitable for the motor type should be determined. Brushless motors and brushless motor drives are preferred in many areas with their high efficiency, long life, quieter operation, high speed and high torque.

In this study, mosfet, mosfet power losses and switching techniques were investigated for the motor driver to be used in a solar powered vehicle.

In this design, isolated gate drivers, isolated converters and TO-247-4L SiC mosfets are used. In the gate driver part, the logic part and the gate driver output are isolated. With isolated converters, the mosfet gate is driven as bipolar. Thanks to the bipolar supply, a noise that will occur at the gate is prevented from activating the mosfet gate. Optimal rise time and fall time were selected while selecting the gate resistor. The bulk capacitors used are paralleled too many times considering the ESR value. Thus, the ESR value is reduced.

In the layout design, the bulk capacitors are kept close to the battery inlet and mosfets. In addition, the gate drivers are positioned as close as possible to the mosfets, so the layout design rules are applied.

In the layout design, trace inductances consisting of path lengths were calculated. In line with the calculated trace inductances, the assumptions of the voltage spikes that will arise from the roads have been made.

In line with the prepared block diagram, schematic and layout drawings were made using the Altium Designer program.

20 DESIGN OF A RESONANT DC-DC FULL BRIDGE CONVERTER WITH LLC COMPENSATION

Metin Polat CAN

2016502025

Advisor: Assist. Prof. Dr. Tolga SÜRGEVİL

ABSTRACT

In this thesis, resonant DC-DC full bridge converter with LLC compensation is designed consisting full bridge inverter, resonant tank, with high frequency transformer and rectifier circuits. Technical information about resonance topologies is given. Advantages and disadvantages are compared. Detailed information on LLCstructure is also provided. The structure, working principle, mathematical expressions and analysis of the studied circuit are examined. Since it has a complex structure, FHA technique is used for modeling and analysis. The circuit itself and its simplified model, the FHA model, are simulated and compared separately. It is the aim of this thesis that the simulation results of the simulated main and simplified circuits are compatible with each other.

21 RECEIVER DESIGN TECHNIQUES IN DIGITAL COMMUNICATION UNDER NON-GAUSSIAN NOISE CHANNELS

Oktay Çırak

2016502096

Advisor: Assoc. Prof. Dr. Mehmet Emre Çek

ABSTRACT

Gaussian distribution can be modelled as noise signal, which using in literature. If analyzing channel is affected by other electromagnetic signals, distribution can be nonGaussian distributed signal, because of those using receivers can be worked with low bit error rate. Non-Gaussian distribution can be analyzed with alpha-stable distribution, which have different signal distribution parameters and with using this distribution model, receivers can analyze non-Gaussian noises. In alpha-stable distribution, parameter changes can be used as showing noise distribution and channel distribution. This thesis proposes receiver design to detect binary signals in presence of non-Gaussian noise exhibiting asymmetric behavior. The channel noise is modelled by skewed and symmetric α -stable distribution. Since the additive noise in the channel is conventionally assumed to be symmetric, the degradation effect of skewness on the error performance of binary signal detection is given analytically. Two different proposes are used to solve skewed, high bit error rate, problem in this thesis. One of them is adding intentional noise to channel noise, other one is directly changing the receiver formula with not using the channel parameters. An intentional noise having an opposite skewness compared with channel noise is added at the receiver in order the resultant noise to exhibit symmetric behavior which results in stochastic resonance phenomenon. The sub-optimal detectors such as Cauchy, soft limiter and sign correlator are utilized to determine the transmitted binary symbol.

22 A CONTROLLER FOR PHOTOBIOREACTOR

Nisanur COŞKUN

2016502027

Advisor: Assist. Prof. Gülter Gülden Köktürk

ABSTRACT

The aim of this project is to control the conditions of the microalgae that is growing in the photobioreactor environment and to send this data to the user to ensure that the ambient conditions remain in the optimum conditions for microalgae. Microalgae are creatures that use chlorophyll, light and inorganic materials in their structure and convert inorganic materials to organics, that is, photosynthesize.

Microalgae can be grown in indoor or outdoor systems. Indoor systems are called as "Photobioreactors". Chlorella Vulgaris, the microalgae species used in this project, is grown in a photobioreactor.

Certain conditions must be met for microalgae to survive and multiply. In areas where microalgae will be grown, temperature, light and pH should be used at optimum values and there should be no major changes over time. That's why a controller was developed to keep the ambient conditions optimal.

The designed controller sends the temperature, pH, humidity and light data in the photobioreactor to the user via Bluetooth. The data received with the sensor are transferred to the microcontroller from the analog to digital converter pins of the microcontroller and processed. The resulting data is sent to the user via Bluetooth. The report covers this circuit design, PCB design, programming, post-production testing and cost.

23 SUBTHRESHOLD SIGNAL DETECTION USING STOCHASTIC RESONANCE

Efe ÇUKUR

2016502097

Advisor: Assoc. Prof. Dr. Mehmet Emre ÇEK

ABSTRACT

In this thesis, the Schmitt Trigger based receiver is described to detect the subthreshold signal in a digital communication system. The receiver is based on adding intentional noise to the received signal within certain duration. If the intentional noise is tuned at an intermediate level, the Schmitt Trigger is stimulated and elapsed time at a constant state is also correlated with the amplitude of the transmitted antipodal baseband signal depending on the message bit. If the intensity of the noise is chosen to be less than the determined value, the Schmitt Trigger cannot be sufficiently stimulated and if intentional noise intensity is greater than intermediate value, then the output voltage varies over the range of both negative and positive state of Schmitt Trigger. The regular behaviour with respect to noise variance yields stochastic resonance phenomenon which constitutes the concentration of the thesis.

From this point of view, the main objective is to analyze the effect of the distribution of the intentional noise which are modeled by Gaussian and Laplacian as unbounded noises and uniform, triangular distributions are utilized to model bounded noise. It is shown that, when the noise distribution gets far away from the origin, the bit error rate (BER) performance of the Schmitt trigger-based receiver is improved. More generally, utilizing unbounded noise yields better detection performance.

24 AUTUNOMOUS WALKING PATTERN GENERATION PLATFORM FOR FOUR LEGGED ROBOT

Ufuk ÇANDIR

2017502088

Advisor: Assoc.Prof.Dr. Ahmet OZKURT

ABSTRACT

It is one of the inevitable consequences of technology that humans develop robots to solve problems. The mobility of these robots, which can be designed in many different ways, needs to be improved. In this project, the planning of the walking strategy of a 4-legged robot in the Webots simulation environment has been studied. Prior to this, a 4-legged robot was installed in the Webots simulation environment based on a model designed in previous studies and necessary simulations settings were made according to test observations. At the current state of the project, the robot can walk properly.

In the later stages of the project, it is aimed to develop the patterns that the robot will use to perform different actions such as walking and turning, by using machine learning methods. At this point, robot has been trained with machine learning methods to keep its body fixed at a certain height.

25 DEVELOPMENT OF AN EARLY WARNING SYSTEM FOR DISTRACTED DRIVERS USING DEEP LEARNING ALGORITHMS

Faruk Umut Çelik

2017502089

Advisor: Prof. Dr. Olcay AKAY

ABSTRACT

Driving a car is a complex action that requires focusing on the road and avoiding distractions. Car accidents cause 1.35 million deaths globally every year and many accidents are caused by dangerous actions of drivers. This makes it necessary to take some precautions in order to prevent human losses and injuries.

This project was designed to minimize driver-related traffic accidents. A system that provides accurate, reliable, and instant warnings is aimed to prohibit, or at least reduce, loss of life and property. It can be utilized as a warning system against dangerous movements of drivers. Those movements are detected based on drivers' facial expressions, head and body movements. Texting or talking on the phone can be given as examples of risky behaviors that increase probability of accidents and need to be detected.

In this project, Convolutional Neural Network (CNN) algorithms which can be included within the broader area of deep learning methods were utilized for distracted driver detection and classification. CNN algorithms are especially popular in image recognition tasks. They are applied to images to extract desired visual features and perform various classification tasks. The data set, StateFarm, used in the project included 19734 training, 2690 validation and 79726 testing images.

Various CNN architectures have been developed until today. It has been desirable to obtain a deeper network architecture by changing the number of layers and employed parameters. VGG16, AlexNet, and Vanilla are three of those architectures which were used in this project. During the analyses, performance of these three deep learning architectures on the selected distracted driving dataset were examined in detail by changing their parameters. Thus, the parameter values for which these architectures give the best results were determined.

26 RECEIVER DESIGN FOR RADIO REMOTE CONTROL

Sefer DEMİR

2015502026

Advisor: Assoc.Prof. Yavuz ŞENOL

ABSTRACT

Within the scope of the thesis, it is aimed to realize the remote control of an industrial crane using the UART communication protocol. The aim is to obtain a more advanced system by adding some features to the remote control devices used today.

The first of the goals to be achieved in line with the determined purpose is to increase the communication distance and reduce the energy consumption. This is aimed to be achieved by selecting the appropriate RF module and ensuring that signals are sent for each control only when the button is pressed. Another goal is to be able to intervene in the system immediately in dangerous situations. This intervention opportunity is provided by the 'emergency stop' button added to the receiver and transmitter circuits. The final goal is to provide a selective mechanism to be added to the transmitter circuit, in principle, to control two different cranes simultaneously or separately.

It processes the external warnings in the transmitter circuit with the PIC microprocessor and transmits the data obtained to the receiver with the UART protocol. The receiver, on the other hand, processes the information received via UART with the microprocessor and operates the relevant relay.

27 COVERT DIGITAL COMMUNICATION USING BOUNDED NOISE

Numan Şükrü DENİZ

2016502028

Advisor: Assoc. Prof. Dr. Mehmet Emre ÇEK

ABSTRACT

In this thesis, a random communication system based on bounded noise is introduced. The main motivation is to generate random signals having a prescribed probability density function defined in a finite interval in order to make practically implementable such a communication system since only a finite range of amplitudes are allowed to be transmitted without any information loss in practice. The truncated peak amplitudes are considered to result in the loss of statistical information related to the transmitted random signal. The covertness is provided by hiding the message information into the statistical feature which is skewness in this study. The probability density function of the information-bearing random signal is designed to have triangular distribution and parabolic distribution together with the skew-normal distribution utilized as a comparison. The receiver determines the sign of the sample skewness under the AWGN channel after truncating the received noise within a certain range determined by the upper and lower bounds of the information-bearing noise. Since the received signal is composed by summation of two random signals, the distribution of two convolved noises is derived in this study, and the bit error rate (BER) performances are also compared. It is shown that, when the order of the polynomial used to model the probability density function increases, the sample skewness also increases, and correspondingly the BER results improve. The effect of the truncation is apparent, especially for low signal-to-noise ratios, and the proposed method slightly gives better BER results compared with the case of the truncated signal.

28 OPTICAL MUSIC RECOGNITION APPLICATION FOR TURKISH MUSICAL INSTRUMENT CALLED BAGLAMA

Utku Berk DENİZ

2016502029

Advisor: Assist. Prof. Dr. Hakkı Tarkan Yalazan

ABSTRACT

Optical Music Recognition (OMR) is a method that aims at automatically recognizing and understanding the content of music scores in images and scanned music sheets. In this project, It is proposed an OMR system to recognize the music symbols endto-end. Connectionist Temporal Classification (CTC) loss function, with which the neural network can be trained in an end-to-end fashion is used for obtaining losses [1]. Supervised Learning Technique is used to train model.

29 PREDICTION OF HYPERTENSION USING MACHINE LEARNING

Süleyman Dilek

2015502120

Advisor: Asst. Prof. Dr. Hatice DOĞAN

ABSTRACT

Hypertension is an important disease that affects negatively human health. Early diagnosis could reduce the mortal effects of hypertension. However, most people do not realize the problem until the disease progress because of no symptoms. Regular monitoring of Blood Pressure (BP) is important to detect hypertension. Nowadays, after the medical examination, twenty-four-hour holter monitorization is used to detect hypertension. Holter device operates that an inflatable band cuff over the upper arm is swathed to cut off blood supply at certain intervals. This method is discrete, and it could irritate patients wearing the device throughout the day. To overcome this problem, researchers show that photoplethysmography (PPG) signal could be used to monitor blood pressure continuously and cuffless in their studies. The aim of the study is to create models using machine learning methods to diagnose hypertension non-invasively from PPG signals. The PPG signals dataset, which is open-source and supplied by Guilin University of Technology, was used for this purpose. There are PPG signals from 219 distinct people in this dataset, as well as demographic information about the people.

30 AUTOMATIC LICENCE PLATE RECOGNITION

Pelin Dilek

2017502029

Advisor: Assist. Prof. Dr. Hakkı Tarkan Yalazan

ABSTRACT

This thesis is about converting Turkish license plates to text by estimating with image processing and neural networks from the taken photo. Many literature reviews have been done on license plate detection and reading. The differences between traditional methods and artificial neural networks have been thoroughly investigated in the accompaniment of the reviewed articles, and the step-by-step methods have been chosen according to these comparisons. The program was written in python because it was decided that it was the most suitable language for modeling. At the same time, it is one of the important factors that the person who wrote the thesis has knowledge about python. has been increased. In this project, the picture of the license plates is taken as jpg as input. In this picture, not only does it contain license plate information, but also parts of the vehicle such as the mirror and hood. Here, first the edges of the plate will be determined and drawn, and the resulting part will be continued as our new input. With this new entry, the separation of characters will be done. A model will then be created for the project. The reason for creating a model will be to keep the success rate high if it makes better predictions and enters different inputs. In the modeling, algorithms will be created with layers using convolutional neural networks. After the created algorithm, the plate in the picture that comes to us will be estimated and presented to the user as text. The data used in the model will be divided into two as test and training, and these will be read as png. This algorithm is planned to be used in places such as parking lots, security units on sites. With this algorithm, it will be possible to keep the vehicle license plate pictures detected by the cameras at the entrances and exits in a sequential manner in the system.

31 REAL TIME DETECTION OF PULSE REPETITION INTERVAL IN PRESENCE OF NOISE

Eda DİNÇ

2017502032

Advisor: Assoc. Prof. Dr. Mehmet Emre ÇEK

ABSTRACT

In this thesis, real time rectangular pulse detection problem is addressed when the channel noise distribution is not known in advance. Since there is no information about the noise parameters, sub-optimal detectors such as soft limiter, sign correlator and the proposed signed power detector are utilized for real time pulse detection problem using only received noisy samples. Noting that the unknown channel noise is not necessarily to be Gaussian, symmetric α-stable (SαS) distribution is given as non-Gaussian noise model. Since one of the main objectives is to detect the existent pulse within minimum observation interval, detector performances characterized by detection and false alarm probabilities are analysed with respect to pulse length under both Gaussian and SαS noise. It is shown that not only the given sub-optimal detectors can exhibit performance close to optimal linear detector under Gaussian noise, but also, they provide superior performance under SαS distribution. When the channel has strong impulsiveness, it is observed that the sign correlator and signed power detector introduced in this thesis exhibit better detection performance compared with soft limiter detector. Consequently, these detectors can be practically implemented to determine existence of pulse within a certain observation interval when there is no prior information about channel noise which is most likely non-Gaussian. Among the other sub-optimal detectors, the proposed signed-power detector is observed to exhibit more stable detection performance under channel noise having varying impulsiveness.

32 DESIGN AND IMPLEMENTATION OF INTELLIGENT TEXT READING SYSTEM FOR VISUALLY IMPAIRED INDIVIDUALS

Mehmet Erman DURMUŞOĞLU

2017502110

Advisor: Dr. Neslihan AVCU

ABSTRACT

Visually impaired people face many challenges in their daily lives. In this project, an automatic text-to-speech system that will give an audible warning when it detects any written text around them is designed to reduce restrictions on freedom of movement and improve their quality of life. In order to facilitate the daily lives of the visually impaired, the microcontroller system guides the person by reading the written texts around it, using a deep learning-based text-speech architecture. The focal point of the project is that the visually impaired individual may encounter in daily life; bus numbers, road signs, shop-market names, book pages, etc. It is helping individuals by converting written documents such as

The first phase of the project include the optical character recognition step to detect different printed text from snapshots taken with a camera integrated into a wearable mechanism. After the printed text within the image is recognized, the microprocessor converts the text to speech to guide the user. The voice warning system transmits the text to the person via a Bluetooth headset. A Raspberry pi camera module was placed on the glasses with a light frame as an image acquisition and audio warning system in order to be preferable for use in daily life, and a bluetooth headset was used. The microcontroller and the battery are suitable for use in daily life with their small designs and sizes that can be carried in a bag or pocket.

The surrounding texts can vary widely. For example, shop signs, road signs, station names, subway-bus line names, wall posters, brochures, labels on shopping packages .In this project, the characters that can be encountered in daily life in these texts are recognized regardless of rotation, font, style and background. The necessary algorithms for the smart text system that can voice the Turkish texts are developed and microcontroller-based application is carried out. This system creates a prototype suitable for daily use so that visually impaired individuals can

continue their lives without the help of people around them. In the project, innovative features such as Turkish text vocalization and recognizing different fonts have been added to the system, unlike similar commercial products.

33 DESIGN AND IMPLEMENTATION OF TWO-LEVEL SPACE VECTOR PULSE WIDTH MODULATION (SVPWM) FOR THREEPHASE INVERTERS

ENGİN DURSUN

2016502035

Advisor: ASSISTANT PROFESSOR ERHAN DEMİROK

ABSTRACT

In this thesis, I created two level space vector pulse width modulation signal for DC-AC 3 phase inverter. The purpose of this design is to obtain as perfect and stable AC voltage signals as possible by using the DC voltage signal in a three-phase inverter that converts the DC voltage signal to AC voltage signal by using the SVPWM technique. First of all, I gave information on the space vector pulse width modulation technique. I reviewed the publications of other researchers in order to make much more reliable calculations about SVPWM. Then I realized the two level SVPWM design using simulink. I created the SVPWM modulation signal using the STM32F407VG discovery development board.

34 ANALYSIS AND SIMULATION OF FRACTIONAL ORDER CHAOTIC CIRCUITS

Ataberk DURU

2017502028

Advisor: Assoc. Prof. Dr. Selçuk Kılınç

ABSTRACT

This project will investigate chaotic circuits generated with fractional-order capacitors. Chaotic systems that are not linear systems have been the subject of much research in recent years. Initial conditions in chaotic circuits are very sensitive and it is very difficult to predict chaotic systems. There are methods such as Lorenz chaotic circuit, Chua chaotic circuit and chaotic jerk circuit in modeling chaotic circuits. In this project we will use the chaotic jerk circuit. Integrators are used to obtain chaotic behavior in chaotic jerk circuits. We will use fractional capacitors instead of pure capacitors used in these integrators. Fraction-order capacitors give us extra freedom when creating a chaotic system compared to pure capacitors. Chaotic circuits formed with fractional-order capacitors are used in areas such as encryption and secure communication.

35 DEVELOPMENT OF PRINTED CIRCUIT BOARD FOR MINI SIZED ROBOCUP ROBOTS WITH ESP

ALP EFENDİOĞLU

2016502039

Advisor: ASSOC.PROF.DR. AHMET ÖZKURT

ABSTRACT

The aim of the project is developing hardware for a Mini-Sized RoboCup Robot with using appropriate parts and components. A printed circuit board (PCB) will be designed and implemented for this project. Mentioned PCB will have ESP-12E Module as a microprocessor and ESP-12E Module (quite popular component on the NodeMCU ESP8266) will provide assistance on the wireless communication side. Also stepper motor drivers (TMC2208) will be used in this Project to provide appropriate current to microstepper motors to move the robot.

In Research Project, mentioned PCB designed with using ATmega328P-AU (quite popular another microcontroller without wireless communication) and TB6612fng (motor driver). To have wireless communication and more efficient motor drivers the components were changed, ATmega328P-AU was changed with ESP-12E Module and TB6612fng changed with TMC2208 motor drivers.

At the end of the project, prepared and worked PCB will obtained. The mechanical parts will be designed and PCB will mounted on the robot. Mentioned robot have to be smaller than usual RoboCup robots.

36 DESIGN AND IMPLEMENTATION OF TELEMETRY/ TELECOMMUNICATION SYSTEM FOR DEHA DRONES

Buket ERYILMAZ

2017502036

Advisor: Assoc. Prof. Dr. Serkan GUNEL

ABSTRACT

Unmanned aerial vehicles (UAVs) are one of the technologies that have entered our lives in the 21st century and whose importance is increasing day by day. Today, unmanned aerial vehicles are used and developed in many different sectors by integrating different technologies. While the production of unmanned aerial vehicles has increased so much, having a good communication system and fast data transfer is an important factor in getting ahead of its competitors. A good hardware system design is very important for UAVs that communicate mostly with radio waves (RF) at high frequencies. Within the scope of this project, it is planned to design a communication system to be integrated into the UAVs designed by the Dokuz Eylul University Space and Aerial Vehicles Student Club, one of the student clubs of our school. AD9361 agile RF transceiver from Analog Devices as the main chip of this system chip is selected. It is aimed to design a system by considering the features of this integration and the inputs of the system. The biggest feature that makes this system superior to other communication systems in the market is its ability to communicate in a wide band range such as 70 MHz-6 GHz, its automatic gain unit, and simultaneous video data transfer. Within the scope of this graduation thesis, hardware design has been made and system simulations have been included. The parameters that are taken into consideration while designing the hardware, the impedance matching in the RF transmission lines, the points to be considered in the highfrequency electronic board design process, the main components of the system, filter design, and simulation results are included. The ultimate goal of the project is to design a wireless and high data rate communication system via transceiver boards.

37 EXAMINING THE REFLECTION FROM THE DIELECTRIC HALF SPACE COATED BY THIN RESISTIVE LAYER

Said Bera Eynallı

2017502038

Advisor: Prof. Dr. Taner Abdullah OĞUZER

ABSTRACT

The aim of this project is to examine the effects of a certain thin coating on a surface. In the project, the dielectric half-space region is coating with a very thin resistive layer. The transmission and reflection coefficients of the electro-magnetic wave sent to the resistive layer were studied according to certain parameters. As a result of the studies, some analyzes were performed. The Brewster angle is studied. There is no Brewster angle when going from low-density medium to high-density medium, but it has been observed that there is a Brewster angle when going from a very dense to a less dense medium. The required formulation results were supported using MATLAB. This is complemented by the results obtained from the programs. In this project, the necessary calculations were made and cost analysis was performed according to them.

38 SPEED CONTROL OF PERMANENT MAGNET SYNCHRONOUS MOTORS (PMSM) FOR LIGHT ELECTRIC VEHICLES

Oğuzhan FAKI

2016502043

Advisor: Dr. Erhan DEMİROK

ABSTRACT

Electric machines have changed human life drastically. With this change, humanity's need for electricity has increased and the efficiency of the devices used has become important. The efficient use of energy significantly reduces environmental pollution and destruction of nature. Induction motors are more inefficient when compared to PMSM (permanent magnet synchronous motor). For this reason, while electrical energy is converted into kinetic energy in industry and daily life, the need for PMSM is increasing.

BLDC(brushless dc) motors are type of PMSM. The difference between BLDC motor and PMSM is that BLDC motor has trapezoidal voltage form whereas PMSM has sinusoidal voltage form. In this study, the techniques used in the control of the BLDC motor are analyzed and it is shown how the BDLC motor is controlled with the 6-step control method.

BLDC motor does not have brushes due to its structure and position information must be known in order for the motor to move. According to the obtained position information, the correct phases are energized. How to process the obtained position information is shown in the study.

In the study, how the polarity of the voltage applied to the phases of the BLDC motor is determined, why the 6 step control technique is applied instead of the field orientation technique, the current and voltage waveforms expected from the phases of the motor in the 6 step control technique are mentioned.

A control card has been prepared for motor control and STM32F103C8T6 MCU has been used on this card. In addition, the functions on the control card and how they work are shown in detail.

In the analyzes, how speed control and direction control is done is explained and simulation outputs are compared with theoretical results.

39 CLASSIFICATION OF FAKE AND REAL FACE IMAGES IN SOCIAL MEDIA USING DEEP LEARNING METHODS

Mehmet Can GENCER

2017502039

Advisor: Prof. Dr. Olcay AKAY

ABSTRACT

With the development of technology, the use of social media and the Internet has also become quite widespread. This has also led to the appearance of fake images on the Internet. In order to achieve various malevolent purposes, some malicious people have started creating and sharing fake face images. It is seen that crimes have been committed using fake biometric photos or by creating fake identities. Therefore, there is a need to discriminate fake and real facial images seen on the Internet and social media.

This project aims to distinguish real and fake face images by using machine learning techniques. Our database consists of both real and fake facial images. Fake images are created by specialists through Photoshop and similar applications. Fake photos are grouped under the names as “easy”, “medium”, and “difficult” according to the degree of forgery.

In this project, machine learning techniques such as deep learning and convolutional neural networks (CNN) were used when classifying facial images as real or fake. Python programming language and some of its libraries were used in the realization of the project.

40 DESIGN OF AN OFF-LINE SOLAR TRACKER SYSTEM FOR PHOTOVOLTAIC PANELS

Sadık Sadettin Günyar

2016502053

Advisor: Assist. Prof. Gülter Gülden KÖKTÜRK

ABSTRACT

Solar energy is one of the top important renewable energy sources and the demand for solar energy is increasing day by day. The fact that it is one of the least pollutant energy sources among the energy sources, low maintenance and installation costs, being more suitable for micro-grid installations than other sources and many other reasons contribute to this increase in demand. It is an extremely natural and clean energy source because photovoltaic systems convert solar energy directly into electrical energy. However, the change in the position of the sun during the day affects the produced power.

Solar tracking systems come into play at this point and solve this problem of photovoltaic panels by using very little power. In this study, various solar tracking systems and the advantages of these systems are examined. With the result of this survey most costeffective solar tracker system is realized and results are compared.

41 ARTIFICAL INTELLIGENCE-BASED DETECTION AND EXTRACTION OF TOXIC SUBSTANCES IN FOOD UNDER UV LIGHT

Enis HATİPOGLU

2013502104

Advisor: Assoc.Prof.Dr. Mustafa Alper Selver

ABSTRACT

Aflatoxins are found in legumes, fruits, nuts and dried foods. Aflatoxin contamination can occur during the growing process of the product, during the harvesting process or during storage. Aflatoxin is also seen in foods obtained from the milk of animals that consume foods containing aflatoxin. Aflatoxin is a poisonous and carcinogenic substance. Consumption of foods containing aflatoxin can cause death in humans and animals.

It is not possible to separate or wash this substance from food by chemical means. In the dark room, the process is carried out by manually separating them. Since people working in this sector are exposed to UV light, skin cancer and eye diseases are frequently encountered. Aflatoxin growth is observed differently in foods at each stage. Different color variations are seen under UV light in the development of aflatoxin.

The main purpose of this study is to detect aflatoxins that cannot be seen with the naked eye in foods under UV light with artificial intelligence and image processing techniques.

42 RESEARCH ON THE RESONANT FREQUENCIES OF THE HUMAN BODY AND MEASURING SIGNALS FOR DIFFERENT ORGANS

Gülçe IRMAK

2017502050

Advisor: Prof. Dr. Gülay TOHUMOĞLU

ABSTRACT

Billions of cells in the human body have electrical activity. The cell membrane has channels that allow certain ions to pass through. When a cell needs electricity, it uses these channels to generate electrical activity. The electricity generated in the body ensures the continuity of life activities. Electricity is needed for all vital activities to run properly. For example, the heart pumps blood throughout the body or the brain communicates with other organs in the body.

Vibrations occur in the body through electrical activity. These vibrations are called body vibrations. The number of vibrations per unit time of body vibration produces the resonant frequency of the body. However, the frequency of the body varies depending on the alignment and whether the muscles can contract or relax.

In addition, each organ has its own vibration. Apart from the vibrations of the body, the organs also vibrate with each other at different speeds. For example, the heartbeat is not the same as the brain. Therefore, the frequencies of the organs also differ from each other. An organ failure or malfunction means there is a problem with the vibration of that organ.

Measurement of these signals is difficult because the amplitude and frequency of the organ signals are very low. In addition, when the signal from one organ is measured, there is noise because the other organ continues to produce its own signal. Thus, the different amplifiers and filters must be used in the measuring circuit for accurate signal measurement. The well-known measured organ signals are Electrocardiography (ECG), Electroencephalography (EEG) and Electrogastrography (EGG) are used to measure heart signals, brain signals and gastric signals, respectively.

In this study, an ECG circuit was designed to measure the electrical signal of the heart. All the work done and the results obtained are included in this report.

43 REALIZATION OF CIRCUITS GENERATING SPIKING AND BURSTING SIGNALS

Enes İSTEK

2016502102

Advisor: Assoc. Prof. Dr. Selçuk KILINÇ

ABSTRACT

In this project, it will be examined how spiking and bursting events occur, the conditions necessary for their realization and where they are used today. There are many models developed to understand how nerve cells work and to examine their behavior and physiological properties. We can list them as Hodgkin-Huxley, FitzHugh-Nagumo, Morris-Lecar, Hindmarsh-Rose, Izhikevich, Integrate & Fire and Adaptive Exponential Integrate-Fire. In recent years, research studies on interneuron phenomena, neuron behavior and neuron structure have become an important research area. Spikes and bursts have been observed in different parts of the brain in many species, including non-mammals. In this project, while designing a spiking and bursting circuit, we are actually designing an oscillator circuit. Oscillators transfer the electrical energy from the DC power source to AC electrical energy at a certain frequency and no external signal is applied during this process. Finally, analog circuit realization of spiking and bursting signal was simulated using the SPICE program, circuit analysis was performed and simulation results were shown.

44 FACE MASK DETECTOR

Ege Kandemir

2018502045

Advisor: Assoc. Prof. Dr. Yavuz ŞENOL

ABSTRACT

The infectious coronavirus disease (COVID-19) was first reported in Wuhan in 2019, it has become a public health problem in China and even around the world. This outbreak causes negative effects on economies around the world. The increase in the number of COVID-19 tests gives more information about the spread this could make it possible to prevent further infections. However, wearing a face mask that prevents the transmission of droplets in the air and maintaining an appropriate physical distance between people, and reducing close contact with each other can still be beneficial in combating this pandemic. Therefore, this final project focuses on implementing a face mask detection model as an embedded vision system. The pre-trained haar cascade classifiers models are be used in the project. People who are wearing masks aimed to be detected. This solution tracks the people with or without masks in a real-time scenario by generating an notification if there is a face mask violation in the scene or in public places. This can be used with the existing embedded camera infrastructure and can be applied to various places, as well as in an office building or at shopping malls. It is required to use image processing algorithms to detect if face masks are being worn or not in certain areas where wearing a face mask is important. Mask size, color, skin of the person wearing the mask and light conditions differs in every application area so usage of neural networks becomes important at final decision stage. This project provides suppport to experts preventing possible dangers from occuring by detection of face mask. Objective of this final year project is to make a system that is able to perform real time face mask detections using a python library called OpenCV [11] and haar-cascade training algorithms. A cascade of haar-Like classifiers model is trained using the datasets.

45 DESIGN OF A THREE-PHASE INVERTER DRIVE WITH SPACE VECTOR PWM TECHNIQUE

Mehmet Selim Keleş

2016502062

Advisor: Assist. Prof. Dr. Tolga SURGEVİL

ABSTRACT

This project aims to design and simulation of the 3-Phase voltage source inverter with the Space Vector Pulse Width Modulation(SVPWM) technique. For this purpose both Conventional and Carrier Based Space Vector Modulation techniques have been examined and 2 different designs created. 2 Level Pulse Width Modulated-Voltage Source Inverter(PWM-VSI) topology and a three-phase RL load used for the hardware implementation of the project. In Conventional SVPWM reference signals for the PWM-VSI circuit have been obtained by using Clarke Transformation. For Carrier Based SVPWM model, modified three-phase sinusoids have been created for reference signals using real-time relations. Results and analysis of the simulation model made by using MATLAB-Simulink software compared to the calculated values. Implementation of the model made by using STM32F407VGT6 microcontroller as Digital Signal Processor. Also, the VSI circuit designed in KiCAD software and printed for hardware implementation. The design philosophy of the Printed Circuit Board and the algorithmic structure of the DSP are explained in detail. In the implementation, the Conventional SVPWM method is preferred. 3-Phase induction motor used as a load for measurements and observations. Cost analysis of the system has shared respectively.

46 WALKING EVALUATION HARDWARE DEVELOPMENT USING FPGA

Berkan KORKMAZ

2016502068

Advisor: Asst. Prof. Özgür TAMER

ABSTRACT

The main idea of this project is to detect the types of walking of MS patients in the early stages of the disease and, anticipating the continuous trend of the disease, to establish a connection between the walking situation and the disease. This is done using cost-effective methods. This type of technology is one of the instrumented walkway systems. In a basic way, I developed a technological carpet. This carpet is to be processed by several FPGA boards, and these are to acquire steps of the patient. After that, the data is analyzed, it will be mapped and distributed as a data set of steps. In the completion of that project, an affordable and cost-effective walkway system is produced. The reason of FPGA usage in that project is to make project flexible and, in the case of internal source need, not to struggle with hardware. Meanwhile, our project will need parallel computation operations. That capability is not eligible for another microcontroller systems, but for FPGA. By the FPGA based system, people who are going to use that system will have the chance of several different features adding to that system.

47 HAND GESTURE RECOGNITION FOR TURKISH SIGN LANGUAGE ALPHABET

Özge ÖLMEZ

2017502093

Advisor: Assist. Prof. Dr. Hakkı Tarkan Yalazan

ABSTRACT

Sign Language is widely used in order to communicate between people who suffer from loss of hearing, speaking, or both. There are many people in the world who have these disabilities and without sign language communication with them would be very hard. Hand Gesture Recognition is a growing field that provides a human-machine interaction. Even, in our daily lives, we can use hand gestures for communication between us without saying a word. Researchers around the world have engaged with developing recognition systems, hand gesture recognition systems for various applications. The main topics in gesture recognition are; data acquisition, gesture modeling, feature extraction, and hand gesture recognition.

A hand gesture recognition program will be done in this project. Mainly the system will recognize the input data which will be taken from the user as a sign language pattern and the system will be done some arrangements about colorization then input image will turn into a binary image which will include just black and white. After the segmentation part, the system will extract the desired part of the image which is a hand from the wrist in our case and then the input image will be ready for the classification part. In the classification part, the system will decide the desired output by comparing the input data with our dataset, lastly, the output letter which is given as an input image will be displayed. This project will be ensured in order to keep human-computer interaction and decrease some difficulties for people who have a disadvantage

48 ROBUST THREE-PHASE GRID SYNCHRONIZATION UNDER DISTORTED AND UNBALANCED CONDITIOINS

İskender ÖNEM

2017502094

Advisor: Assist. Prof. Dr. Erhan DEMİROK

ABSTRACT

In this project, a synchronization algorithm has been developed and applied under nonideal situations where unbalanced voltages and harmonics between phases that may be encountered in the real electricity distribution networks. Within the scope of this thesis, the second order generalized integral (SOGI) filter method applied in single-phase systems will be adapted for three-phase voltages. Also, the phase imbalance problem will be implemented in a fast prototype thanks to the method of separating the voltage into symmetrical components used in power analysis. In order to make this thesis successful, three goals will be achieved. The first goal is to obtain voltage, frequency and phase angle information in the network with SRF-PLL. The second goal is the process of filtering as separating fundamental voltage (positive sequence voltage) from harmonics with SOGI filter after obtaining a symmetrically balanced voltage signal from the unbalanced voltage between phases in the network. The third goal is to perform the necessary fast prototyping setup and testing after completing the developed algorithm to ensure synchronization with the network. This project will lead the control of power converters to be used in many sectors such as electrical energy produced from renewable energy sources, which are becoming increasingly widespread and integrated into power systems, electrical charging stations and aircraft electrification, etc

49 DESIGN OF A PORTABLE BATTERY CHARGER SYSTEM WITH BUCK-BOOST CONVERTER TOPOLOGY

Mertcan ÖZDEMİR

2017502096

Advisor: Dr. Tolga SÜRGEVİL

ABSTRACT

Today, there are many technological applications in which natural, environmentally friendly and renewable energy sources are used. Solar photovoltaic energy, which is one of the most widely used among these, is mainly used in many areas such as heating, cooking and electricity generation. However, a general disadvantage of natural energy sources is that the intensity produced is not constant, that is, it is uncertain. We can give an example of this phenomenon when the intensity of the light entering the solar panels is uncertain. Light intensity can be affected by weather conditions. The change in light intensity causes irregularity in the output voltage of the solar panels. Therefore, the amount of output voltage can be adjusted higher or lower than the input voltage using a buck-boost converter. In addition, the output voltage level can be controlled with the help of a microcontroller that controls the pulse widths produced by the PWM signals. Based on this idea, in this project, a USB portable solar cell charging system with buck-boost converter topology, whose output current and output voltage can be adjusted with the help of a controller, is designed. The full simulation model and measurements of the system were created in MATLAB/Simulink during the research process. In the final stage, after the circuit was produced, it was tested in the laboratory environment and compared with the results obtained from the simulation. The parameters affecting the system performance were determined in the design and explained in the report. In summary, the system was designed as USB portable to include the control of the converter with a microcontroller card, and the materials used in the system were determined in the 5th chapter and explained in detail.

50 DESIGN AND IMPLEMENTATION OF PID CONTROLLED ADJUSTABLE VOLTAGE REGULATOR BY USING ARDUINO NANO

Halil Oğuzhan ÖZER

2017502098

Advisor: Assoc. Prof. Dr. Özge CİHANBEĞENDİ

ABSTRACT

First of all, voltage regulator can be defined as any electrical or electronic device that keeps the voltage of a power source relatively close to a desired value. The goal of voltage regulation in power systems is to deliver a more dependable, stable, and fixed output voltage value to the user. The voltage regulator is the system's brain, controlling the exciter's output so that the generated voltage changes in the desired way. The voltage regulator (VR) is a controller in most modern systems that senses the output voltage (and sometimes current) and takes corrective action by altering the exciter control in the desired direction. Since a power supply regularly provides raw current that would otherwise destroy one of the circuit's components, voltage regulators are one of the most common electronic components.

For a long time, the Proportional-Integral-Derivative (PID) controller has been used and dominated the process control industries because it provides control action in terms of compensation based on present error input (proportional control), as well as depending on past error (integral control) and derivative control. As the name implies, PID is made up of three separate constant parameters: proportional constant, integral constant, and derivative constant, all of which are adjusted to achieve an ideal, steady, and faster response, as well as to reduce the steady state error to zero or a very small tolerance limit. The advantages include good output voltage regulation (tap switching) to very good output voltage regulation (double conversion), fast voltage correction speed, no restrictions on the number of correction cycles, voltage and configuration versatility, very low or no regular maintenance, and good line isolation. For industrial, heavy commercial, and medical imaging applications, voltage requlators are the ideal option.

The aim of this project is to design and implement a PID controlled adjustable voltage regulator with the help of Arduino. Thanks to the buck converter structure used, it is aimed to

obtain a stable output voltage with a lower value at the output, depending on the demand and purpose of use, in cases where the input voltage has a high value.

High side sliding process was implemented with the help of N channel mosfet used in the buck converter structure. Thanks to the PID control structure, it is aimed to reach the desired voltage value as precisely as possible. Finally, Ardunio Nano is preferred due to its economic and application advantages

51 DESIGN AND APPLICATION OF PI CONTROLLED DC-DC BUCK CONVERTER

Emre Polat

2017502063

Advisor: Dr. Taner Göktaş

ABSTRACT

In general, converters are circuits whose outputs have a different voltage value than the voltage value at the input. It can be said that the rapid development of technology in today's world, the increasing number of electronic devices used day by day, and the fact that these devices have different operating voltages increase the importance of converters, their areas of use and the way they are used. In this project, PI Controlled DC-DC Buck (Step-Down) Converter was analyzed and designed in general, respectively. Then the circuit parameters were calculated and the design criteria were determined. Then, the theoretical values of the circuit elements obtained as a result of analysis and calculations are defined. After that, using the defined values and according to the determined criteria, the step-down converter circuit was built and simulated in the Matlab Simulink environment. Finally, the results obtained as a result of this simulation are presented.

In the continuation of the paper, firstly, the calculation of the values of the circuit elements to be used in the design of the step-down converter, the selection of the appropriate materials, the determination of the duty period and the operating mode are explained. Then, by designing the controller circuit, it is explained that the duty period can be controlled in different load and input voltage situations. Finally, a constant output voltage is obtained by applying the appropriate PWM signal to the Buck Converter circuit through the PI control circuit created in the Matlab Simulink environment in different load and different input voltage situations. The results obtained are presented with their justifications.

After the analysis and simulation studies were completed, the PCB Layout design part was started by using Altium Designer. For this purpose, firstly, the circuit elements to be used were investigated, and materials suitable for the calculated values and accessible were preferred. In addition, at the stage of material selection, ferrite core is wounded in order to obtain an inductor

because it has a unique value and this process is mentioned. In addition, at this stage, a PI-controlled PWM signal was produced with a microprocessor and a digital circuit was added to the circuit design in order to perform the switching process without any problems. At this stage, ground problems and the methods that can be applied to eliminate this problem are mentioned. Finally, 3D and 2D views of the designed circuit diagrams are added and the generation of PI controlled PWM signal with microprocessor is mentioned.

52 TRANSMITTER DESIGN FOR RADIO REMOTE CONTROL

Seda SAVRAN

2016502077

Advisor: Assoc. Prof. Yavuz ŞENOL

ABSTRACT

The aim of the thesis is to realize the remote control of an industrial crane using UART protocol. The aim is to create a more advanced system by adding some features to existing remote control devices.

The first goal that is aimed to be achieved is to expand the communication distance while reducing energy consumption. This was planned to be done by selecting the correct RF module and ensuring that signals for each control are sent only when the button is pressed. Another goal is to be able to act quickly within the system in emergency situations. The 'emergency stop' button added to the receiver and transmitter circuits provides this intervention opportunity. The goal is to add a selectable mechanism to the transmitter circuit, allowing two cranes to be controlled simultaneously or independently.

It uses a PIC microprocessor to analyze external excitations in the transmitter circuit and then uses the UART protocol to send the data to the receiver. The receiver, on the other hand, uses the microprocessor to process the information it receives over the UART and to control the required relay.

53 CONSTITUTING AND SIMULATING A MATHEMATICAL MODEL FOR THE SLIME MOLD GROWTH MODEL

Öznur SERT

2016502078

Advisor: Assoc. Dr. Ogr. Gülten KÖKTÜRK

ABSTRACT

In this thesis, it has been studied how a biological creature solves a problem and at the same time how and where the solution created by this organism can be used. The living thing to be used in the research is a multicellular eukaryotic organism, because this creature has adapted to various environmental conditions for many years. At the same time, it does not take a long time for the desired results to occur. This organism is called Slime Mold Physarum Polycephalum in the literature. The behavior of this creature that can be used to find the shortest path has been analyzed. When this creature, which is hungry and in need of food, is left in an environment with food sources, it first forms a network that reaches all the nutrients. This network structure consists of a tubular structure resembling pipes. Nutrients and signals from these tubes circulate thanks to the plasmodium. Thanks to this circulation, necessary nutrients and signals reach every part of the organism. The organism destroys some tubes in the network structure over time and provides thickening of some tubes. This is due to the amount of nutrient flow in the tubes. While it provides support to places with high nutrient flow, it destroys tubes with low nutrient flow. In this way, tubes of minimum required quantity and length remain among the food sources. It has been studied on the examination of this behavior of the organism under certain conditions and the extraction of its mathematical expression. An algorithm can be created thanks to the extracted mathematical expression. The algorithm created was tried to create the shortest network connecting the points by imitating the movement of the living thing. It has been studied that this algorithm should be created on the basis of which features of the living thing and which parameters should be defined as variables in its mathematical formula. It has been observed how the output will change with the change of the values defined as variables. Pareto law, which can be used in Multi-Objective Problem solution, is used as a method in the algorithm. Thus, a non-dominated solution set can be found among many answers.

54 RECONNAISSENCE, OSINT & CYBER INTELLIGENCE TOOL

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ABSTRACT

Together with growing digitalisation, the amount of information and the number of threats against information assets have taken off. By considering information security as an umbrella, and cyber security underneath it, safety of the information in cyber space has become globally crucial. Therefore, Reconnaissance, OSINT (Open-Source Intelligence Gathering) and Cyber Intelligence (CI) have been using with different methods to ensure maximum security. Although reconnaissance, OSINT (Open-Source Intelligence Gathering) and cyber intelligence (CI) processes have differences, they can actually be treated as linked, interconnected and complementary elements. Even though considering them as different and separate topics is not wrong, combining and performing these processes together could result in a much more effective and informative work. From this point of view, the goal of this project has been determined as to analyse the subject (the system/company/service/digital asset/official institution to be protected) and possible threats/flaws against the subject by combining reconnaissance, OSINT (Open-Source Intelligence Gathering) and cyber intelligence (CI) processes together. The tool is expected neither to give a comprehensive, all-in-one output nor to show vulnerabilities that pose security risks, but it is expected to give a glimpse of overall structure and information assets of the target is expected in the output. In order to achieve this goal; reconnaissance, OSINT (Open-Source Intelligence Gathering) and cyber intelligence (CI) processes have been included as separate modules in this project, and these modules have been programmed in different languages (Python, Bash) by making use of some other services and tools. The biggest and the most comprehensive part of the project, the reconnaissance module, maps web attack surface and gives some ideas about what some possible security holes could be. When the reconnaissance is being done, a lot of information is gathered, parsed, and presented in a readable and understandable format. OSINT module helps with gaining information about the domain, specific email addresses and employees of the target organisation. Cyber Intelligence module

provides information gathered from different sources, including Tor network, to improve the security testing process. To bring all the functions together; various techniques, methods, services, sources or API/access keys are used as well as open-source projects. Consequently, the ultimate goal of the project has been reached, and a unique, costbeneficial tool which can be effective in early stage of penetration tests has been successfully built.

55 DESIGN Of FUNDAMENTAL LOGIC GATES USING FINFETS

Feyza SÖĞÜTLÜ

2016502079

Advisor: Prof.Dr. Uğur ÇAM

ABSTRACT

As nanometer process technologies have advanced, chip density and operating frequency have increased, making power consumption in battery-operated portable devices a major concern. Even for nonportable devices, power consumption is important because of the increased packaging and cooling costs as well as potential reliability problems. Thus, the main design goal for VLSI (very-large-scale integration) designers is to meet performance requirements within a power budget. Therefore, power efficiency has assumed increased importance.

Nowadays, it has become necessary to design digital circuits by using smaller, faster and less energy-consuming structures according to Moore's law. Scaling as one of the most important challenges from the technology viewpoint. The channel length of Field Effect Transistors (FETs) has passed from micrometers to tens of nano meters. However, drawbacks of scaling have the increase of short channel, parasitic, reliability and variability effects. To overcome the problems related to scaling, new transistor architectures have to be investigated. FinFET is the most promising double-gate transistor architecture to extend scaling over planar device. Multiple gates have better control over the SCEs. Particularly the FinFET technology provides superior scalability of the DG-MOSFETs compared to the planar MOSFET. Fin-FETs are predicted as one of the best possible candidates to replace the bulk MOSFETs. The FinFET technology power consumption compare with the CMOS technology. The two gates of a FinFET can either be shorted for higher performance or independently controlled for lower leakage or reduced transistor count.

Logic gates form the basis of digital circuits. For this reason, in this project, starting from 45nm FinFETs, the design and performance analyzes of smaller FinFET models and logic gates will be made. The focus of this study is on the development of FinFET device and implementation of various Inverter, AND, NAND, OR, XOR, NOR, XNOR designs where the performance

are analyzed. In this project, using BSIM CMG model files, logic gates were designed with LTSPICE and performance analyzes were made

56 INCREASING THE EFFICIENCY OF SOLAR ENERGY SYSTEMS BY DESIGNING A REMOTE MONITORING AND CONTROLLING SYSTEM

Can ŞEKERCİ

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Advisor: Assoc. Prof. Dr. Özge CİHANBEĞENDİ

ABSTRACT

Electricity is the most needed type of energy at the present time. Rather than generating it by using fossil fuels, it is aimed to generate electricity in a cleaner way using renewable energy sources and these efforts are becoming more crucial day by day. In line with this, the aim of this project is to make more efficient use of solar energy that one of the renewable generation sources for electricity.

In this project, the current and voltage values that the solar panel can generate as well as the power value calculated by connecting a representive resistance for any connected device to the solar panel in parallel are sent to the user's Android based device via the Wi-Fi module. In this way, the user can monitor the performance of the system remotely and can also suspend the operation of the system if it is necessary in the case of low production efficiency. In addition, the system follows the sun to maximize the benefit of sunlight and the system can also clean the panel with a designed water cleaning mechanism in case of any dirt accumulate on panel. The system has a "Dual-Axis" construction that can move on both horizontal and vertical axis to be able to catch the higher amount of sunlight at right angle. Beside of these, the system's operation can be suspended with the user's appoval if the humidity sensor gives rainy weather forecast.

The project of controlling and monitoring the solar panel that converts sunlight to electrical energy via Wi-Fi module with Android compatible application is realized in cooperation with Politeknik Elektronik. Accordingly, the project involves the monitoring the parameters of the solar energy panel and the physical control of the panel remotely.

This report gives information about the literature researches on how the project could be designed, the design methodology of the system, the used components in the system, coding

and algorithm briefs, the implementation process and the possible improvements for the system. Within the scope of the project in the report, a solar panel is controlled with an application compatible with Android-based devices by using the Wi-Fi module, remote monitoring of the parameters of the panel and physical control of the panel are carried out

57 DESIGN AND IMPLEMENTATION OF AUTOMATIC PATH GUIDANCE SYSTEM FOR VISUALLY IMPAIRED PEOPLE

Şahin ŞENGÜL

2017502114

Advisor: Dr. Neslihan AVCU

ABSTRACT

This project includes the design and implementation of a smart guide system in order to increase the quality of life of visually impaired individuals and to help them perform their daily activities independently. Visually impaired people use walking canes in daily life for a helping device. These canes can help to feel the objects in front of them but cannot help them recognize the objects around them. A project has been designed for the visually impaired user to recognize the objects around him and to guide the selected object if he wants to reach one of these detected objects. This project designed and implemented as a smart guidance system based on deep neural networks and image processing.

Instant environment images are processed using deep neural networks-based image processing models and objects in the image are detected and transmitted to the user by the voice feedback system. The user can request path guidance for the desired object from the control according to the audible feedback sequence. In case of a path guidance request for a detected object, the user is guided by voice commands. This smart guide system, which will facilitate the daily lives of visually impaired individuals, will enable individuals to act more independently.

The project consists of two main parts: i) glasses with integrated camera and ii) microprocessor. Integrated camera glasses are designed as a device with a camera module on the sunglasses, which is very easy and comfortable to use. Blind and visually impaired people do not want to stand out when using aids in their daily lives. In light of this fact, the user can get help for guidance with an easy-touse, light and portable system by using the smart guide system without attracting attention. The ambient image coming from the integrated camera glasses passes through the image processing algorithm in the microprocessor, which is another main component of the system, and the objects in the image detected. Detected objects are sent to

the user's headset via bluetooth connection and the user is informed about the objects around. After the audible warning is completed, the user will select the object for which he or she wants roadside assistance from the remote, depending on the order in which the objects are spoken. Roadside assistance is also provided audible through headphones.

This project, designed to facilitate the lives of visually impaired individuals and enabling them to live their lives independently, compared to commercial products with the same purpose, it has superior aspects in terms of functionality and ease of use. Its functions and features can be further developed, making it a commercial product in the future, and its usage area can be further developed.

58 READING THE MAIN INFORMATION OF VEHICLES WITH CAN COMMUNICATION(CAN-BUS)

Ferhat Onat ŞİRİN

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Advisor: Assist. Prof. Dr. Reyat YILMAZ

ABSTRACT

Efficiency was one of the most important factors of today's technology. Efficiency in vehicles and other technological systems is ensured by a healthy data transfer, just like between people. Each system has its own communication system.

CAN-Bus communication protocol is one of them. CAN is short for "The Controller Area Network". As can be understood from its full name, it is an area where the CAN control network communicates and connects as a whole. The CAN-Bus protocol physically alleviates the hardware load on a system. It became widespread in a short time with its success in transmission speed and started to be used on various systems (band systems etc.). It provides safe and long-term use with its high error rate.

In this study, CAN-Bus system was examined and one of its applications in the automotive field was realized. The project basically aimed to extract data from the vehicle CAN-Bus line and to display the captured data with a digital display. It was realized as a solution to the problem of creating visual results for the user by taking information from the tool. This project is a solution that will allow only digital instrument panel vehicles and vehicle information to be monitored remotely. Thanks to this application, improvements such as tracking large vehicle fleets can be made.

A visual result was presented to the passenger with the help of bluetooth by obtaining the speed, rpm and temperature information from the vehicle used within the scope of the project. In addition to the research part of the report, the modules used, the connections of the modules, hardware and software parts are explained in detail. The application part is detailed.

59 DESIGN AND IMPLEMENTATION OF A STOCK TRACKING ROBOT FOR A SMART INVENTORY MANAGEMENT SYSTEM

Necati Taş

2017502074

Advisor: Dr. Neslihan Avcu

ABSTRACT

A robot is a computer programmable machine that can automatically perform a series of complex actions. Most of the robots used today are used in industry. The reason for this is that robots must be able to perform tasks that require precision or power, with great speed and error-free. That's why it goes head-to-head with large companies, universities, and technology institutions in developing robotics. With the increase in basic needs with the increasing population, it is getting more and more difficult for companies to control incoming and outgoing goods. In the project, a strategic solution for smart storage developed by using a system consisting of a robot with autonomous mobility and image processing algorithms. A mobile robot on which the camera is mounted with the help of an apparatus such as an inverted pendulum was designed to scan the high shelves and detect whether they are empty and measure the lengths of these spaces. The results of the empty partition range and occupied partition range on the shelf were transferred to the user via bluetooth. The stock status of the product are checked by determining the barcodes on the boxes by applying image processing techniques to the snapshots. The control mechanism is designed to solve the problem of shaky image that may be caused by the inverted pendulum camera mechanism during the barcode reading process.

60 TIME SERIES ANALYSIS AND ANOMALY PREDICTION WITH MACHINE LEARNING

Onur TAŞ

2017502075

Advisor: Assist. Prof. Dr. Metehan Makinacı

ABSTRACT

Machine learning has been produced to be a solution to many problems that can be difficult for people today. Especially after the widespread use of machines, deterioration and wear times have become very valuable. Predicting when a machine will break down has been difficult in the past. As a result of great experience, people were able to make decisions by listening. However, now, with the help of the sensors produced, we can obtain various data from the machines. These data we obtain are marked with a time. This shows that the data we hold is Time Series data. With the analysis of time series data, we can have information about the distribution or format of our data. Machine learning, on the other hand, learns the data with this prepared format and will be very useful in estimating the time of deterioration with the help of the models in hand, faster and more precisely than the human eye can predict. In this study, necessary researches were prepared for this project.

61 OPTICAL MUSIC RECOGNITION APPLICATION FOR DRUM

Dogan Can TOP

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Advisor: Assist. Prof. Dr. Hakkı Tarkan Yalazan

ABSTRACT

Drum is a very popular instrument that consists of multiple percussion equipment. The music made by using that instrument is generally polyphonic. This thesis aims to read drum notes, so how to read polyphonic notes by a computer was studied. In the article [1], more than one solution for reading polyphonic music was presented and compared. The most successful one, which is called RNNDecoder, was preferred to be used in this application. In this thesis; the generation of the used dataset and its features, the structure of the used model, experimental results of the application, and its assessments with respect to the article are placed.

62 ANALYSIS OF THE ALL-OPTICAL AMPLIFICATION PROCESS IN OPTICAL FIBER CABLES

Serap TÜRKOĞLU

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Advisor: Prof. Dr. Metin H. SABUNCU

ABSTRACT

Since the first ages, people have used different methods to communicate with people at long distances. The first example that comes to mind is communication with smoke. People managed to transfer the information they wanted to convey from one point to another by lighting a fire. Fire was used as a source of light. The biggest difficulty in this primitive communication technique made with light was that the size of the information to be conveyed was limited. In addition, as the communication distance increased, the transmitted information was getting smaller. Thanks to the technology that has developed over time, different environments have been developed that are much more suitable for transferring information and communicating. In general, these technologies are based on the transmission of electrical signals to different points through cables used as a conductive medium.

Due to the rapid and great change in voice, data and video communication, the bandwidths of electronic systems were insufficient [1]. More bandwidth was needed in the field of telecommunications. Ground microwave systems and satellite systems could only offer a temporary solution to the increasing demand. As a solution to these problems, alternative communication systems that allow high quality communication, which are more economical and have a large capacity, were sought. At this very point, Optical communication systems have been developed and started to be used as an alternative to metal conductors for data transfer.

Optical communication systems, in which light is used as an information carrier, allow high-speed data transfer. Light is a very high frequency electromagnetic signal [2]. It is a difficult and inconvenient method to propagate light waves in the earth's atmosphere. Therefore, fiber cables with glass or plastic material are used to transmit light from a source to a destination.

The higher the carrier frequency in a communication system, the higher the bandwidth. As a result, the higher the information carrying capacity [3]. For example, the bandwidth of a radio system operating at 100MHz is considered to be 10MHz since it is 10 % of the carrier

frequency. The frequency of light, which is carrier in fiber optic systems, is between 1014 Hz and 1015 Hz [5]. The bandwidth of this system is about 106 GHz. This bandwidth is quite sufficient to meet the needs of today and the near future. This situation reveals the potential capacities and importance of optical communication systems.

The energy of the light signal traveling in the fiber cable is lost for various reasons. This loss is measured in decibels. In order to reduce the signal losses due to the increase in the transmission distance, the weakened signals are amplified by using an amplifier. For the amplification process, the light signal is first converted to an electrical signal. Then, by performing the amplification process, the electrical signal is converted back to the light signal. However, this leads to losses in the energy of the signal. In order to avoid energy losses, transmission should only be done in optical media.

Optical amplifiers are used for this. Optical amplification can be performed using the stimulated emission process of atoms with energy band gaps corresponding to optical windows. By selecting and doping appropriate atoms in a waveguide, attenuating optical signals are efficiently amplified to desired levels in the optical field.

The aim of this project is to analyze the optical amplification process of this atom by selecting the most suitable atom for the optical amplification process and subtracting the signal-to-noise ratios at various fiber lengths.

Erbium atom was chosen in this project. Erbium Doped Fiber Amplifiers (EDFA), created by doping this atom, are preferred more than other amplifier types due to their high gain, low noise and wide bandwidth. MATLAB® was used to model the EDFA process. In this way, the effect of changing the EDFA parameters on the gain and noise of the system was examined and the characteristics of the optical amplifier were deduced.

63 DIGITAL PULSE OXIMETER

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2017502100

Advisor: Assoc. Prof. Gülden Köktürk

ABSTRACT

Pulse oximetry devices are a non-invasive device used to measure oxygen saturation in the blood and heart rate. In this thesis, it is investigated how to determine the oxygen level in the blood in a non-invasive way and how to design pulse oximeters. With COVID-19, an epidemic that damages the respiratory system, the detection of oxygen saturation in the blood has become important. The level of oxygen saturation in human blood should be at least 80 %. When this value is not provided, hypoxia occurs, which is also called oxygen deficiency. Knowing the value of the oxygen level in such emergency situations allows us to apply the right treatment. Pulse oximeter calculates oxygen saturation and heart rate by measuring the light absorption of hemoglobin in the blood in the arteries. It is planned to use red and infrared light at wavelengths of 660 nm and 880 nm. Deoxyhemoglobin is more sensitive to red light, while oxyhemoglobin absorbs more infrared light. After some of the light coming into the hemoglobin is absorbed, it falls into the photodiode, where a current occurs. After processing the formed current, oxygen saturation in the blood is calculated.

64 DESIGN OF A BRUSHLESS DC MOTOR DRIVE

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2017502082

Advisor: Asst.Prof.Dr. Tolga SÜRGEVİL

ABSTRACT

Brushed dc motors are still widely used but they have lost their old popularity when power electronic circuit elements are developed.Brushless direct current motors have a very common usage area such as industrial automation, UAV, automotive and robotics. In this project, the commutation of the brushless direct current motor with pulse width modulation and the mathematical modeling of the motor were examined. The characteristics of brushless DC motors were explained with the designed model. The main purpose of this project was to investigate the working principles of brushless dc motors and to simulate the results obtained after simulating in MATLAB-SIMULINK environment. is to compare the simulation results with the theoretical results

65 ANALYSIS & SIMULATION OF MEMRISTIVE CHAOTIC CIRCUITS

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Advisor: Assoc. Prof. Dr. Selçuk KILINÇ

ABSTRACT

In this paper, analysis and simulation of memristive chaotic circuit is proposed. Chaotic circuit has been derived from the Chua's circuit. Chua's circuit is a circuit that shows chaotic behavior. It consists of standard circuit components resistor, inductor, capacitor and in addition to that a Chua diode which is nonlinear active resistor. Here, Chua diode was replaced by a memristor. The memristor was implemented by using the off-the-shelf components and then LTspice simulation and physical implementation was performed in order to obtain the voltagecurrent characteristic. When it is excited by a sinusoidal voltage, the memristor presents a pinched hysteresis loop in the current-voltage plane. The main idea of the memristor realization is constructing an analog integrator to obtain the flux across the memristor and obtaining the memristor's characteristic by using this flux. Finally, by constructing this Chua circuit with implemented memristor, 3 different chaotic signals were generated.

66 OPERATIONAL TRANSCONDUCTANCE AMPLIFIER (OTA) DESIGN USING FINFETS

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Advisor: Prof. Dr. Uğur ÇAM

ABSTRACT

Within the scope of this project, an Operational TAmplifier (OTA) design was obtained in the LTspice program using FinFET Transistor. Reducing the size of the transistor saves more space in the chip designs used. By using FinFET technology, the time delays in the designs are reduced and the bandwidth of the used areas is increased.

OTA, one of the indispensable building blocks of analog electronics, is widely used in many amplifier types, different radio frequencies (RF) and many additional fields. In electronic circuits, OTA is widely used as a current-controlled voltage source. On the other hand, it is sensitive to fluctuations and insensitive to noise in the circuits in which it is used. FinFET, which is a 3D transistor, has been preferred and used recently due to its prevention of leakage currents and much less power consumption. In OTA design, the use of FinFET is to create high gain and wide bandwidth against the decreasing power supply and channel length. In the project, 45 nm FinFET, which is not included in the LTspice program, has been modeled and it has been tested that it works in the converter with this model. For Miller OTA, designs were obtained with 45 nm CMOS and FinFET. AC, DC and Transient analyzes of the designs were made and compared. In the continuation of the project, the operation of the OTA created in LTspice in an integrating circuit from real-life locations was examined. The efficiency of the operation of the OTA created with the FinFET design has been analyzed.

FinFET technology, which is much better in terms of energy efficiency, can be developed by taking part in smaller sizes and different OTA designs. OTA structure is included in more than one analog electronics. It is great that it works as an integrator circuit in filter designs, amplitude modulators and in the project. provides facilities.

67 REFLECTION AND TRANSMISSION FROM THE LOSSY DIELECTRIC SLAB

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ABSTRACT

The area between the two planes is called the slab. This region can be modeled by taking the dielectric constant ϵ and conductivity σ and can be considered nonmagnetic ($\mu r = 1$). A planar em wave comes to this structure and some of it is reflected, some is transmitted and some is absorbed in the substance. By modeling this structure, reflection and transmission coefficients can be found and their dependence on thickness (h), conductivity (σ) and frequency can be examined. We observed how the coefficients of the incident and reflected rays change, and how the absorbed power changes depending on them, by creating an electromagnetic wave in the MATLAB application.

68 MODEL-BASED DESIGN OF FIR LOWPASS FILTERS FOR FPGA IMPLEMENTATION

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ABSTRACT

In this thesis, FIR (Finite Impulse Response) low-pass, band-pass, high-pass filters and a two-dimensional FIR low-pass filter for image processing applications were designed to be implemented in the FPGA (Field Programmable Gate Arrays) environment using modelbased design method. All designs were designed in MATLAB Simulink environment with model-based design method. In the first stage of the thesis, one-dimensional filters were designed using the FDATool (MATLAB tool) and Simulink simulation results were given. Verilog code was generated with HDL (Hardware Description Language) Coder of these designed filters. This generated Verilog code was transferred to Xilinx Vivado. Later, this Verilog code was successfully synthesized in Xilinx Vivado. In the second stage of the thesis, a two-dimensional FIR low-pass filter was designed using various blocks on MATLAB Simulink and Simulink simulation results were given. Verilog code of this designed filter was created with HDL Coder and successfully synthesized in Xilinx Vivado. The purpose of this designed filter is to be used in image processing applications. Detailed design processes, simulation results and synthesis results are shown in this thesis.