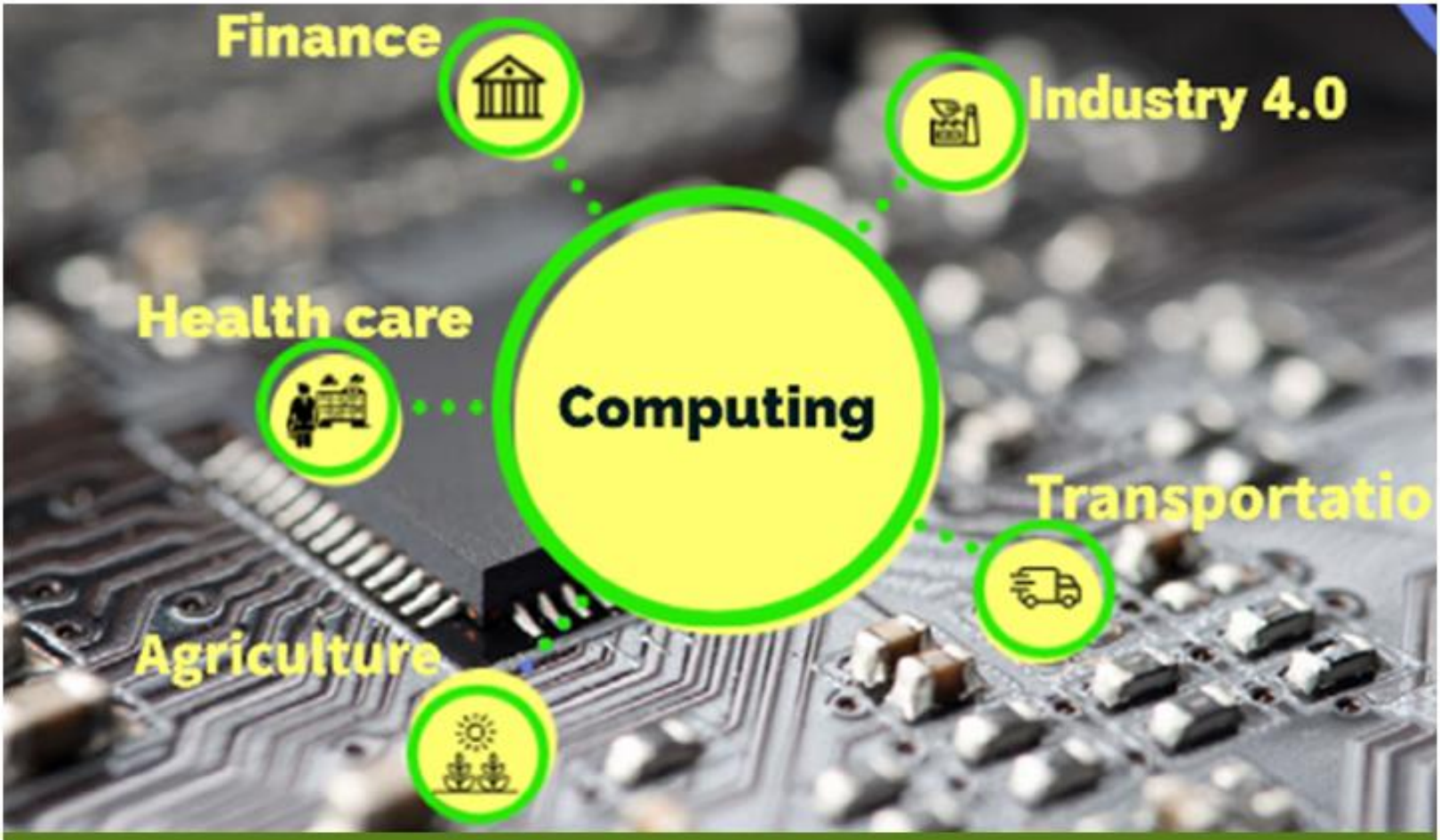
UET Taxila

Computer Engineering Projects Booklet



Learn the Skills

Develop 40 Projects

Gain Intensive Hands-on Experience

Table of Contents

CONTENTS

SEMESTER – I

Dr. Sanay Muhammad Umar Saeed

Dr. Sanay Muhammad Umar Saeed
PhD (UET Taxila, Pakistan)
Lecturer,
Department of Computer Engineering,
University of Engineering and Technology, Taxila,
Pakistan.
Email: sanay.muhammad@uettaxila.edu.pk
Phone: +92 3149503025

Dr. Sanay Muhammad received his PhD in Computer Engineering from University of Engineering and Technology (UET) Taxila, Pakistan in 2020. He is currently serving as a Lecturer at Department of Computer Engineering, UET Taxila and a member of Signal, Image, Multimedia Processing and Learning (SIMPLE) research group. He is also the secretary of Artificial Intelligence and Multimedia Systems (AIMS) Laboratory at Department of Computer Engineering. He has organized many university events like open houses and orientation ceremonies. His research interests include EEG-base brain computer interface, emotion recognition, artificial intelligence, and machine learning. He has over ten years teaching experience. His taught courses include Computing Fundamentals, Internet of Things, Ubiquitous Computing, and Intelligent Systems

Bird Shooter Game

Computing Fundamentals

Instructor: Dr. Sanay Muhammad

Features

- Bird Shooter game is an interesting game in which the aim is to shoot as many birds in a limited time
- For each hit, the score of the user will be incremented
- Motion, drawing, looks, sound, procedures, variables, decisions and repetition are some key game programming concepts that are used in this game

Block Diagram

Tools Used

SCRATCH

- Scratch is a high-level block-based visual programming language and website
- Users on the site, called Scratchers, can create projects on the website using a block-like interface

CloudDB Chat App

Computing Fundamentals

Instructor: Dr. Sanay Muhammad

Features

- This app is a simple app that uses the CloudDB component to store data in the cloud and allows multiple users of the app to communicate over multiple devices.

Components of the App

Drawer	Component	Name	Property	Setting
User Interface	Label	Label1	Text	"Enter your name to join"
Layout	Horizontal Arrangement	Horizontal Arrangement1	Width Align Horizontal	"Fill Parent" "Center: 3"
User Interface	TextBox	TextBox1		

MIT APP Inventor

MIT APP INVENTOR

- MIT App Inventor is an intuitive, visual programming environment that allows everyone to build fully functional apps for Android phones, iPhones, and Android/iOS tablets

Engr. Asim Raza

Engr. Asim Raza
MSc (UET Taxila, Pakistan) BSc (CIIT Wah, Pakistan)
Lecturer,
Department of Computer Engineering,
University of Engineering and Technology, Taxila,
Pakistan.
Email: asim.raza@uettaxila.edu.pk
Phone: +92 51 9047596

Engr. Asim Raza received BSc. in Computer Engineering with honors from COMSATS Institute of Information Technology, Pakistan in 2009, MSc in Image Processing from the University of Engineering and Technology Taxila, Pakistan in 2014, and presently doing PhD in Computer Vision from the University of Engineering and Technology Taxila, Pakistan. He is currently a Lecturer at Department of Computer Engineering. His research interests include image processing, Computer vision and activity recognition.

CONTROLLING SOLAR ENERGY

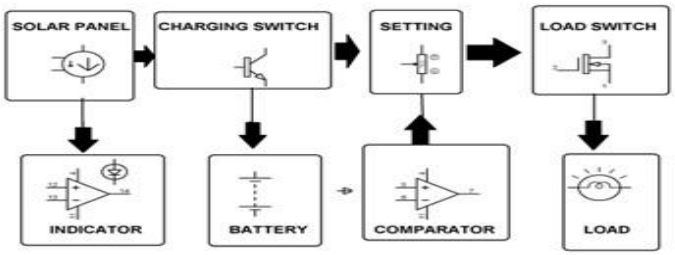
SUBJECT: BASIC ELECTRICAL ENGINEERING
COMPLEXITY LEVEL: MEDIUM

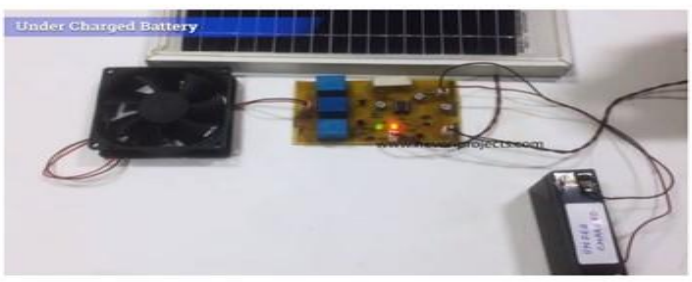
Components

- Solar Panel
- Load
- Battery
- Indicator
- Resistors
- Capacitors
- Transistors
- Diodes
- PCB and Breadboards
- LED
- Transformer/Adapter
- Push Buttons

Block Diagram

The project allows for battery charging system from a solar panel. With the help of the solar panel the solar energy is converted into electrical energy through photo-voltaic cells. The system is beneficial for storing the energy for night time use. The project even controls the charging





Features

- Battery status indication using LEDs
- Cut off the load when it gets overcharged or is undercharged
- Constantly monitors the parameters like panel voltage, load current etc

Project-2: Solar Powered Garden Light

SOLAR POWERED GARDEN LIGHT

SUBJECT: BASIC ELECTRICAL ENGINEERING

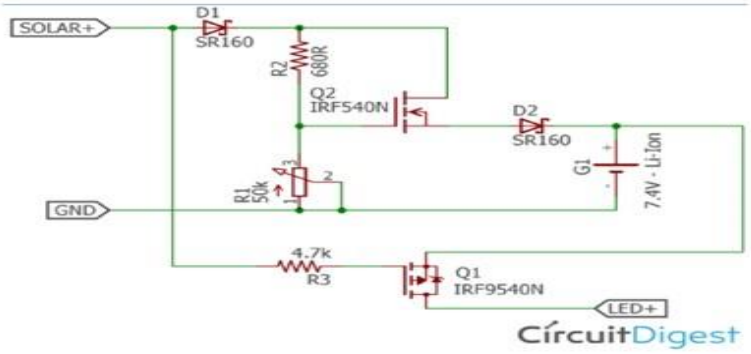
COMPLEXITY LEVEL: MEDIUM

Components

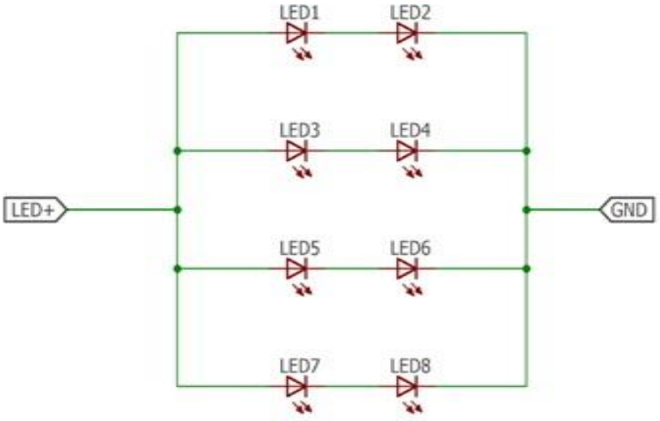
- Lithium battery 7.4V
- LEDs with 3.5V forward voltage
- IRF9540N – P channel Mosfet
- IRF540N – N Channel Mosfet
- SR160 Schottky diode 2 pcs
- 680R resistor
- 50k potentiometer
- 4.7k resistor
- Solar Panel 15 – 18V with more than 300mA current rating if a 3600mAH battery is selected.

Circuit Diagram

- The Construction makes use of common electrical components like diode, resistors, and transistors.
- Divided into two components
- Designed to work in both light and dark



.



Applications

- Can be used in areas with high amounts of sunlight
- Perfect for implementation in streetlights to save energy
- Can be automated with a switching mechanism via a controller.

SEMESTER - II

Engr. Noshina Ishaaq

Engr. Noshina Ishaque
MSc and BSc (UET Taxila, Pakistan)
Lecturer,
Department of Computer Engineering,
University of Engineering and Technology, Taxila,
Pakistan.
Email: noshina.shamir@uettaxila.edu.pk
Phone: +92 51 9047582

Engr. Noshina Ishaque received BSc. in Computer Engineering from University of Engineering and Technology (UET) Taxila, Pakistan in 2008, MSc in 2012 respectively. She is currently a Lecturer at Department of Computer Engineering, UET Taxila and Class Advisor of First year and also member of departmental Internship committee. Her research interests include Internet of Things (IoTs) and Network security.

Obstacle Avoiding and Metal Detector Robot

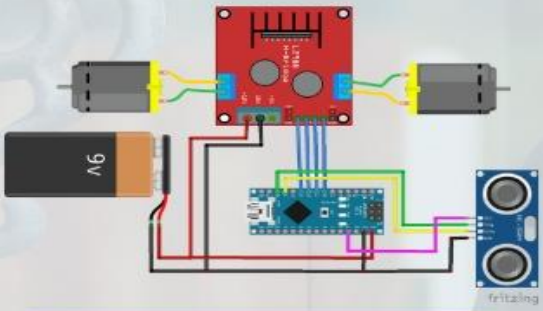
Digital Logic and Design

Instructor: Engr. Noshina Shamir

Complexity Level: Advance

Components Required

- Arduino UNO
- HC-SR04 Ultrasonic Sensor
- LM298N Motor Driver Module
- 5V DC Motors
- TDA0161 Proximity Detector IC
- 5 KΩ Potentiometer
- 5V Buzzer
- Coil (copper wire of 26 – 30 AWG)
- 5mm LED
- 2N2222A (NPN Transistor)



Circuit diagram

Circuit Diagram of this robot consist of Arduino UNO board, Ultrasonic sensor, DC motors, motor driver and power supply. This robot consist of another circuit for metal detection that consist of proximity IC, Buzzer, Led, transistor and coil.

Features

- Ultrasonic sensor based obstacle detection
- Automatic moving system
- On board motor driver
- Battery operated robot car
- High Sensitivity to Detect all Types of Metallic Land mines and Scrap
- Simplified Indicators

Applications

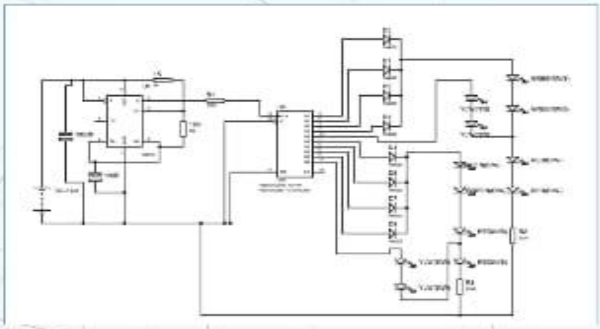
- Obstacle Avoiding metal detector robot is used for defense purpose.
- It will detect land mines in Battle field this will help in saving soldier's life .
- It will also used for research purpose by detecting ancient metallic things under soil.
- It will detect underground pipelines.

Project-2: Four Way Traffic Light Control System

Four Way Traffic Light Control System
Instructor: Noshina Ishaque
Subject : Digital Logic Design
Complexity Level: Basic

Components

- 555 Timer IC
- CD4017 Decade Counter IC
- 4,4 piece of RED YELLOW &GREEN LED
- IN 4007 Diodes (8 pieces)
- 1kohm,10kohm and 220 ohm resistors
- 100uF Capacitors (2pieces)
- 9V Battery

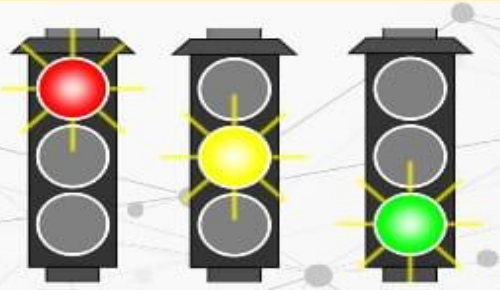


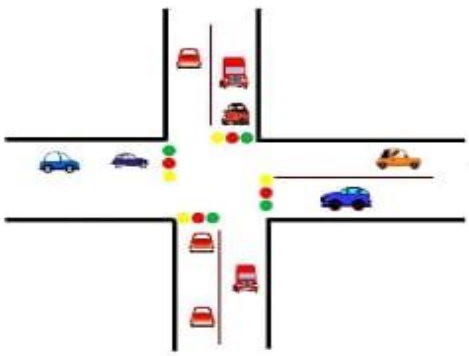
Circuit Diagram

Here we are using timer IC555 to produce pulse based on timing resistors and capacitors. The produced pulse is fed into counter IC CD4017. Clock input this counter integrated circuit count pulse and changes the output lines logic into HIGH or LOW, by connecting proper color LED at this IC output, thus we can obtain traffic signal light.

Features

This Project is made with the Help of timer IC 555 and counter IC CD4017.This traffic light setup has three colors i.e RED for STOP, YELLOW for WAIT and GREEN for GO. These signals change after some specific time intervals.





Applications

Traffic Signals are widely used around the globe. They Help people in travelling by providing orderly movement of vehicles, improved safety, reduced travel times and increasing the amount of time a traffic intersection can handle. These signals also reduces the risk of accidents caused by inappropriate judgement of drivers.

4-Bit ALU (Arithmetic Logic Unit)

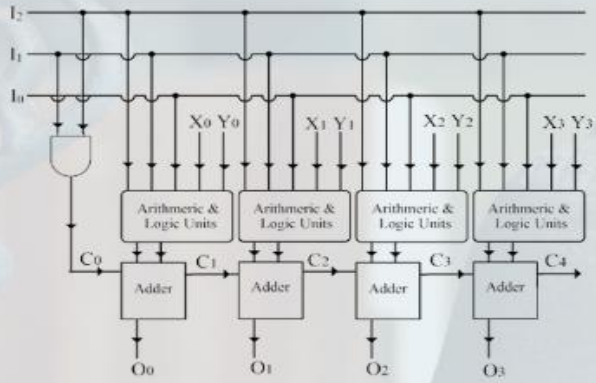
Digital Logic Design

Instructor: Engr. Noshina Ishaque

Complexity Level: Basic

Components Required

- 7 segments Led Display
- Matrix Keypad
- Integrated Circuits
- Breadboard
- 9 V Battery



Circuit Diagram

ALU is building block of CPU that is capable of performing basic Arithmetic and bit of logical operations. Here we have made 4 bit ALU that can manipulate number ranging from 0-15.

Features

- Provides 16 arithmetic operations: add, subtract, compare, double, plus twelve other arithmetic operations
- Provides all 16 logic operations of two variables: exclusive-OR, compare, AND, NAND, OR, NOR, plus ten other logic operations

Application

- Major application of ALU is in CPU also being used in embedded system to perform basic calculations.
- It performs Bit Shifting Operations Arithmetic operations Logical operations(AND,NAND etc)

Dr. Afshan Jamil

Dr. Afshan Jamil
PhD (UET Taxila) MSc (UET Taxila) BSc (UET Taxila)
Assistant Professor,
Department of Computer Engineering,
University of Engineering and Technology, Taxila,
Pakistan.
Email: afshan.jamil@uettaxila.edu.pk
Phone: +92 51 9047588

Dr Afshan Jamil is currently working as an Assistant Professor in the Department of Computer Engineering, University of Engineering & Technology Taxila. She was awarded Governor Gold medal in Bachelor of Computer Engineering for overall first position. She completed her Master's degree in Computer Engineering. She completed her Ph.D. degree in 2020 with research in Multimedia and Image Processing. She has supervised four postgraduate projects as part of Signal Image Multimedia Processing and LEarning (SIMPLE) and Centre for Computer Vision Research (C2VR) in UET Taxila. She is also actively collaborating with national and internationally well-reputed researchers being part of these research groups. Her areas of interest are image and video retrieval, visual saliency, image compression, object detection and artificial intelligence.

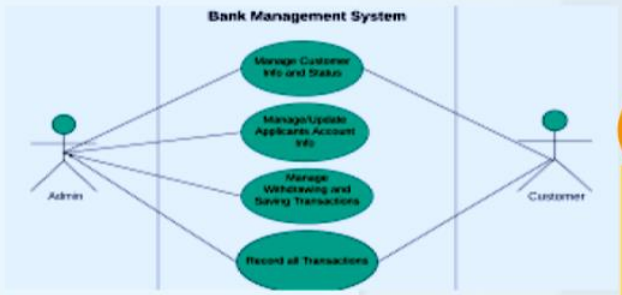
Bank Management System

Computer Programming

Instructor: Dr. Afshan Jamil
Complexity Level: Basic

Tools used

- Visual Studio 2022
- Dev C++



Block diagram

Block diagram of bank management system is very simple. It simply shows roles and responsibilities of customer and admin.

Features

- The bank management system is a program that keeps track of a person's bank account.
- The system allows customers to create accounts, deposit/ withdraw money from their accounts, and examine reports for all of their accounts.

Applications

- It will help customer to manage their account and transactions without physically visiting the bank.
- It will help the bank staff to do customer and bank related task efficiently and effectively.

Sudoku Game

Computer Programming

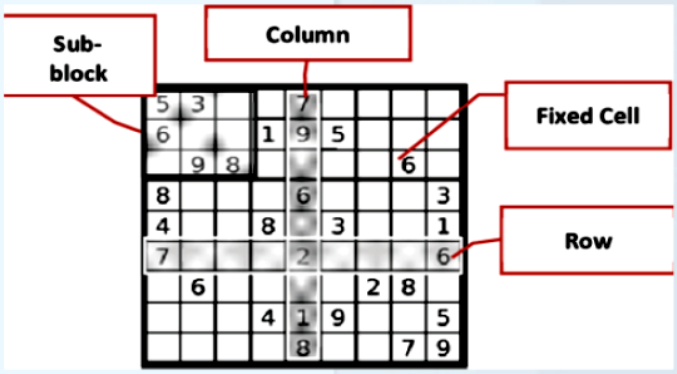
Instructor: Dr. Afshan Jamil
Complexity Level: Basic

Tools used

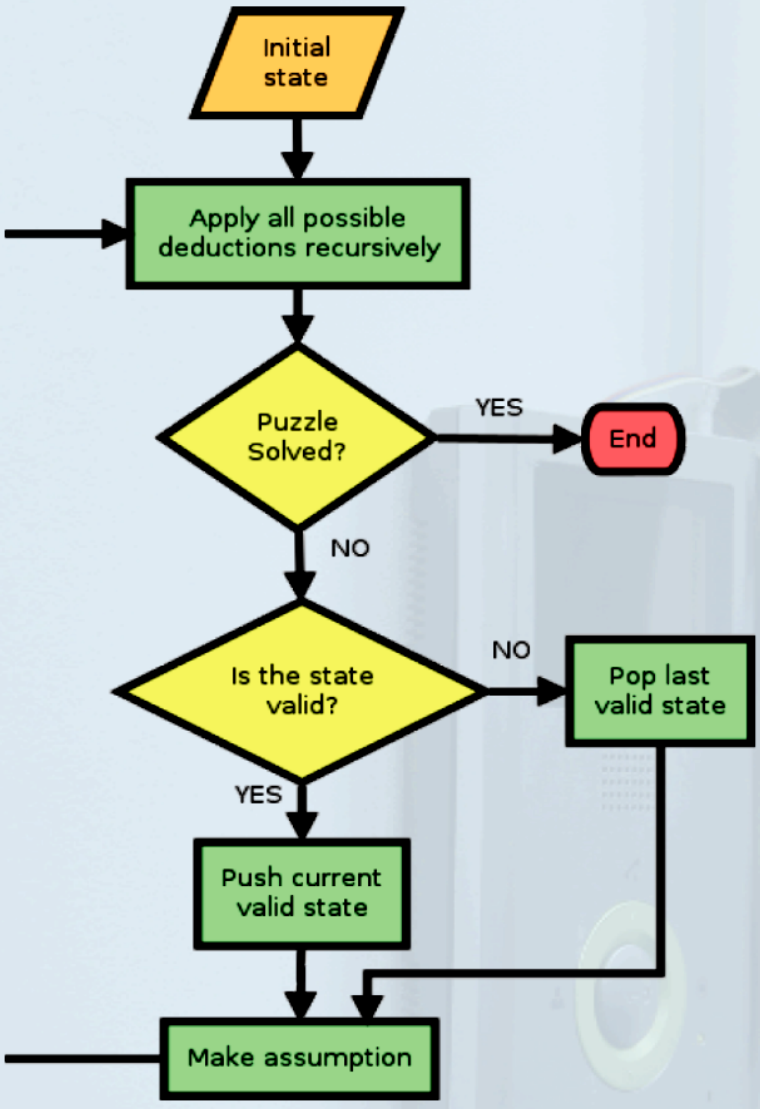
- Visual Studio 2022
- Dev C++

Features

- Sudoku is a logic-based combinatorial number-placement puzzle game.
- The goal of Sudoku is to fill a 9×9 grid with numbers so that each row, column and 3×3 section contain all of the digits between 1 and 9.
- It is an excellent brain game.



Block diagram



Word Puzzle Game

Computer Programming

Instructor: Dr. Afshan Jamil
Complexity Level: Basic

Tools used

- Visual Studio 2022
- Dev C++

Features

- a puzzle consisting of a grid of squares and blanks into which words crossing vertically and horizontally are written according to clues.

Applications

- This game is a healthy way to spend free time.
- It helps in increasing brain activity.
- It helps in increasing vocabulary.
- It is inexpensive requiring only your brain.

Engr. Asim Raza

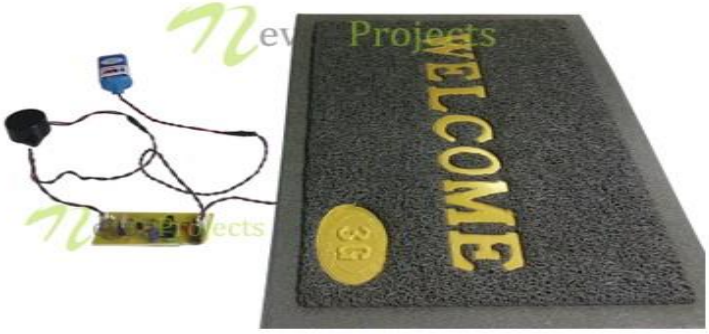
Engr. Asim Raza
MSc (UET Taxila, Pakistan) BSc (CIIT Wah, Pakistan)
Lecturer,
Department of Computer Engineering,
University of Engineering and Technology, Taxila,
Pakistan.
Email: asim.raza@uettaxila.edu.pk
Phone: +92 51 9047596

Engr. Asim Raza received BSc. in Computer Engineering with honors from COMSATS Institute of Information Technology, Pakistan in 2009, MSc in Image Processing from the University of Engineering and Technology Taxila, Pakistan in 2014, and presently doing PhD in Computer Vision from the University of Engineering and Technology Taxila, Pakistan. He is currently a Lecturer at Department of Computer Engineering. His research interests include image processing, Computer vision and activity recognition.

Visitor Sensing Welcome Mat

SUBJECT: CIRCUIT ANALYSIS

COMPLEXITY LEVEL: MEDIUM

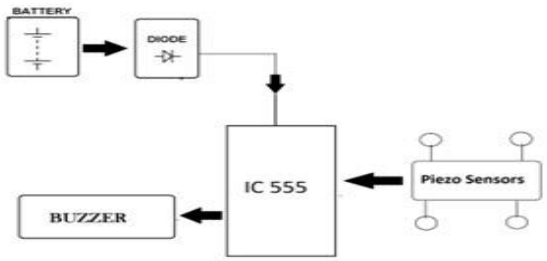


Components

- Piezoelectric Sensor
- 555 IC
- Resistors
- Capacitors
- Transistors
- Cables and Connectors
- Diodes
- PCB and Breadboards
- LED
- Transformer/Adapter
- Push Buttons
- Switch

Block Diagram

How smart is your doormat? Is it just a simple carpet used only for wiping feet before coming inside? Doormat should do a lot more than that. So here we have made an project which notifies you when any guest or visitor steps at doormat.



FEATURES

- No need of door bell for visitors
- Actively monitor any time whether there's a change in pressure from someone or something standing or sitting on the Mat.
- It's a weight touchy layer of smart foam that you can set under your doormat

Project-2: Power Efficient Mini Inverter

Power Efficient Mini Inverter Project

SUBJECT: CIRCUIT ANALYSIS
COMPLEXITY LEVEL: MEDIUM

Components

- Resistors
- Capacitors
- Transistors
- Cables and Connectors
- Diodes
- PCB and Breadboards
- LED
- Transformer/Adapter
- Push Buttons
- Switch
- IC
- IC Sockets

Block Diagram

The Inverters are widely used in the domestic as well as industrial environments to serve as second line of source in case of power cut form the electricity utility grids. Inverter is the device that powers the electric appliances in the event of the power failure. Inverter as the name implies first converts AC to DC for charging the battery and then inverts DC

Features

- Power efficient inverter
- Small in size and which can give output voltage of 220v-230
- This power efficient mini inverter can be used to power up devices such as Wifi routers, mobile chargers, Lights

SEMESTER – III

Dr. Romana Farhan

Dr. Romana Farhan
PhD Computer Engineering, MSc Computer Engineering, BSc Computer Engineering from UET Taxila.
Assistant Professor,
Department of Computer Engineering,
University of Engineering and Technology, Taxila,
Pakistan.
Email: romana.farhan@uettaxila.edu.pk
Phone: +92 51 9047589

Dr. Romana Farhan received her B.Sc. Engineering and M.Sc. Engineering degrees in Computer discipline with distinctions from the University of Engineering and Technology Taxila Pakistan, in 2008 and 2011, respectively. She completed her Ph.D. degree from the same department in 2020 and published various impact factor papers in well reputed journals. Along with her higher education, she continued doing job in the engineering profession. She started her career from Wah Engineering College (WEC) where she joined as Lecturer. In 2008, she joined Computer engineering department of UET TAXILA where she is currently working as Assistant Professor. Her research interests include network security, cryptography, and reliability with focus on e-health applications. She has published many journal and conference papers in these areas.

AUTOMATIC CERTIFICATE GENERATION USING MATLAB

Course: Computer Applications In Engineering Design
Instructor: Dr. Romana Farhan

DESCRIPTION

Educational institutions and companies use specialised tools for report cards and certificates generation on a large scale. This project can be used to generate report cards and certificates automatically.

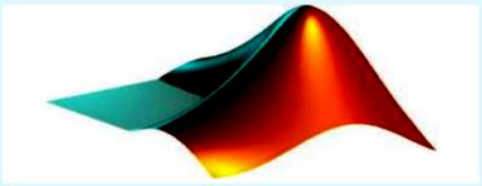
FEATURES

Analysis and presentation of large data sets is a tedious task in applications such as Big Data, IoT and sensors-actuators modelling. The project presented here can be extended and customized for analysis and reports generation in these applications.

APPLICATIONS

Applications of this project includes:

- Documents Generation
- Result Cards
- Certificates
- Reports



TOOLS

- MATLAB
- MS EXCEL

PROJECT DIAGRAM

Project-2: MATLAB Image Editor

MATLAB
IMAGE EDITOR

Course: Computer Applications In Engineering Design
Instructor: Dr. Romana Farhan

Description

Image processing is the technique to convert an image into digital format and perform operations on it to get an enhanced image or extract some useful information from it. Changes that take place in images are usually performed automatically and rely on carefully designed algorithms.

Features

Image conversion into digital form.
Histogram analysis
RGB to grey scale conversion.
Image Filtering

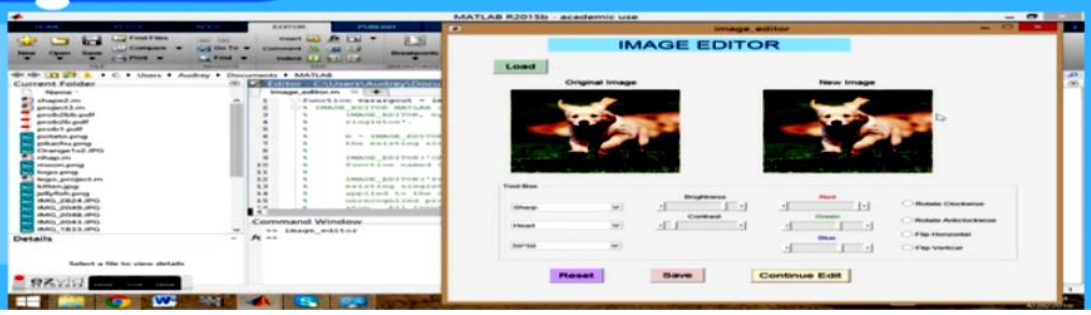
Applications

The need to extract information from images and interpret their content has been the driving factor in the development of image processing. Image processing finds use in numerous sectors, including medicine, industry, military, consumer electronics and so on.

Tools

In MATLAB, the IPT is a collection of functions that extends the capability of the MATLAB numeric computing environment. It provides a comprehensive set of reference-standard algorithms and workflow applications for image processing, analysis, visualisation and algorithm development.

Project Diagram



Project-3: MATLAB GUI Based Scientific Calculator & DE Solver

MATLAB GUI Based Scientific Calculator and Differential Equation Solver

Course: Computer Applications In Engineering Design
Instructor: Dr. Romana Farhan

Description

In this project a GUI based scientific calculator and differential solver will be designed in MATLAB. A graphical user interface(GUI) is a pictorial interface to a program. A good GUI can make programs easier to use by providing them with a consistent appearance and intuitive controls. GUI should behave in an understandable and predictable manner.

$$\frac{dy}{dx} + P(x)y = Q(x)$$

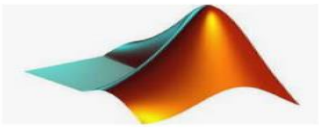
Features

Project will be able to perform/solve,

- Arithmetic Calculations
- Square roots and Under roots
- First Order Differential Equation
- Other Scientific & Numerical Calculations.

Applications

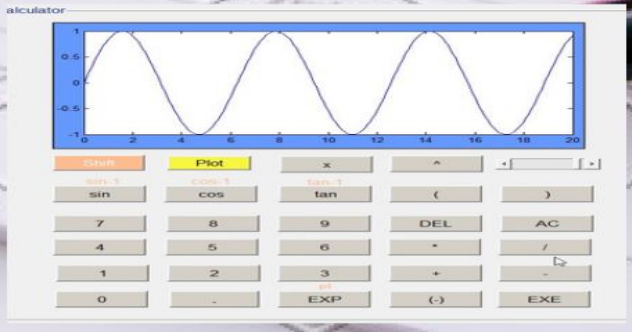
Mathematics
Computing
Numerical Analysis

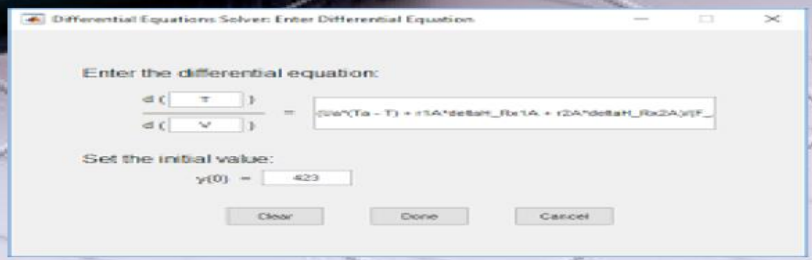


Tools

MATLAB will be used to write code and desgining Graphical User Interface.

Project Diagram





SEMESTER - IV

Engr. Sharoon Saleem

Engr. Sharoon Saleem
PhD (Currently enrolled, UET Taxila), MSc & BSc (UET Taxila, Pakistan)
Lecturer,
Department of Computer Engineering,
University of Engineering and Technology, Taxila,
Pakistan.
Email: sharoon.saleem@uettaxila.edu.pk
Phone: +92 51 9047596

Engr. Sharoon Saleem received the B.Sc. Degree in Computer Engineering and the M.S. degree from the University of Engineering and Technology, Taxila (UET Taxila), in 2007 and 2015, respectively, where he is currently pursuing the Ph.D. degree. He has served in the Industry in International Tech Companies and has played his part in Development/ Technical Support Operations as well. He is currently working as a Lecturer with the Computer Engineering Department, UET Taxila. He had been involved in various projects in the domain of Embedded System Design/ Web Application Development in his career. His research interests include Network on Chip (NoC), Fault Tolerant Systems, and Reconfigurable System Designs. He is also working on the low-complexity and low-cost Optimized Application Mapping Techniques for Multicore Platforms.

Project-1: IOT Based Remote Patient Monitoring System

IOT-BASED REMOTE PATIENT MONITORING SYSTEM

SUBJECT : MICROPROCESSORS AND INTERFACING
INSTRUCTOR : ENGR. SHAROON SALEEM
COMPLEXITY LEVEL : ADVANCED

Description

When we are talking about major vital signs of a human body, there are four major parameters that we need to be aware of, they are body temperature, heart rate, breath rate, blood pressure, and due to COVID, oxygen saturation has become a major parameter to be monitored as well. For this purpose, IoT based remote patient monitoring System would be developed.

Features

This system consists of a simple Arduino Nano 33 IoT-based device with multiple sensors. The device can measure some vital parameters of the human body. The device will be like a multi-para monitor that you see in ICUs, a lot simpler and made of low cost sensors to be used in medical industry.

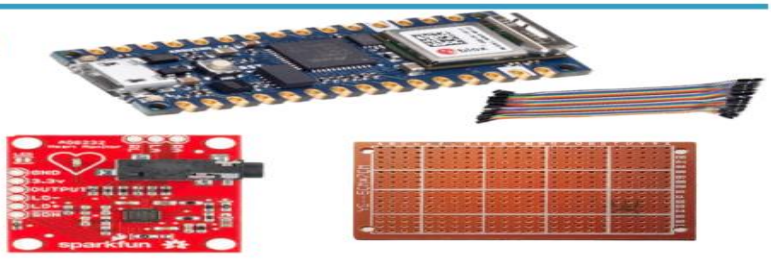
Applications

Medical conditions that can be managed through Remote Patient Monitoring(RPM) include:

- Diabetes
- Dementia
- Heart Disease

Components Required

- Arduino Nano 33 IOT
- MLX90614
- AD8232 (Heart Rate Monitor)
- MAX30100
- Audio (optional)
- Perfboard
- Jumper Wires.



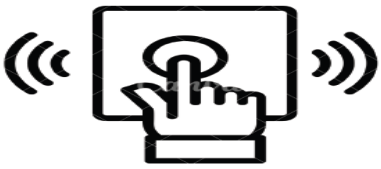
System Diagram

The system consists of various sensors that collect data, the sensors are interfaced with microcontroller board which is used to send the gathered data to the remote location such as to the medical specialists and the care taker.

Project-2: Smart Door-Bell

SMART DOORBELL

SUBJECT: MICROPROCESSORS AND INTERACING
INSTRUCTOR: ENGR SHAROON SALEEM
COMPLEXITY LEVEL: ADVANCED



Description

Nowadays, Security system is one of the most researched fields and with increasing security threats, companies are launching new smart security products to combat these threats. Internet of things(IoT) is an added advantage in this field which can automatically trigger an event, like calling the police, fire brigade or your neighbor, in case of any emergency. Here, we will use ESP32 and camera to build a Smart Wi-Fi doorbell.

Features

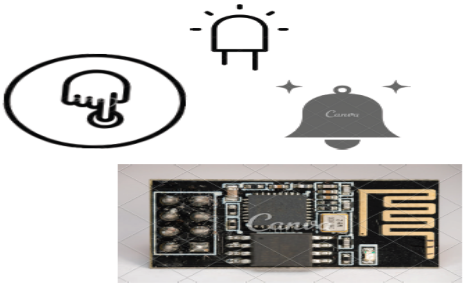
- Wireless connectivity
- Audio/ Video Streaming
- Compact
- Low cost
- Low Power

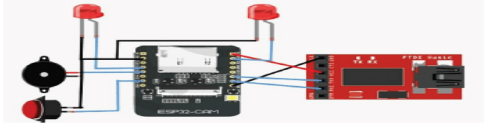
Applications

- Innovative Smart doorbell provides high-quality audio and video streaming, wireless connectivity.
- It lets home owner use a smartphone app to view the visitor by using the doorbell's built-in high-definition camera from a remote location.

Components Required

- ESP32-CAM
- FTDI Programming Board
- 220V AC to 5V DC Converter
- Buzzer
- Push
- Button
- LED (2)





Circuit Diagram

The project consists of ESP32 interfaced with a camera and a Wi-Fi module. The circuit consists of LEDs, a push button and a buzzer connected to ESP32 GPIO pins. Network LED will be in a high state if ESP is connected to a network otherwise, it will blink.

Project-3: Smart Drip Irrigation System

SMART DRIP IRRIGATION SYSTEM

SUBJECT: MICROPROCESSORS AND INTERFACING
INSTRUCTOR: ENGR. SHAROON SALEEM
COMPLEXITY LEVEL: INTERMEDIATE

Description

Smart Watering/ drip irrigation is a cloud – connected hardware that automates irrigation in the orchard and puts the irrigation and fertilization on autopilot eventually saving time and money for developing the farm business to the next level. Outdoor water savings can be achieved using smart irrigation technologies.

Features

Smart irrigation controllers use external information like weather data and/or soil moisture to determine the frequency and length of watering cycles. Controllers receive frequent updates on weather or soil moisture and adjust watering schedules, accordingly.

Applications

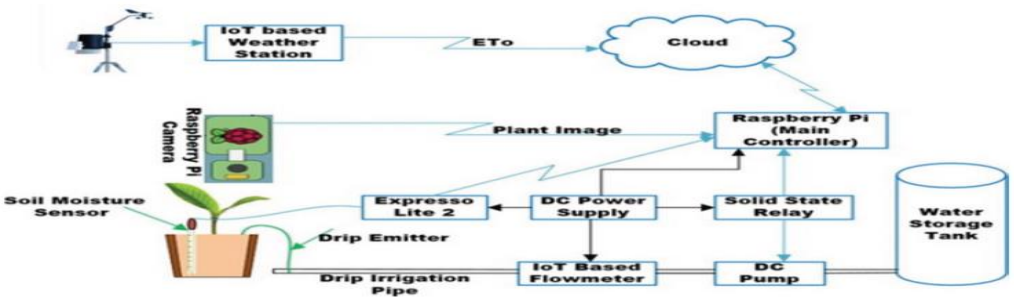
The system consists of smart platform of IoT and solenoid valves to control the flow of water based on the moisture of the soil and gives real-time surveillance to the owners who stay far away from the farms.

Components Required

- Soil Moisture Sensor
- Temperature Sensor
- Humidity Sensor
- Rain drop sensor
- Raspberry pi 3 or any other Microcontroller
- DC motor pump

Block Diagram

The moisture, wind and temperature-based sensors are interfaced with the microprocessor-based board. The irrigation is carried out by the designed hardware system based on the state of the environmental conditions acquired by sensors.



Engr. Muhammad Tariq Javed

Engr. Muhammad Tariq Javed
PhD (In Progress) (UET Taxila) MSc (UET Taxila) BSc (COMSATS, Wah)
Lecturer,
Department of Computer Engineering,
University of Engineering and Technology, Taxila,
Pakistan.
Email: tariq.javed@uettaxila.edu.pk
Phone: +92 51 9047596

Engr. Muhammad Tariq Javed received BSc. in Computer Engineering from COMSATS Institute of Information Technology Wah Cantt, Pakistan in 2009, MSc in Computer Engineering from UET Taxila, Pakistan in 2014. He is currently a Lecturer and PhD Scholar in Computer Engineering Department UET Taxila, Pakistan. His research interests include Sentiment analysis, Emotional Chat Machines, Conversational AI Chatbots and Automatic Speech Recognition Systems.

Conversational AI Chatbot

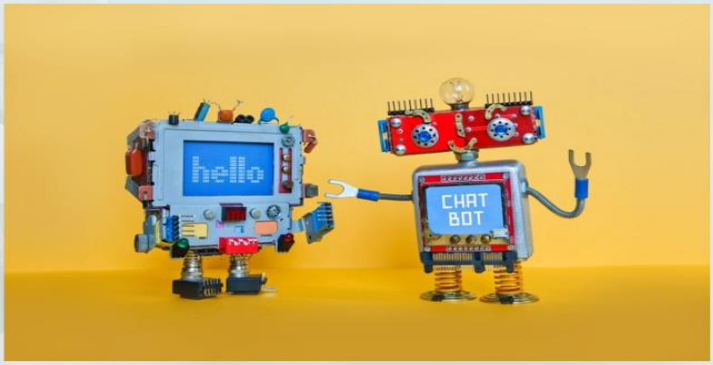
Discrete Structures

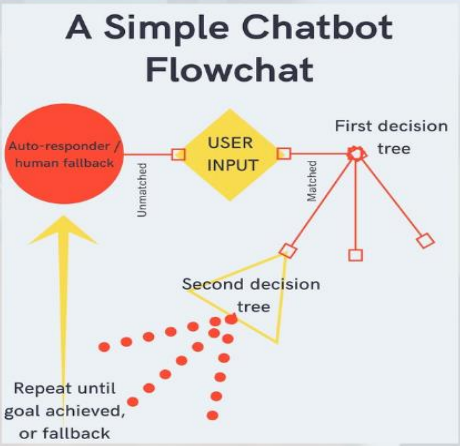
Instructor: Engr. Muhammad Tariq Javed

Complexity Level: Advanced

Tools

- Python
- NumPy
- TensorFlow



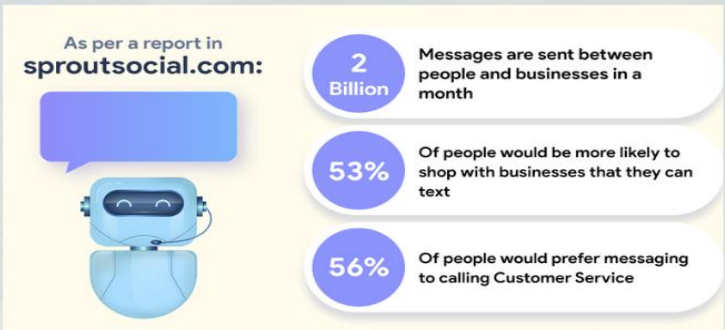


A Simple Chatbot Flowchart

Typically, all the chatbots we build have autoresponders, fallbacks, and eventually a human fallback. An autoresponder is a message that simply welcomes the new users and shows a series of keywords or commands they can use.

Features

- Conversational AI Chatbot is a type of virtual agent that enables consumers to interact with computer applications the way they would with other humans.
- Conversational AI has primarily taken the form of advanced chatbots, or AI chatbots that contrast with conventional chatbots.



Application

Now that we have covered the basic benefits of chatbots, let's take a look at specific use cases in each industry.

- Retail and e-commerce.
- Travel and hospitality.
- Banking, finance, and fintech.
- Healthcare.
- Media and entertainment.
- Education.

Huffman Encoder/Decoder

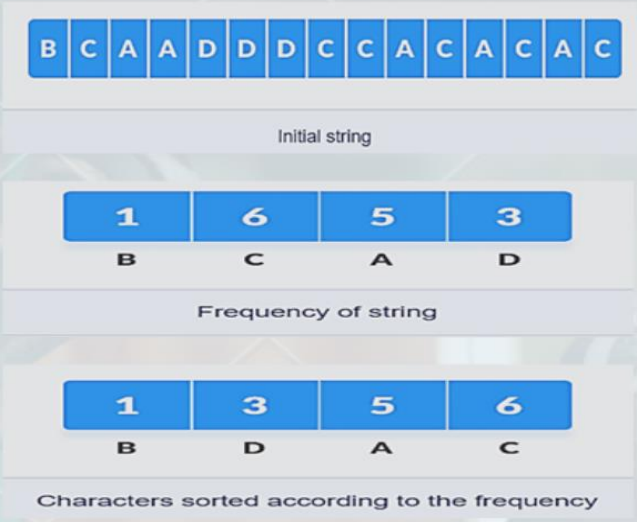
Discrete Structures

Instructor: Engr. Muhammad Tariq Javed

Complexity Level: Beginner

Tools

- Python
- C/C++
- JavaScript



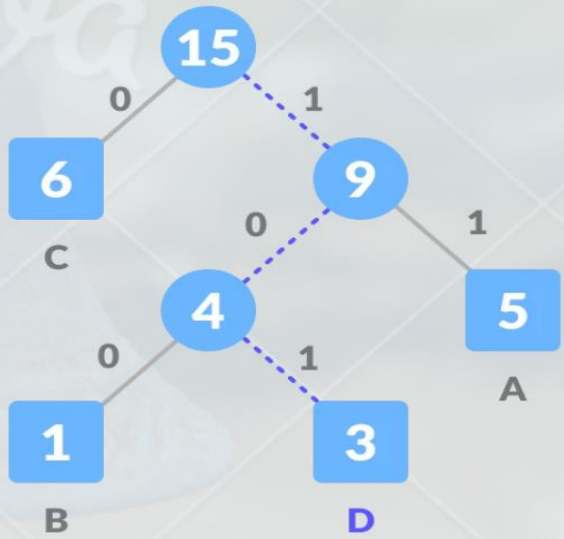
Huffman Algorithm

Step 1: Get Frequencies – Scan the file to be compressed and count the occurrence of each character – Sort the characters based on their frequency.

Step 2: Build Tree & Assign Codes – Build a Huffman-code tree (binary tree) – Traverse the tree to assign codes.

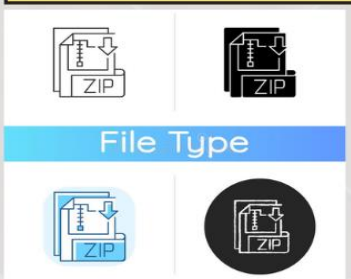
Step 3: Encode (Compress) – Scan the file again & replace each character by its code.

Step 4: Decode (Decompress) – Huffman tree is the key to decompess the file.



Features

- Huffman coding is a lossless data compression algorithm.
- The idea is to assign variable-length codes to input characters, lengths of the assigned codes are based on the frequencies of corresponding characters.
- The most frequent character gets smallest code and least frequent character gets the largest code.



Application

- Used for transmitting fax and text.
- Used by conventional compression formats like PKZIP, GZIP, etc.
- Multimedia codecs like JPEG, PNG, and MP3 use Huffman encoding(to be more precise the prefix codes).

SEMESTER – V

Dr. Aasim Raheel

Dr. Aasim Raheel
Lecturer,
Department of Computer Engineering,
University of Engineering and Technology, Taxila,
Pakistan.
Email: asim.raheel@uettaxila.edu.pk
Phone: +92 51 9047584

Aasim Raheel received his B.Sc., M.Sc., and Ph.D. degrees in computer engineering from the University of Engineering and Technology (UET), Taxila, in 2010, 2015, and 2020, respectively. He is currently working as a Lecturer at Department of Computer Engineering, UET Taxila. He is also working as a Store Incharge at Department of Computer Engineering, UET Taxila. His research interests include biomedical signal processing, ubiquitous computing, machine learning, facial expression and emotion recognition, and brain–computer interface.

Project-1: Network Based Online Form

SEMESTER V

COMPUTER COMMUNICATION AND NETWORKS

INSTRUCTOR: DR. AASIM RAHEEL

NETWORK BASED ONLINE FORM

DESCRIPTION

Creating a server and placing a questionnaires based form on it. Anyone with a system shall access that form via a network consisting of routers/access points, to fill-in the questionnaires and store it in the server.

FEATURES

- Shareable reports
- Graphs and tables
- Security

APPLICATIONS

- Online data analysis
- Business Insights
- Universities: Online evaluation

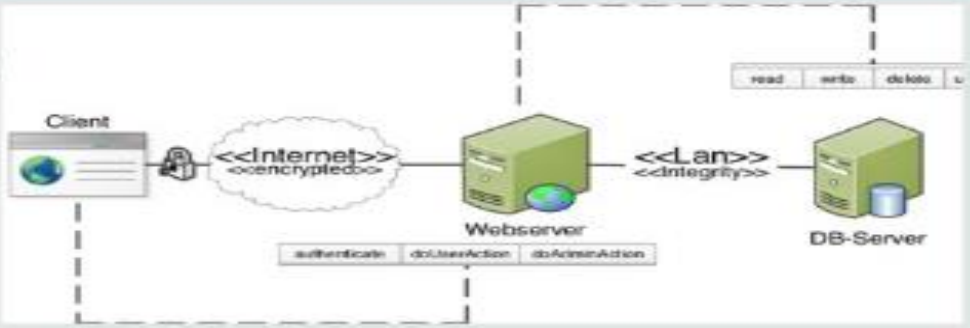
TOOLS

- Packet Tracer
- Windows Server

HARDWARE

- PC's
- Router/Switches

WORKING DIAGRAM



Project-2: IOT Based Network

SEMESTER V

COMPUTER COMMUNICATION AND NETWORKS

INSTRUCTOR: DR. AASIM RAHEEL

IOT BASED NETWORK

DESCRIPTION

A network is a collection of devices that can communicate with each other. Developing an IoT based network of devices involving IP cameras that are connected to the network. The system shall monitor on the basis of motion of objects in the frames.

FEATURES

- Security
- Communication

APPLICATIONS

- Offices
- Homes
- Universities

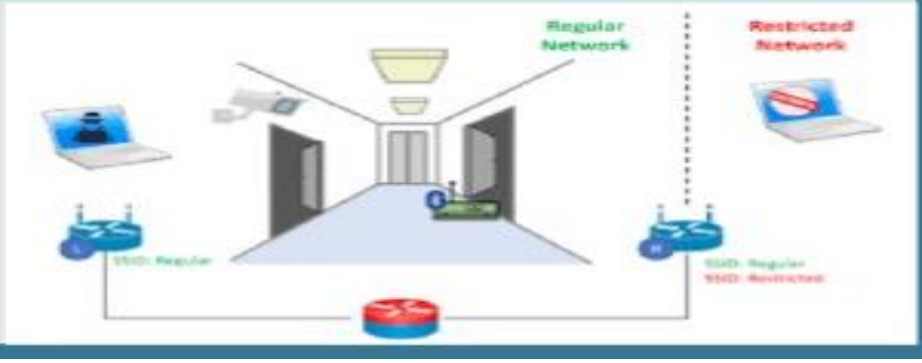
TOOLS

- Packet Tracer

HARDWARE

- PC's
- IP Cameras
- Router/Switches

WORKING DIAGRAM



Dr. Muhammad Majid

Dr. Muhammad Majid
PhD (Sheffield, UK) MSc (Sheffield, UK) BSc (UET Taxila, Pakistan)
Associate Professor,
Department of Computer Engineering,
University of Engineering and Technology, Taxila,
Pakistan.
Email: m.majid@uettaxila.edu.pk
Phone: +92 51 9047581

Dr. Muhammad Majid received BSc. in Computer Engineering with honors from University of Engineering and Technology (UET) Taxila, Pakistan in 2005, MSc in Data Communications with distinction and PhD in Electronic and Electrical Engineering from the University of Sheffield, UK in 2007 and 2011 respectively. He is currently an Associate Professor at Department of Computer Engineering, UET Taxila and heading Signal, Image, Multimedia Processing and Learning (SIMPLE) research group. He is also the director of Artificial Intelligence and Multimedia Systems (AIMS) Laboratory at Department of Computer Engineering. He was a recipient of Faculty Development Program Scholarship of Higher Education Commission (HEC) Pakistan for his MSc and PhD Studies. His research interests include image and video coding, multimedia signal processing, biomedical signal processing, human stress assessment and emotion recognition in response to multimedia content.

NOISE CANCELLATION

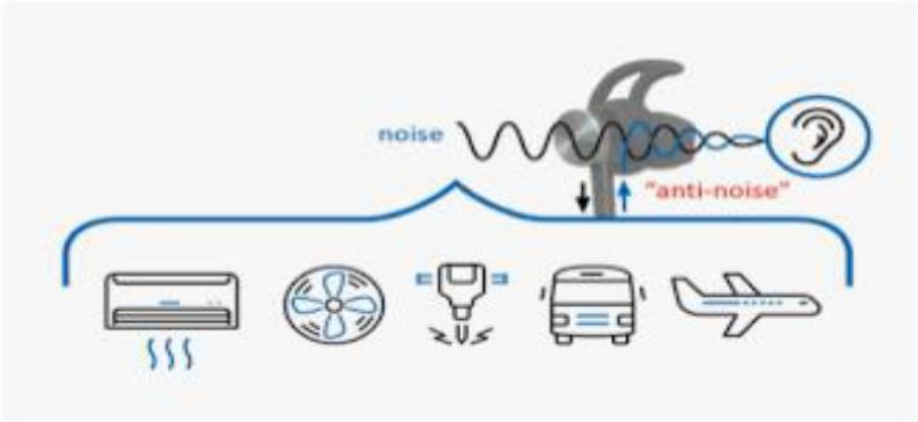
Course: Digital Signal Processing
Instructor: Dr. Muhammad Majid
Complexity Level: Advanced

Project Description:

- Inspired by the importance of audio recording over electronics today, our task focuses on the removal of audible noise from audio signals.
- Our task focuses on recordings of human voice, such as audio, that are mixed with certain types of noisy components, such as train noise, people talking in the background, or machine working.

Project Goal

The goal of this project is to create a system that can effectively solve noise cancellation problems by separating each speaker and remove noise accordingly.



Method

We have to use Digital Signal Processing (DSP) skills such as frequency analysis, frequency filtering, change of basis, wave decomposition, independent component analysis, mel frequency cepstral coefficient, and etc. to separate, remove noise, and reconstruct the audio signal with clearer human voice.

Tools Used:
Matlab Digital Signal Processing Tool Box

HEART RATE FROM PHOTOPLETHYSMOGRAM (PPG) SIGNALS

Course: Digital Signal Processing
Instructor: Dr. Muhammad Majid
Complexity Level: Advanced

Project Description:

- Monitoring the heart rate (HR) information from the wearable device is popular.
- Electrocardiogram (ECG) provides the best HR estimation cannot be used in wearable devices.
- Photoplethysmogram (PPG) signal obtained from pulse-oximeter uses light emitting diode (LED) and a photo diode (PD).

Project Goal

The goal of this project is to create a system that can effectively measure the heart rate from PPG signals

Method

- Compute the 1,024-point FFT of the signal and plot the absolute values of the single-sided FFT with a stem plot: Find the frequency in hertz of the highest magnitude in the FFT of the PPG. Note that the frequency corresponding to the highest magnitude represents the heart rate.

Tools Used:
Matlab Digital Signal Processing Tool Box

SEMESTER – VI

Engr. Abdul Rehman Aslam

Engr. Abdul Rehman Aslam
PhD (LUMS, Pakistan) (Expected December 2022)
MSc (LUMS, Pakistan)
BSc (UET Taxila, Pakistan)
Assistant Professor,
Department of Computer Engineering,
University of Engineering and Technology, Taxila,
Pakistan.
Email: arehman.aslam@uettaxila.edu.pk
Phone: +92 51 9047568

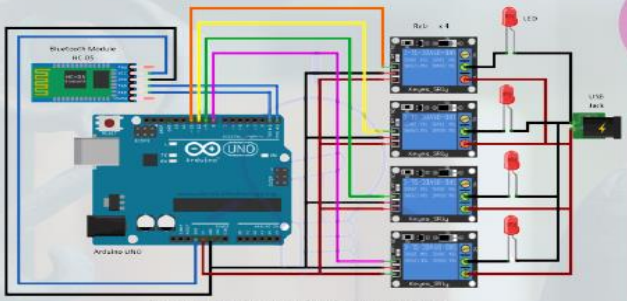
Engr. Abdul Rehman Aslam received the B.S. degree in computer engineering from the University of Engineering and Technology, Taxila, Pakistan, in 2008, and the M.Sc. degree in computer engineering from the Lahore University of Management Sciences (LUMS), Lahore, Pakistan, in 2012. He is currently working toward the Ph.D. degree in electrical engineering and working in the area of the biomedical system on chip design from LUMS. He was a Faculty Member at different universities including COMSATS, University of Central Punjab (UCP), and University of Lahore (UOL) from 2009 to 2014. In 2014, he joined UET Taxila as an Assistant Professor of Computer Engineering. He was also the recipient of the Syed Babar Ali Research Award (SBARA), LUMS, Pakistan (2020–2022), Commonwealth split side Ph.D. scholarship for University of Glasgow, Scotland, U.K. (2021–2022), and IEEE Circuits and Systems Society Predoctoral research Award (2021–2022). His research interests include embedded systems, digital design, on-chip implementation of machine learning/ deep learning algorithms, and low power bio-medical processors with special focus on neurological disorders.

Smart Phone Control Home Automation System

INSTRUCTOR: **Engr. Abdul Rehman Aslam**
COMPLEXITY LEVEL: **INTERMEDIATE**

Components Required

- Arduino
- Relay Breakout board
- Bluetooth Module - HC-05
- Jumper Cables



Smart Home Automation System Project

Circuit diagram

The circuit is designed using Arduino, Bluetooth, relay, and LEDs. We have connected the Bluetooth serially with the Arduino. The Relay is used to operate the home appliances. We have used four relays for four appliances

Features

- Interoperability. The beauty of an automation system is its ability to tie diverse electronic devices together.
- Remote Access. More often than not, plans change when you're not at home, so being able to communicate those changes.

Applications

Home appliances like fans, bulbs, AC, and automatic door locks are controlled by a Home automation system using Arduino Uno with a Bluetooth module. The project mainly focuses on the monitor and control of the smart home by Android phone and provides a security based smart home, when the people does not present at home.

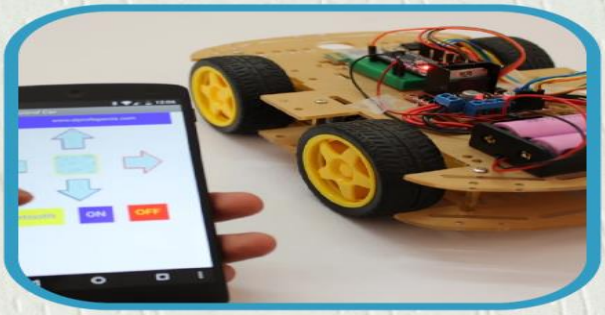
Project-2: SmartPhone Controlled Arduino 4WD Robot Car

SMARTPHONE CONTROLLED ARDUINO 4WD ROBOT CAR

SUBJECT: MICROCOMPUTER SYSTEM
INSTRUCTOR: ENGR. ABDUL REHMAN ASLAM
COMPLEXITY LEVEL: INTERMEDIATE

Description

This Arduino based Robot Car can be controlled using an Android Smartphone having ArduinoRC application installed in it. This car can move forward and backward, left and right, change its speed. we will interface Bluetooth module with Arduino. Then, we will install a simple Bluetooth Controller app on our android phone and start to transmit data.



Tools & Applications used

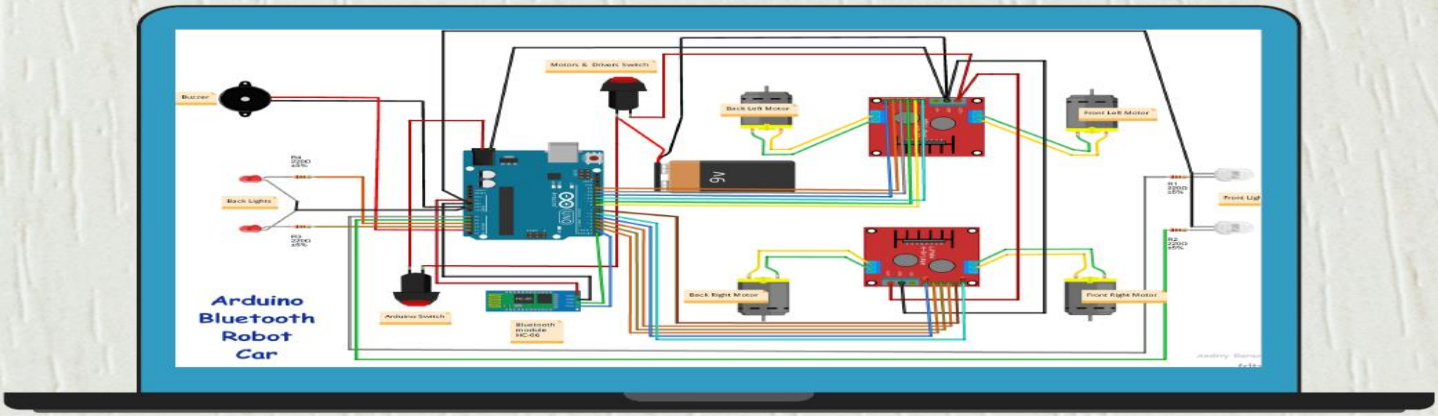
Arduino IDE
Arduino Bluetooth RC Car App
Soldering iron(generic)

Components Required

- 1x Arduino uno
- 1x HC-06 Bluetooth module
- 1x 4WD Smart Robot Car Chassis Kit
- 2x Motor Drivers L298N
- 2x Li-ion Battery 18650
- 4x LED(generic)
- 1x Buzzer
- 4x Resistors (221 ohm)

Circuit Diagram

The complete circuit diagram to build the Smartphone Controlled Arduino 4WD Robot Car is shown below.



Dr. Naveed Khan Baloch

Dr. Naveed Khan Baloch
PhD(UET Taxila), MS and BS (UET Taxila, Pakistan)
Assistant Professor,
Department of Computer Engineering,
University of Engineering and Technology, Taxila,
Pakistan.
Email: naveed.khan@uettaxila.edu.pk
Phone: +92 51 9047569

Dr. NAVEED KHAN BALOCH received the B.Sc.degree in computer engineering from the University of Engineering and Technology (UET),Taxila, Pakistan, in 2007, M.S. degree and the Ph.D. degree in computer engineering from UET Taxila. He started his career from the multinational company and then joined the academia where he utilized the experience in teaching the students, gained from industry. He is currently working as an Assistant Professor, CPED and also holds position of CoPi in SWARM Robotics lab established in CPED Department. He has published his research in Impact factor journals and top ranked conferences and have also established many research collaborations with industry and academia around the globe. He is Reviewer of a lot of impact factor journals from ACM, IEEE, MDPI and Elsevier. He has also worked on industrial projects, to provide support to the industry. He has Supervised many FYPs on innovative ideas e.g., Embedded Systems, Artificial Intelligence, FPGAs, Internet of things etc. He also played his part in supervision of 20 MSc students on cutting edge technologies, all of the students are now working in highly prestigious organizations.

Project-1: Floor Cleaning Robot

FLOOR CLEANING ROBOT

SUBJECT : MICROCOMPUTER SYSTEM DESIGN
INSTRUCTOR : DR NAVEED KHAN BALOCH
COMPLEXITY LEVEL : INTERMEDIATE

Description

This is a Semi-Autonomous Robotic car that cleans floors using water and soap. The main purpose of making this project is to solve the problem of the time-consuming tiring, tedious and monotonous job of cleaning Floors. It has two modes:

- Semi-Autonomous Mode
- Manual mode

Features

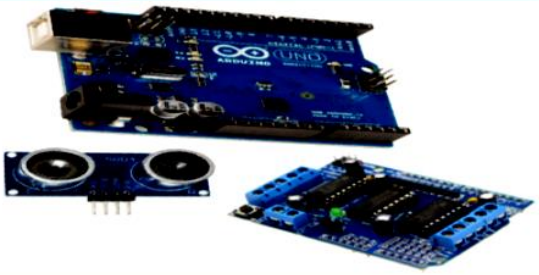
Automatic Home Cleaning Robot can detect the obstacles and objects in front of it and can continue moving, avoiding the obstacles, until the whole room is cleaned. It has a small brush attached to it to clean the floor.

Applications

- Autonomous robot for floor cleaning application reduces much time in existence. It does sweep and mopping tasks at a time, it also detects obstacles, and has an automatic water sprayer.
- Manual works will be replaced by robot technology and lots of the related robot system applications are used.

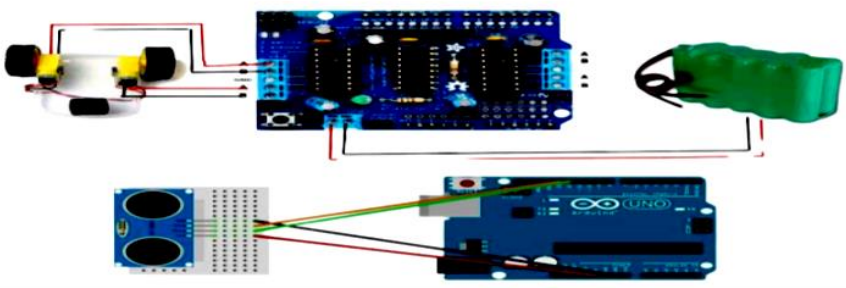
Components Required

- Arduino UNO R3.
- Ultrasonic Sensor.
- Arduino Motor Driver shield.
- Wheel Drive Robot Chassis.
- Computer to Program the Arduino.
- Battery for the Motors.
- A Power Bank To Power The Arduino
- A Scotch Brite Scrub Pad



Circuit Diagram

Circuit for this Automatic Home Cleaning Robot is very simple. Connect the Ultrasonic sensor to the Arduino as shown below and place the motor shield on to the Arduino like and another shield.



Project-2: Smart Attendance System

SMART ATTENDANCE SYSTEM

SUBJECT: MICROCOMPUTER SYSTEM DESIGN
INSTRUCTOR: DR NAVEED KHAN BALOCH
COMPLEXITY LEVEL: INTERMEDIATE

Description

In this project, we have designed RFID based Attendance System using Arduino and RFID MFRC522 Module. In this system, each student is issued an RFID card as their id card and their attendance is marked when they touch their card to the RFID reader.

Features

- It automates the system
- It is convenient
- It Offers ensured Data Security
- It provides real time and accurate updates

Applications

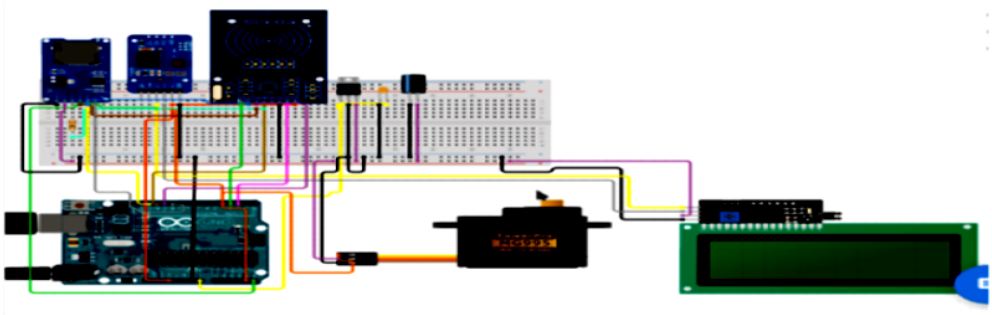
This system can be used to take attendance for students in school, college, and university. It also can be used to take attendance for workers in working places. Its ability to uniquely identify each person based on their RFID tag type of ID card make the process of taking attendance easier, faster, and more secure as compared to the conventional method.

Components Required

- Arduino UNO
- RFID reader
- Alphanumeric LCD, 20X4
- Breadboard(generic)
- Jumper Wires
- Servo Module

Circuit Diagram

The complete circuit diagram to build the Smart Attendance System is shown below.



Project-3: Smart Mirror

SMART MIRROR

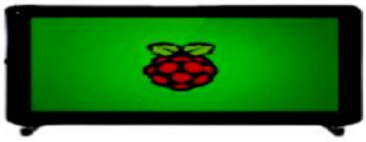
SUBJECT: MICROCOMPUTER SYSTEM DESIGN
INSTRUCTOR: DR NAVEED KHAN BALOCH
COMPLEXITY LEVEL: ADVANCED

Description

A smart mirror can be a cool addition to any space. Nowadays, it is surprisingly easy to build a smart mirror with less time and a low budget. Developing a smart mirror by using a Raspberry PI module interfaced with the display so that users may see updates, news, weather information, etc., is the main goal of this project.

Features

It's cool to see daily tasks, weather reports, the latest news headlines, incoming messages, and more while getting ready in front of the mirror — especially in our everyday life with busy schedules. That's how the Magic Mirror was born. It is a powerful and user-friendly platform that allows users to customize it to make it their own.



Applications

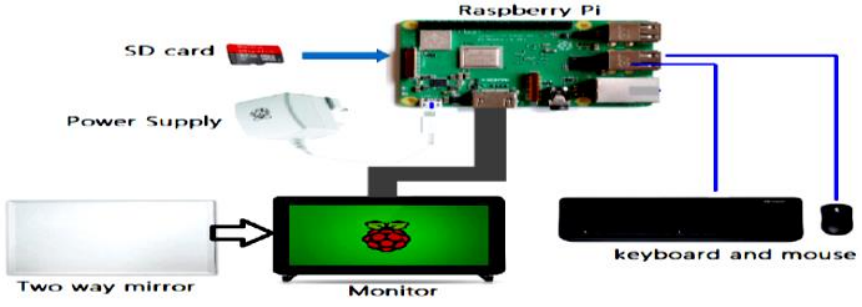
This mind-blowing technology is applicable for specific applications from beauty to fitness. The beauty-focused HI Mirror can provide personalized information about your skincare and makeup, while the fitness device Mirror provides workout guidance right on the glass.

Components Required

- Raspberry Pi
- SD Card
- Monitor
- Keyboard and mouse
- HDMI Cable
- Two-way mirror
- Power Supply

Circuit Diagram

Mount the Raspberry Pi on the backside of the monitor. Then attach the two-way mirror on the top face of the monitor carefully. If you cannot cut the mirror to match the size of the monitor, use a one-way reflective film on the top face. It will behave like a mirror.



Dr. Farhan Qamar

Dr. Farhan Qamar
PhD Telecommunication, MSc Telecommunication, BSc Computer Engineering from UET Taxila.
Associate Professor,
Department of Computer Engineering,
University of Engineering and Technology, Taxila,
Pakistan.
Email: farhan.qamar@uettaxila.edu.pk
Phone: +92 51 9047586

Farhan Qamar received his B.Sc. Computer Engineering, M.Sc. Telecommunication Engineering and Ph.D. Telecommunication Engineering degrees from University of Engineering and Technology, Taxila, Pakistan. After his graduation, he remained attached with different sections of Huawei and Mobilink (Orascom/VimpelCom) for more than 7 years. In 2012, he joined the Telecommunication department in UET TAXILA where he served as Assistant Professor till Feb 2021. He acted as Principal investigator of Advance Optical Communication Group (AOCG) in the same department. Currently, he is working as Associate Professor in Computer Engineering Department of UET Taxila and heading the Communication section. His area of interest includes Chaos Communication, Optical Networks, 5G Networks, Advance Modulation Formats and Radio over Fiber. He has published many Journals Papers, Conference Papers, and Book Chapter in reputed journals.

EDA (EXPLORATORY DATA ANALYSIS) ON TELECOMMUNICATION NETWORK DATA USING PYTHON

COURSE: WIRELESS & MOBILE NETWORKS

INSTRUCTOR: DR. FARHAN QAMAR

DESCRIPTION

On daily basis millions of events are generated and reported in telecommunication networks. Processing of these events depend upon their severity level i.e. critical, major and minor. Processing and EDA analysis of this data is daily routine work to run the network properly efficiently.

FEATURES

- Critical Data Analysis
- Major Network Alarms Processing
- Traffic Stats Analysis
- Churn Prediction

APPLICATIONS

Telecommunication Networks
Computer Networks
Social Media Related Organizations

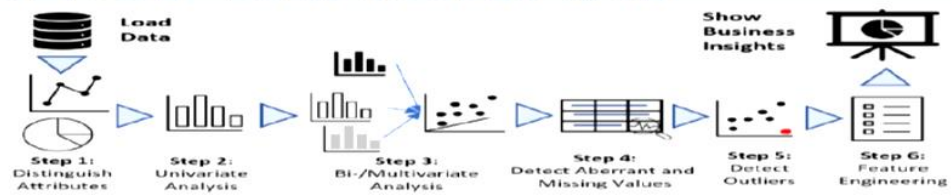
COMPONENTS REQUIRED

- RAW DATA SOURCE FILES
- COMPUTING MACHINE
- DATA PROCESSING SOFTWARES

TOOLS

PYTHON
SQL
MS EXCEL

PROJECT DIAGRAM



DESIGN AND ANALYSIS OF DWDM COMMUNICATION SYSTEM FOR 5G NETWORKS USING OPTISYSTEM

Course: Wireless & Mobile Networks
Instructor: Dr. Farhan Qamar

OptiSystem
Optiwave

DESCRIPTION

Fifth Generation (5G) is the upcoming cellular generation and is expected to meet the increasing demands of data and bandwidth. DWDM ensures high data rate transmission while utilizing Optical fiber bandwidth effectively.

FEATURES

- High Data Rate Transmission
- Low latency
- Effective Bandwidth Utilization
- High Reliability

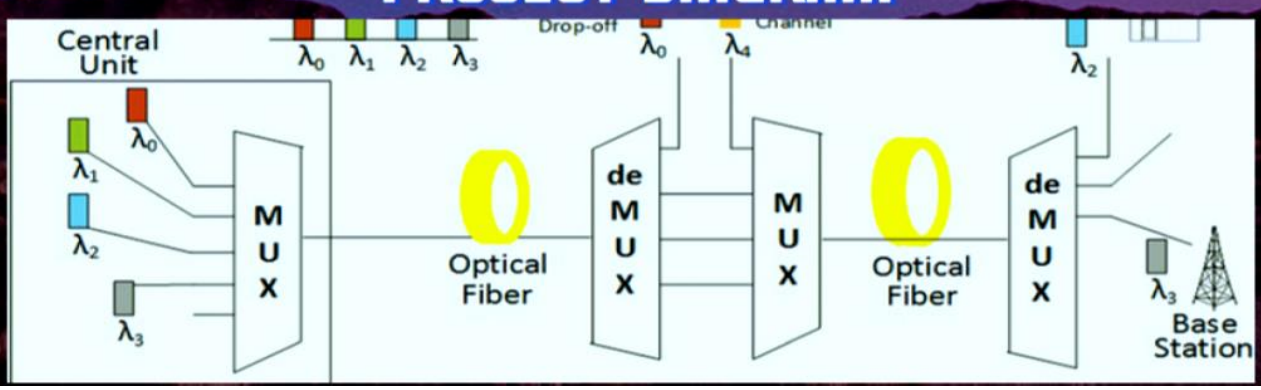
APPLICATIONS

- Currently deployed 2G, 3G & 4G Networks
- Upcoming 5G Network
- Next Generation Networks

COMPONENTS REQUIRED

- Lasers
- Optical Fiber
- DWDM
- Amplifier
- Modulators
- Photodiodes

PROJECT DIAGRAM



SEMESTER – VII

Dr. Muhammad Asif Khan

Dr. Muhammad Asif Khan
PhD (UTP, Malaysia), MS (UTP, Malaysia), BSc (UET Taxila)
Assistant Professor
Department of Computer Engineering
University of Engineering and Technology, Taxila,
Pakistan
Email: masif.khan@uettaxila.edu.pk
Mobile: 03366333553

Dr Muhamad Asif Khan is currently working as an Assistant Professor in the Computer Engineering Department, University of Engineering and Technology Taxila, Pakistan. Received his B.Sc. degree in computer engineering from the University of Engineering and Technology, Taxila, Pakistan, in 2005. He completed his MS and PhD in Electrical and Electronic Engineering from University Teknologi PETRONAS, Malaysia, in 2009 and 2015, respectively. He is the recipient Universiti Teknologi Petronas post-graduate scholarship and teaching assistantship for MS and PhD studies.

From 2005 to 2006, he was a Lecturer at the University of Engineering and Technology, Taxila, Pakistan. From 2006 to 2013, he was a Research Assistant with the Electrical and Electronic Engineering Department, Universiti Teknologi PETRONAS. From 2013 to 2015, he worked as Research Scientist with PETRONAS SD BHD for the Project WiDUCT. His field of specialization is chaos-based cryptography and wireless PHY layer security. His research interests are within the field of blockchain, watermarking, multimedia security, lightweight cryptography

Secure Communication using Blockchain

Blockchain

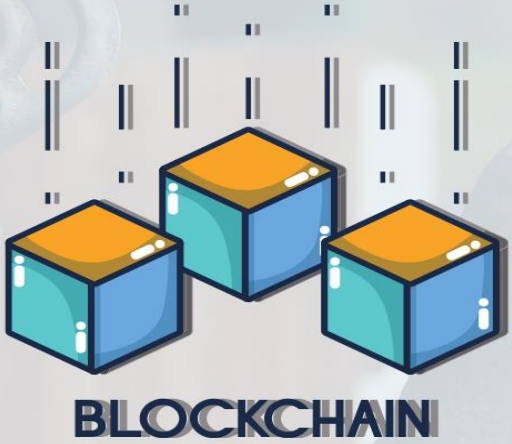
Instructor: Dr. Muhammad Asif Khan

Complexity Level: WP1 - WP5

Description

A permissioned private blockchain-based solution to secure the image while encrypting it

- The ciphered image is stored on a Blockchain
- Cryptographic analysis and cryptanalysis define the strength of the ciphered image.



Key Features

- A blockchain is a digital ledger that records every transaction that has ever taken place on the network.
- establish a reliable secure communication to do away with intermediaries in financial transactions.
- The encrypted multimedia data is stored on blockchain that provides an unchangeable ledger.

Design Steps

1. Data acquisition
2. Cloud-based Image and feature processing
3. Image-authenticated-encryption
4. Cipher blockchain
5. Smart contract

Applications

- Traditional solutions to secure sensitive data fade in Industrial IoT environments in the presence of third parties
- Heath care data protection
- Lightweight cryptography: Secure communication for energy constraints devices

Project-2: Blockchain Based Real-Estate Transactions

Blockchain-Based Real-estate Property Transactions

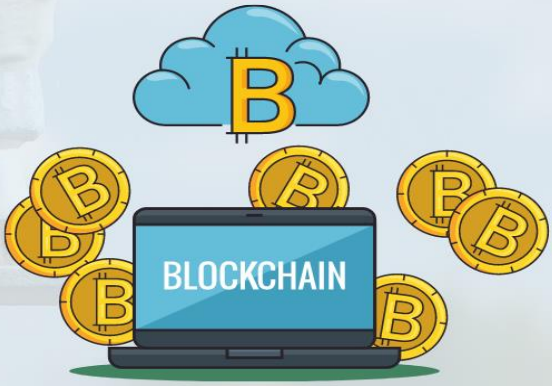
Subject: Blockchain

Instructor: Dr. Muhammad Asif Khan

Complexity Level: WP1 - WP5

Description

- To create a platform using blockchain to mimic the purchasing and selling of property in the residential real estate market.
- Current issues like, property fraud, user data misuse, inaccessibility to records, affect speed, price and security



Key Features

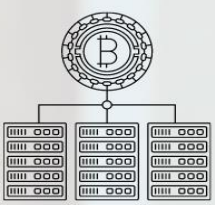
- The immutability of the blockchain can withstand fraud efforts.
- Problems relating to the vulnerability of personal data can be resolved by combining a peer-to-peer transaction model with advancements in cyber security
- Block chain improves speed of property tranaction

Design Elements

1. Client - VueJS
2. Server - ExpressJS
3. Storage - MongoDB
4. Oracles - NodeJS
5. Network - Docker (Geth nodes + MongoDB server)
6. Smart Contracts

Platform, Software & Tool

- Docker - Version 2.0.0.3 (31259) or later
- Docker-Compose - 1.23.2 or later
- Geth client - Version 1.8.23-stable
- NodeJS - v11.12.0
- Truffle - v5.0.9
- Process Manager 2 (pm2) - v3.3.1
- Yarn Package Manager - v1.15.2
- Metamask Browser Plugin - v6.5.3



Cryptanalytic framework for cryptosystem

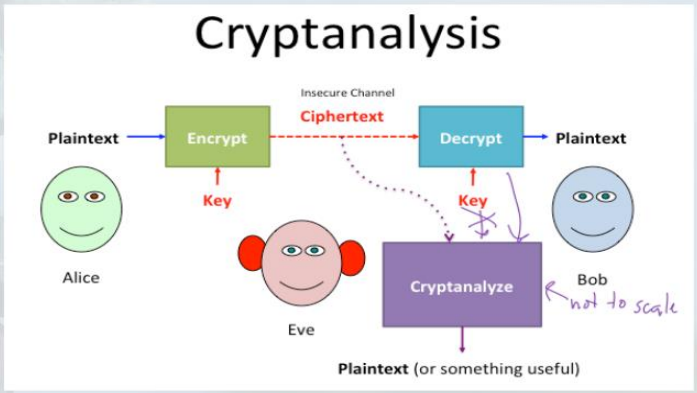
Network Security

Instructor: Dr. Muhammad Asif Khan

Complexity Level: WP1 - WP5

Description

- Development and Implement boomerang and differential attacking scenario on a crypto-system



Problem statement

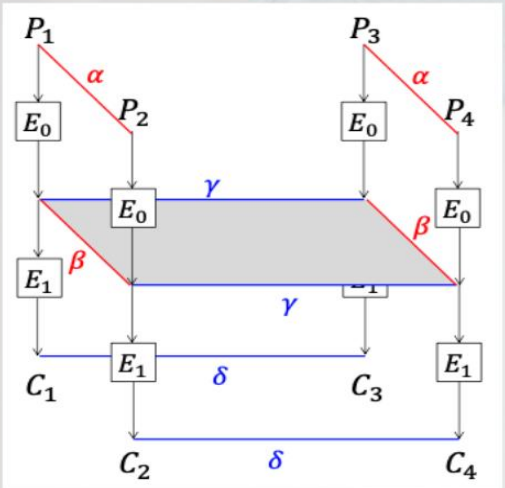
Currently, brute-force differential's information of a crypto-system using differential cryptanalysis may leads to false positive solution, due to incompatibility among differential.

Project Requirement

The framework is required for evaluating probabilities that boomerang style quartet are generating. Further, their analysis on aof cryptosystem

Design Steps

- Generate nonlinear components equivalence classes
- Generate BCT tables of Nonlinear components
- Generate difference tables Nonlinear components
- Define a framework using BCT and DDT to evaluate nonlinear components.

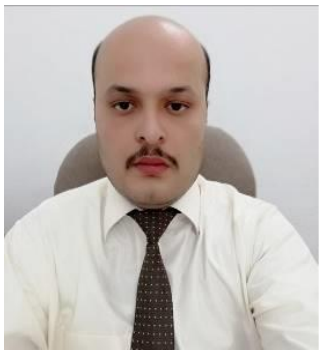


Software and Tools

- Python
- MATLAB

SEMESTER – VIII

Dr. Zahid Mehmood



Zahid Mehmood completed his Ph.D. Computer Engineering in 2016 from UET, Taxila, Pakistan. He completed his MS Electronic Engineering in 2012 with specialization in Signal and Image Processing from International Islamic University (IIU), Islamabad, Pakistan and BS Computer Engineering (Hons) in 2009 from COMSATS University of Sciences and Technology, Wah Campus, Pakistan. He is a team-lead of *FAMLIR (Forensic Analysis, Machine Learning, and Information Retrieval)* research group. He is also a reviewer for international journals and conferences such as *IEEE Access, Pattern Recognition, Neural Computing and Applications, Neurocomputing, Journal of Electronic Imaging, Journal of Information Science, Computer & Electrical Engineering, PAMI, CVPR,* etc. His research interests are *content-based image retrieval (CBIR), medical imaging, deep learning, image forensic, computer vision, and machine learning*.

ASTERISK SERVER

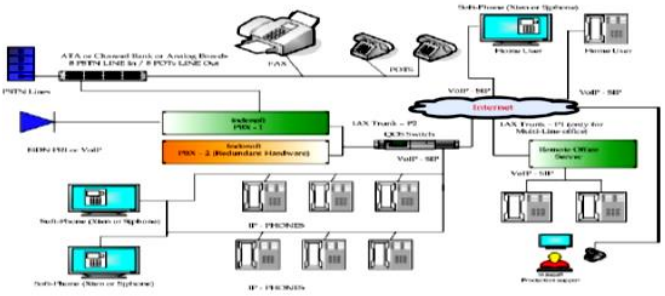
SUBJECT: SYSTEMS PROGRAMMING
COMPLEXITY LEVEL: ADVANCE

Description

Asterisk an open-source framework for building communications applications. It runs on Linux, BSD and OS X and allows you to build a PBX given sufficient Linux and telephony know-how. Asterisk does voice over IP in four protocols and can interoperate with almost all standards-based telephony equipment using relatively inexpensive hardware.

Features

Asterisk is open-source software (more about that in a bit), it has a very large and active online community that, among other things, develops companion software and components that work with it to enhance its features and operation. One example is the open-source graphical user interface (GUI) called FreePBX.



Interoperability

One of the primary advantages of Asterisk in general, whether in a developed-from-scratch or a commercially available Asterisk-based product, is its interoperability with virtually all VoIP hardware and software. Asterisk leverages the most widely used codecs and protocols, which are also supported by most VoIP equipment vendors.

Project-2: SAMBA Server

SAMBA SERVER

SUBJECT: SYSTEMS PROGRAMMING
COMPLEXITY LEVEL: ADVANCE

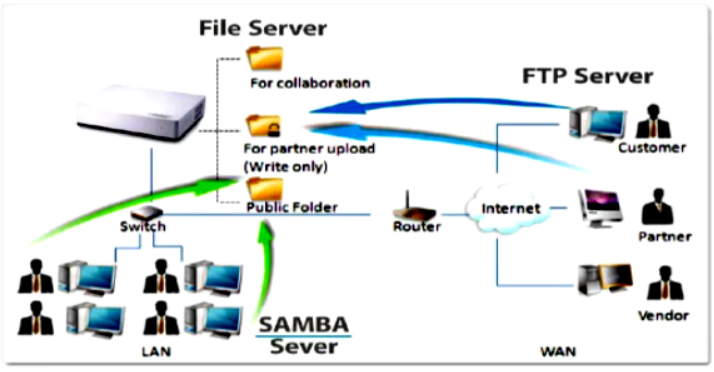
Description

Samba is an open-source software suite that runs on Unix/Linux based platforms but is able to communicate with Windows clients like a native application. So, Samba is able to provide this service by employing the Common Internet File System (CIFS).

Deployment Platform

- **Microsoft Windows**
- **Redhat Enterprise Linux**
- **MAC OS**

.



How SMB protocol work?

Samba The SMB protocol enables applications and their users to access files on remote servers, as well as connect to other resources, including printers, maillots and named pipes. SMB provides client applications with a secure and controlled method for opening, reading, moving, creating and updating files on remote servers. The protocol can also communicate with server programs configured to receive SMB client requests.

Project-3: SQUID Server

SQUID SERVER

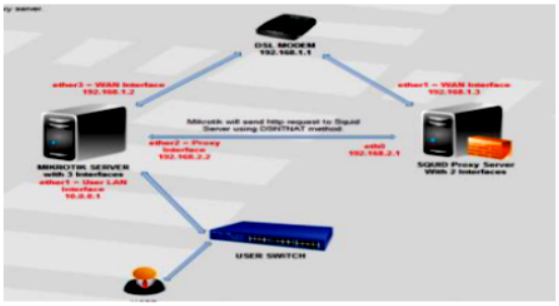
SUBJECT: SYSTEMS PROGRAMMING
COMPLEXITY LEVEL: ADVANCE

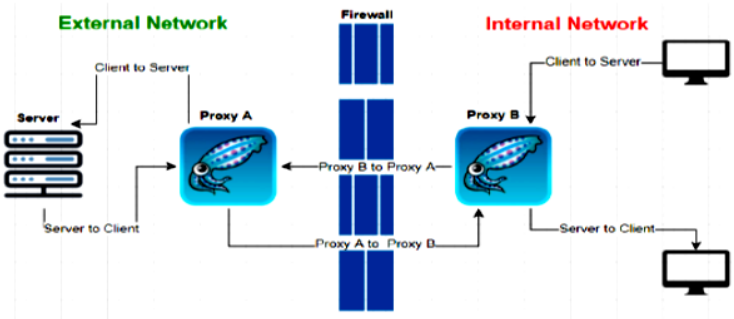
Description

Squid is a full-featured web proxy cache server application which provides proxy and cache services for Hyper Text Transport Protocol (HTTP), File Transfer Protocol (FTP), and other popular network protocols.

Features

- Squid together with a firewall to secure internal networks from the outside using a proxy cache
- Squid can be configured for cache hierarchies, so a cache is able to forward object requests to sibling caches or to a parent cache





How Squid Server work?

Squid will act as an intermediary, passing the client's request on to the destination (Server). . a client or user requests an internet object from a web server. Instead of the request going to the web server directly, it goes to the caching proxy server. If the internet object, which can be a web page, document, or any other form of response of a query, is present on the proxy server, it is delivered instantly.

Dr. Waqar Ahmad

Dr. Waqar Ahmad
PhD (Politecnico di Torino, Italy) MSc (UET Taxila) BSc (COMSATS Abbottabad)
Assistant Professor,
Department of Computer Engineering,
University of Engineering and Technology, Taxila,
Pakistan.
Email: waqar.ahmad@uettaxila.edu.pk
Phone: +92 51 9047586

Dr. Waqar Ahmad has over 15 years of teaching, research, training and development experience in Computing and Engineering fields. He has worked in various professional capacities across the academia such as Lab Engineer, Lecturer and Assistant Professor of Artificial Intelligence, Machine Learning and Deep Learning. He has a strong professional industrial collaboration with top-notch companies of the Artificial Intelligence and Hardware Design. He holds PhD degree in Electronics and Communication from one of the top universities of Europe. He has supervised over 40 students at PhD, MS and BS level in their research and development activities. He is a certified Deep Learning Specialist with focus on Natural Language Processing (NLP), Computer Vision (CV) and Speech Recognition (SR) . Some of Waqar's areas of specialization are Natural Language Processing (NLP) , Python programming, Computer Vision, Artificial Intelligence, Machine Learning, Deep Learning, Digital System Design, Microelectronics, Field Programmable Gate Arrays (FPGAs), Very Large Scale Integration (VLSI), Verilog, Web Development. Shopify, HTML and JavaScript.

SMART GYM BASED ON HUMAN POSE ESTIMATION

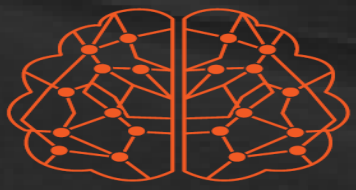
INSTRUCTORS: DR, NAVEED BALOCH, DR WAQAR AHMED

Human pose estimation is a popular project today in the field of computer vision. The human pose estimation can be developed using Artificial Intelligence or Machine learning in which the system is fed with sample data or trained models and hence can localize joints in the human body over a video or an image.

By localizing joints in the human body we can use it for wide applications such as getting the gait cycle of a person walking or tracking down the movements of a professional athlete in order to understand the physical techniques and strategies involved to achieve his/her success.

One of the applications of Human pose estimation could be developing a smart gym trainer software, that could help struggling bodybuilders to achieve their goals.

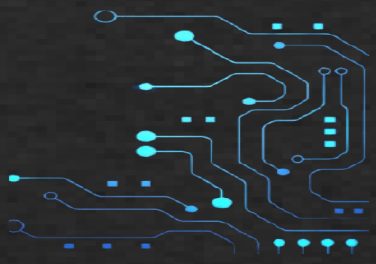
At the core of any human pose estimation application lies a pose estimation algorithm that receives an image of a person as an input and outputs the coordinates of the specific keypoints or landmarks on the human body (XY co-ords in 2D pose estimation or XYZ co-ords in 3D pose estimation).



Modern pose estimation algorithms are almost exclusively based on **Convolutional Neural Networks (CNN)** with hourglass architecture or its variants. Similarly, **Single Shot Detector (SDD), Kinematic, Planar and Volumertic Model, Recurrent Neural Network (RNN).**

LIBRARIES AND TOOLS FOR POSE DETECTION

- DeepLabCut
- OpenPose
- OpenCV
- PoseNer
- Detectectron2
- AlphaPose
- Some popular 2D human pose estimation methods include OpenPose, CPN, AlphaPose, and HRNet



Human pose estimation has been utilized in a wide range of applications, including human-computer interaction, action recognition, motion analysis, augmented reality, sports and fitness, and robotics.

The smart gym utilizes pose estimation technique and detects the user's exercise posture and provides detailed, customized recommendations on how the user can improve their posture

Project-2: Resume Parsing APP

RESUME PARSING APP

INSTRUCTORS: DR. WAQAR AHMAD,
DR. NAVEED KHAN BALOCH

Resume parsers are software programs that automate the collection, storage, and categorization of employment resumes. This technology can scan large volumes of documents, analyze them, and extract information recruiters and hiring managers need.

Machine Learning and NLP-based tools have a great and central role in improving the accuracy of these parsers– thus increasing the usage of these tools by new companies or hiring agencies. NLP users **NER Technique** which is quite helpful in understanding the hidden meanings, and pulling out the essential information in fraction of seconds...!

The 3 major libraries that Resume Parsing Apps use to parse the complex and High level resumes are Spacy, NLTK, and Stanford-NER. These are intelligent enough to find out the hidden meanings within the resumes and extracting required information in seconds...!

ADVANTAGES

Quick and easy access to candidate's categorized data.

Human errors eliminated and easy recruitment process.

Optimized and tuned database of resume data.

Top Resume Parsing Softwares Used Worldwide

- Affinda
- Zappyhire
- Sovren
- CandidateZip
- Crelate
- Skillate
- SmartRecruiters

Companies using Resume Parsing Technology

- Booking.com
- Arbisoft
- Roche
- Europeana
- Recruitee

Resume Parsing is simply conversion of a free-form resume document into a structured set of information suitable for storage, reporting, and manipulation by software.
Resume parsing helps recruiters to efficiently manage electronic resume documents sent electronically. It is becoming popular day by day as more companies are upgrading their old systems to the resume parsing technology as it saves time and is efficient...!

Project-3: AI Chatbot

AI CHATBOT

INSTRUCTORS: DR. NAVEED KHAN BALOCH, DR. WAQAR AHMED

AI Chatbots are increasingly becoming common and a powerful tool to engage online visitors by interacting with them in their natural language.

AI Chatbot is a computer program that simulates a natural human conversation. Users communicate with a chatbot via the chat interface or by voice, like how they would talk to a real person.

Role of NLP in chatbot

These AI-powered chatbots use a branch of AI called natural language processing (NLP) to provide a better user experience. Often referred to as virtual agents or intelligent virtual assistants, these NLP chatbots help human agents by taking over repetitive and time consuming communications.

LIBRARIES AND TOOLS

The significant libraries that AI Chatbot uses are as follows:

spaCy
NLTK
ChatterBot
TextBlob
Deeppavlov
PyNLPI

Top 5 NLP Chatbot platform:

Intelliticks
Quickreply.ai
Google Dialog Flow
Wit.Ai
Haptik
Kore.AI
ChatFuel

SIGNIFICANCE AND ADVANTAGES

- Make Customer Service Available 24/7.
- Save Time and Money.
- Reduce People-to-People Interactions with Customers.
- Eliminate Tedious Time-Consuming Tasks.
- Offer a Smoother Customer Journey.
- Reduce Stress for Consumers.

PILLARS OF NLP BASED CHATBOT

Three Pillars of an NLP Based Chatbot

- Dialog System
- Natural Language Understanding
- Natural Language Generation