

Title: Talking Refrigerator

Student Name and Exam Seat Number:

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Guided by: Prof Y. M. Vaidya

Abstract:

This is an IoT-based smart fridge that uses Computer Vision to automatically log in food, informs the users through text messages of what's stored inside and expiration date, and recommend healthier and better use of user's current storage through features like checking nutrition and search for recipes related to some items. Each year, according to United Nations Environment Programme, around 1.3 billion tons of food is wasted. Much food waste comes from restaurants, from stores, and from homes. However, little has been said about the food waste that comes from the consumer's refrigerator, such as forgotten leftovers or expired ingredients. In general, we put food into a refrigerator to make it last longer. Most home cooks remove ingredients from the refrigerator to cook meals, and then return the leftovers to the refrigerator. However, some food is forgotten or goes uneaten due to personal taste. Consumers also throw out food to clear space for fresher options. Therefore, talking refrigerator system is developed which can alert the user about their food condition in the refrigerator. The system will send a message to the users to let them know how long they have stored certain food in the refrigerator. When the limit (the period which is set by the user) is reached, the system will send a warning message so that the user will use the food as soon as possible before it spoiled and to avoid from food waste and spoilage. The talking refrigerator will also have cooling system and user will be able to chat with refrigerator through messenger app

Title: DESIGN STUDY OF HIGH POWER DC-DC CONVERTERS USING WIDE BANDGAP SEMICONDUCTOR

Student Name and Exam Seat Number:

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Guided by: Dr. S. P. Mahajan

Abstract:

Since the dawn of the electronics age over a hundred years ago, power design engineers have been on a quest for the ideal switch, one that will rapidly and efficiently convert raw electrical energy into a controlled, useful flow of electrons. Silicon quickly became the material of choice for the semiconductor transistor, not only because of its fundamentally superior electrical properties, but it was also cheap to produce. Silicon power MOSFETs have now reached the end of the road in delivering better performance at a constantly declining cost. Fortunately, the quest for the ideal switch that has infinitely fast switching speed, no electrical resistance, and a lower cost, has not slowed and new base materials upon which to build high performance power conversion transistors and integrated circuits have emerged. The leading candidate for taking electronic performance to the next level and a reactivation of positive momentum of Moore's Law is gallium nitride (GaN). GaN high electron mobility transistors have been studied with great interest as the cost decreases and makes it an ideal candidate for compact electrical systems of the future. This project studies the characteristics of wideband semiconductors with a focus on GaN. A comparative study between the conventional Si MOSFET and GaN HEMT for DC-DC converters is presented. The importance of soft switching for switch mode converters is determined. Further, the design of a high power boost converter using GaN is done and verified experimentally. A single layer PCB is designed for an agnostic, application neutral converter and power density of this device is calculated. Finally, a case study of a design from 2019 is presented to understand the testing process and how a GaN based converter would be designed for a commercial photovoltaic application

Title: Smart Interactive Wearable Tracking Gadget for Alzheimer's Patient

Student Name and Exam Seat Number:

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Guided by: Prof. D. V. Niture

Abstract:

Alzheimer's Disease (AD) may be disconcerting and overwhelming for both caregivers and ones living with the disease. However, new technologies can help ease anxiety, establish routine, and improve the standard of life for everyone involved. The proposed Interactive device with face recognition technology can prove to be assisting in promoting AD patients an independent life, managing potential safety risks around them, and reducing stress. AD patients often struggle with recognizing members of the family, forget relationships, call members of the family by other names in the early and middle stages of Alzheimer's. The proposed device conducts face detection and recognition process to help AD patient recognize and remember name and relationship with the person coming to visit him/her. Location tracking is a great way of ensuring patient's safety from a distance. The proposed device is worn and used for tracking and let a caregiver know if the patient has left a certain area by accessing location information through a mobile application. This type of technology is also built to alert emergency personnel to ensure a safe and speedy recovery. The device also assists the patients with real-time medicine reminders, these reminders are recorded on the device and then played back out loud at the appropriate time. Research shows that people with Alzheimer's can recall how an event has made them feel, even if they are no longer able to remember faces and names, and hence a mobile application is built to keep their mind active by solving puzzles to retain thinking skills and slow the memory loss. Aids to assist in the day to day social interactions may be important to enhance the standard of life for Alzheimer's patients and hence the proposed device proves to be the solution.

Title: IoT ENABLED SMART SHOPPING TROLLEY SYSTEM

Student Name and Exam Seat Number:

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Guided by: Asst.Prof.Y.M.Vaidya

Abstract:

As the technology is constantly evolving and everyday there are new inventions in various fields including machine learning, artificial intelligence, internet of things and so on, there is an increase in the expectations in the consumer point of view in retail shopping and supermarkets. In a typical large supermarket, the most common problem people face is the long queue at the billing counter with many customers standing up with their trolleys. With the fast moving lives, the consumers absolutely have no time to stand in long queues in order to get their billing done. In the times of Covid-19, it has become an utmost priority to reduce the queues at shopping malls/supermarkets and prevent people from crowding up at the billing counter. We are presenting a smart shopping system using Barcode Scanner, RFID ,Raspberry Pi controller. The shopping carts in the shopping malls are designed so that the customer can bill the products themselves by scanning the product on the barcode scanner (fixed on each trolley) before putting them into the trolley. The total summed up price of all products is displayed on the shopping cart so as to help customers plan their shopping strategy to match their budget. The scanned product's data is continuously sent to the cloud where it is stored in a database where there's a different table for each trolley. A master computer can track the items in each individual trolley for billing directly and can also check the status of each trolley. The system is also subjected to anti-theft management where the system doesn't let any customer take non-billed items.This anti-theft management is done by using a weight sensor with calculates the total weight of the trolley, while the microprocessor calculates the expected weight of the trolley using product data obtained from the cloud. If both the weights match (with some small margin of error tolerable), the trolley assumes that all the products have been scanned. If not, the trolley displays an error. The trolley is enabled and disabled for the shopping by the RFID tags present with the supermarket employees where each trolley has a unique RFID reader. The administration of all the shopping carts is done through the cloud. The microprocessor used also has its own power supply using batteries and proper circuits as defined.

Title: IMPLEMENTATION OF AN AGENT BASED MODEL FOR SHORTEST PATH FINDING USING AI PRINCIPLES

Student Name and Exam Seat Number:

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Guided by: Dr. Vanita Agarwal

Abstract:

With the advent of autonomous vehicles, the need for finding effective path search algorithms has become critical. Several machine learning algorithms/ neural networks / deep networks have been adopted for this purpose. However, the extensive amount of parameters and computations become a dominant problem in the deployment of these networks in occurrences of real time inference systems owing to the network latency induced due to cloud servers. In such cases, edge computation needs to be implemented. However, deploying such networks on edge computing devices proves to be a challenging task given the absence of high computation and memory capabilities at the edge devices. This issue can be resolved with the help of lightweight AI algorithms that are able to achieve the goal in comparatively less amount of computations. In this report, we aim to model a traditional path finding algorithm. Further we design and model a path finding algorithm using the principles of fractals and fractal decomposition. The modelling is done with the help of NetLogo IDE. The fractal decomposition algorithm has been implemented by decomposing the network into macro level and micro level. These can be decomposed into further levels. With increasing levels, the computation approaches the order of linearity. This report contains a detailed study of the theoretical background required for the implementation of these algorithms. Along with this, it contains a detailed analysis of the implementation and results of the algorithms. Further, an overview of the future work that could be performed on this topic is provided in the report.

Title: MICROSTRIP PATCH ANTENNA FOR 5G Mobile Application

Student Name and Exam Seat Number:

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Guided by: Mrs. Yogita Vaidya

Abstract:

5th generation (5G) mobile technology greatly enhances communication capabilities. This invention brings with it the need to build a high-quality antenna. Modern wireless communication systems require a low-profile, lightweight, high-efficiency and easily built antenna to ensure maximum reliability, mobility and efficiency. Therefore, Microstrip antennas are highly preferred because of their low profile, easy to operate, and easy feeding. These antennas are very useful and easy to use due to their ease of use and compliance to change their structure according to need and use. The CADFEKO software tool is used to design and compare the performance of the antennas and POSTFEKO software is used to study the operation of antenna designed by observing the various parameters like VSWR, reflection coefficient, gain, radiation pattern, current distribution, etc.. The results obtained were satisfying our needs.

Title: ADVANCED COMMUNICATION CRYPTOPROCES

Student Name and Exam Seat Number:

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Guided by: Dr. Vaishali Ingale

Abstract:

With the advent of modern computing and high amount of valuable data generation, with the help of powerful algorithms and computers, the security of this generated data becomes of paramount importance. Such massive data can be used for various applications, which may be significantly sensitive to several operation agencies, companies and even governments of different countries. Encryption algorithms have been very often and very easily implemented in high level programming languages like C++ or python. But these algorithms are prone to various types of software attacks. A software can always be hacked into. As mentioned earlier, with the modern computing technologies the technology available to the hackers is also ever increasing. Distributed denial-of-service attacks, man in the middle attack, phishing and spear phishing attacks are the very common software attacks encountered. Hence, in order to avoid such attacks, hardware cryptographic algorithms can be implemented and a design for the same can be made on the FPGA. Attacks are much less prone in case of hardware implemented algorithms. Hardware implemented algorithms are also faster than those implemented on software. With the help of powerful FPGAs, algorithms can be written and built with features like parallel processing and pipelining. Such designs can be later fabricated as chips and then used for encryption purposes. There are various aspects according to which a hardware implementation is better than a software implementation. First aspect is the overall robustness of the system, second aspect being the speed and last one being the efficiency of the system as a whole. When it comes to security of the data in an application as critical as satellite communication, there should not be any loopholes or backdoors in the implementation. It is not uncommon for a software-based system to be hacked. There have been instances where the security sites of the Pentagon were hacked (a site where robustness is given the utmost priority), and as these software systems can be hacked, we can never completely rely on software-based solutions. As any software implementation has the intrinsic property of being manipulated, tasks that are extremely critical and are best implemented using custom hardware. The use of custom hardware implementation also removes unnecessary overheads in processing, data conversion, etc., removing redundancies. This increases the overall speed

and responsiveness of the system. As many overheads are eliminated and only a specific task or tasks are to be carried out the implementation is much more efficient in terms of power consumption. Using such refinements and elimination of redundancies eliminate any unnecessary loopholes and increases the reliability of the system. These reasons are the motivation for implementing the encryption/decryption system using custom hardware (done in Verilog) as explained above. Cryptographic algorithms are classified into 2 major classes namely symmetric algorithms and asymmetric algorithms. Each of the two types of algorithms have their own advantages and disadvantages. So, this project deals with the demonstration of an asymmetric and a symmetric algorithm RSA and AES respectively. Both these algorithms have been implemented and tested on a FPGA. The synthesized design has been rigorously tested, which include STA (static timing analysis) test and chipscope pro tests (runtime analysis of output). The purpose of this project is targeted to applications that need transmission of data to be secure. This project proposes a methodology that involves use of symmetric and asymmetric key algorithms in tandem in order to make data transmission secure. The innovation of the methodology is not in making the key difficult to break because the system does not rely on a single key. Rather than the usual methodologies which are central in nature to a particular cryptographic algorithm and hence a key, this project has been implemented by making the system distributed and randomizing multiple processes. A key is fixed for a given communication session only and the data transmitted will be encrypted with a given key only once. This makes the entire process random in nature. One of the other important features of the secure communication of data between the satellite and the ground station is in case of time sensitive transaction of data from the satellite to the ground station, we hope to develop an algorithm to allow ground stations other than our own to receive the data from satellite – in encrypted format and only decode it at our ground station. This increases the scope of utilization of the system

Title: Design of Wideband Amplifier using CADENCE-CAD Tool

Student Name and Exam Seat Number:

1. Adwait Kiran Wakankar 141707013

Guided by: Dr. Vanita Agarwal

Abstract:

In this project I am designing a CMOS based Operational Amplifier using Cadence Virtuoso/ LT Spice 130nm CMOS Technology. Complementary metal oxide semiconductor technology is used for constructing integrated circuits. This technology is preferred to design OpAmp as CMOS devices are high noise immune and consume low static power. An operational amplifier is a DC-coupled high-gain electronic voltage amplifier with a differential input and usually, a single-ended output. Operational amplifiers used to perform mathematical operations in many linear, non-linear and frequency-dependent circuits. Op-amp is widely used as a building block in integrated circuits is due to its versatility. The targeted OpAmp has very high Open Loop Gain around 2500 and its High Speed OpAmp that is it will work at high frequencies. Unity gain bandwidth of OpAmp is targeted around 500MHz. As we are using 130nm technology it will have power source of 1.2V only and has less power consumption. This can have numerous high speed applications as in medical field as well as in Telecommunication field.

Title: SEED THE RISE-ANALYSIS AND STRENGTHENING OF SYSTEM FOR AGRICULTURAL DEVELOPMENT

Student Name and Exam Seat Number:

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Guided by: Prof. Ashwini Kulkarni

Abstract:

In this system we make profitable decisions that farmers need throughout the entire farming cycle and also provide them with adequate information needed for the monitoring of all agricultural parameters. The parameters include soil condition monitoring, crop health and disease monitoring system. A plant disease diagnosis method that can be implemented with the resources of a mobile phone application, that does not have to be connected to a remote server, is presented and evaluated. It can be used both by amateur gardeners and by professional agriculturists for early detection of diseases. The features used are extracted from photographs of plant parts like leaves and include the color, the relative area and the number of the lesion spots. These classification features, along with additional information like weather metadata, form disease signatures that can be easily defined by the end user (e.g., an agronomist). These signatures are based on the statistical processing of a small number of representative training photographs. The extracted features of a test photograph are compared against the disease signatures in order to select the most likely disease. An important advantage of the proposed approach is that the diagnosis does not depend on the orientation, the scale or the resolution of the photograph. The experiments have been conducted under several light exposure conditions. The database consists of various plant diseases and then output will be predicted with optimum accuracy. We use Convolution Neural Network (CNN) which comprises of different layers which are used for prediction. It also provides the cure and preventive measures to be taken

Title: An Autonomous Grapes Harvesting Robot.

Student Name and Exam Seat Number:

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Guided by: Prof. Mukul S. Sutaone

Abstract:

In Field of agriculture, the cultural manual inspection still remains as a time consuming and tedious work along with the high error factor. Autonomous harvesting robots offer a solution to reducing labor costs and performance inconsistency, optimizing harvest scheduling, and increasing operational efficiency. These attributes allow farmers to maximize production efficiency and profits. In our project, the aim is to design and develop an automatic robotic system to detect , localize grape clusters and furthermore we extend this in harvesting of grapes by calculating the cutting point of the grape clusters. We are using a [4] Faster R-CNN framework for training our model on Embrapa 1 WGISD (Wine Grapes Instance segmentation data set) We have modified this dataset and converted 5 classes to one (Grapes) class. Initially, the idea is to train and test our model on the data set. After successful testing , the trained model would be deployed on NVIDIA Jetson Nano. Finally testing the robotic system on trained model.
