Electronics Club
IIT Guwahati

Project Description

2024-2025

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RETRO GAME CONSOLE

Domain - Digital

This project will implement the hardware found in old game consoles like the Game Boy on an FPGA which will allow you to run famous retro games like Mario and Pokemon without any software emulation. You'll be using Hardware Description Languages (HDL) like Verilog to describe all the hardware found in Game Boy from the VGA port to the processor itself. Working with an FPGA allows you to have full control over the hardware so you can control the game's FPS or change its color output to make it look more vibrant than what the original Game Boy was capable of.

Summary

Implement old and famous game consoles like the Game Boy on FPGA and play famous titles like Mario and Pokemon without any software emulation.

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HARDWARE SECURITY

Domain - Digital

Communication is key, both in a relationship and in electronics, and to ensure that the information doesn't get leaked, we perform cryptography. First part of this project will include learning about various cryptography methods and implementing them using two Arduinos communicating with each other. Second part will include conducting a side channel attack by probing the wire between the transmitter and receiver by methods such as power analysis.

Summary

This project involves learning and implementing cryptography methods on two communicating Arduinos to secure information, followed by conducting a side channel attack using techniques like power analysis to probe the communication wire.

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REAL-TIME ANALYZER

Domain - Analog Circuit Design

An analog real-time analyzer (RTA) is a device used to measure and visually display the frequency spectrum of audio signals in real time. It typically consists of a microphone to capture the sound, filters to separate the audio into different frequency bands, and a visual display (such as LED bars) that shows the amplitude of each frequency band. RTAs are commonly used in audio engineering, live sound, and acoustics to analyze the balance of frequencies in a sound environment and make adjustments for optimal audio quality.

Summary

RTA measures and displays the frequency spectrum of audio signals in real time, using a microphone, filters, and a visual display. It's commonly used in audio engineering and acoustics to optimize sound quality by analyzing and adjusting frequency balance.

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AUDIO SHIELD

Domain - Signal Processing

As you might have experienced, in your ANC headphones, the amount to which high pitched ringing sound is reduced is to a minimum level. When you are on your headphones in the class, you still can hear your professor blabbering stuff. In this project we will be working on filtering these high frequency components using a digital filter. We will try to integrate Bluetooth which can interact with a variety of input given to the headphones.

Summary

This project aims to reduce high-pitched sounds in ANC headphones using a digital filter and integrate Bluetooth for versatile input interaction. Despite ANC, high-frequency noise like voices can still be heard, which this project seeks to address.

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POINTICK

Domain - IoT

Pointick is a wearable glove that allows users to control cursor movement and perform mouse functions through intuitive hand gestures. Utilizing a 3-axis accelerometer, it accurately detects tilt and motion for precise cursor control, while also recognizing button clicks. The glove communicates wirelessly with a base station using radio transceivers, ensuring smooth and responsive interaction. This radical approach towards developing a futuristic model of a traditional mouse can prove to be of great assistance in a vast multitude of applications.

Summary

Pointick is a wearable glove that allows users to control cursor movement and perform mouse functions through hand gestures, using a 3-axis accelerometer and wireless communication with a base station. This innovative device offers a futuristic alternative to the traditional mouse.

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3-D RECONSTRUCTION

Domain - OpenCV

In this project, we will utilize binocular geometry and machine learning to create a disparity matrix and estimate distances. Additionally, we will engage in advanced point cloud processing, 3D rendering, and visualization to achieve 3D visualization using the estimated distances. We will also extract the structure from motion using various photogrammetry tools. Overall, this project promises to be an exciting experience, offering the opportunity to learn numerous computer vision and machine learning libraries that are applicable in various real-life scenarios.

Summary

This project focuses on 3D reconstruction using binocular geometry, machine learning, and photogrammetry to create disparity matrices, estimate distances, and process point clouds for 3D visualization. Participants will gain experience with computer vision and machine learning libraries used in real-world applications.