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M.Tech.

Electronic Systems Engineering
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Research Interest

Biomedical Devices
Brain-Computer Interfaces
Optical Instrumentation
Electronic Systems Engineering
Neural Engineering

Technical Skills

Electronic Product Design
Embedded System Programming
FPGA Programming using Verilog
Image Processing
Machine Learning
Mechatronics
Microfabrication Process flow
Optical Instrumentation

ESS-Dx: A Handheld Probe for Rapid Breast Cancer Diagnosis

Aim: Design and development of elastic scattering spectroscopy (ESS)-based probe for breast cancer diagnosis and margin detection.

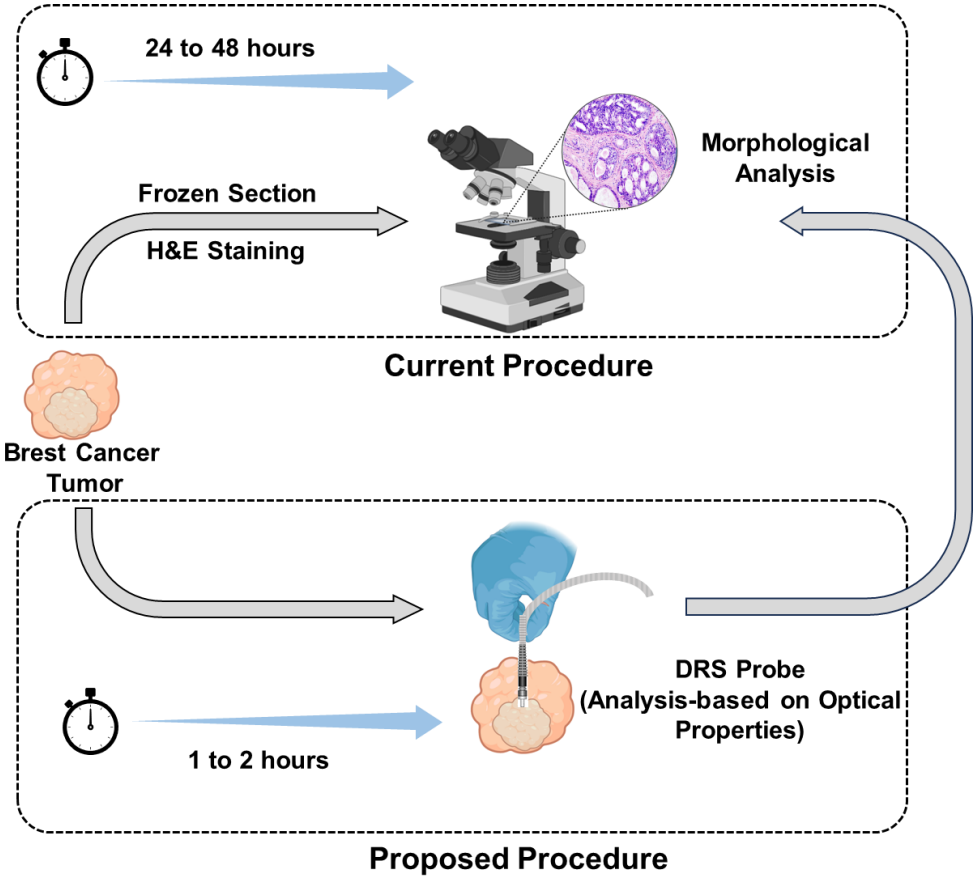
Objective: Design and development of data acquisition (DAQ) system, a mathematical model, and a user-friendly graphical user interface (GUI) for data (optical properties such as reflectance, absorption coefficient, and scattering coefficient of the tissue sample) acquisition, processing, and visualization in real-time

Approach

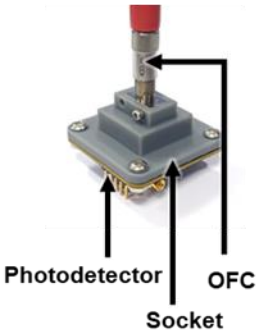
The hand-held probe can be used during surgery for breast cancer diagnosis and margin detection, ensuring all the tumor is extracted at the time of surgery, eliminating the possibility of re-excision after histopathological examination.

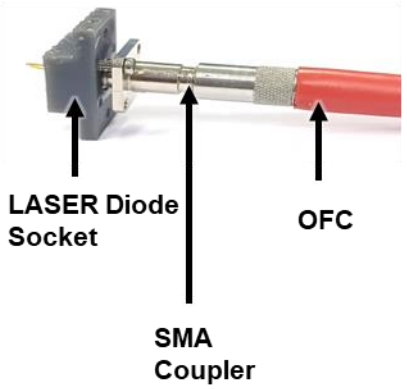
Phantom to mimic tissue properties

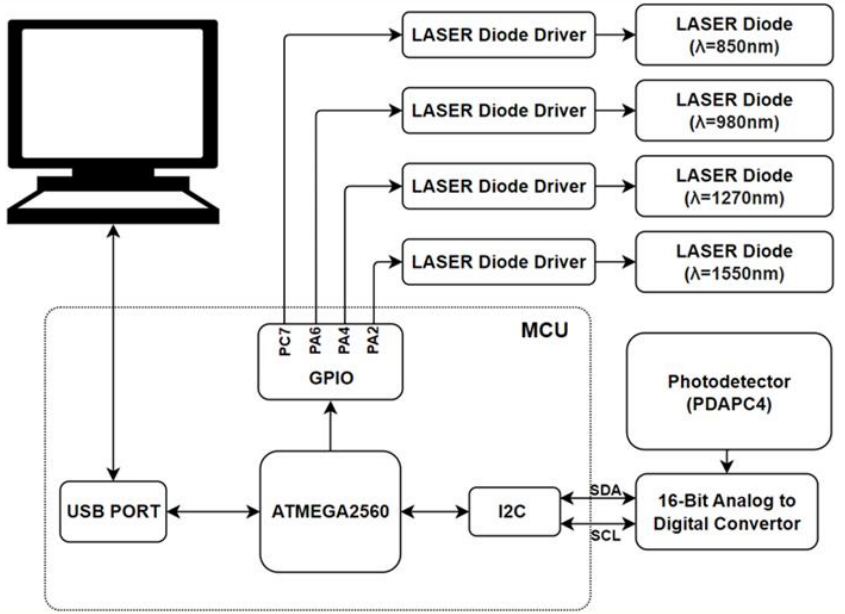
Breast-Conserving Surgery

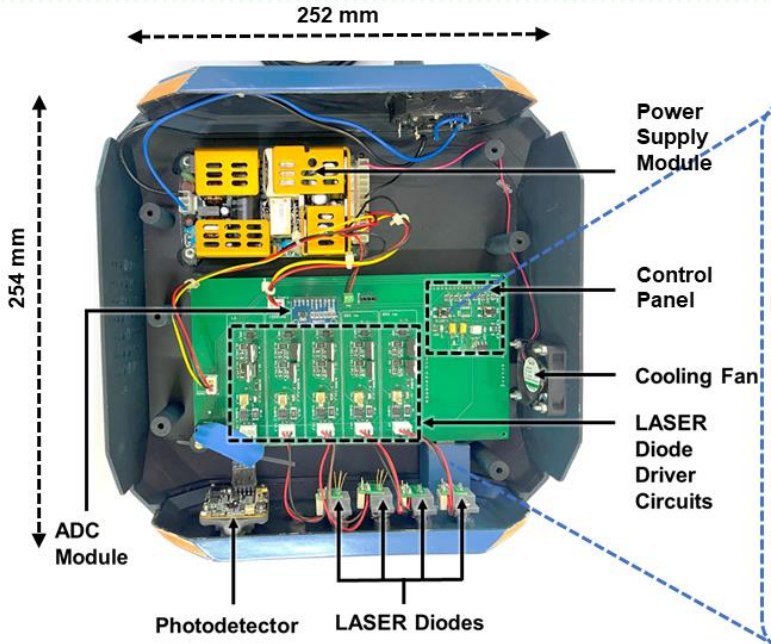


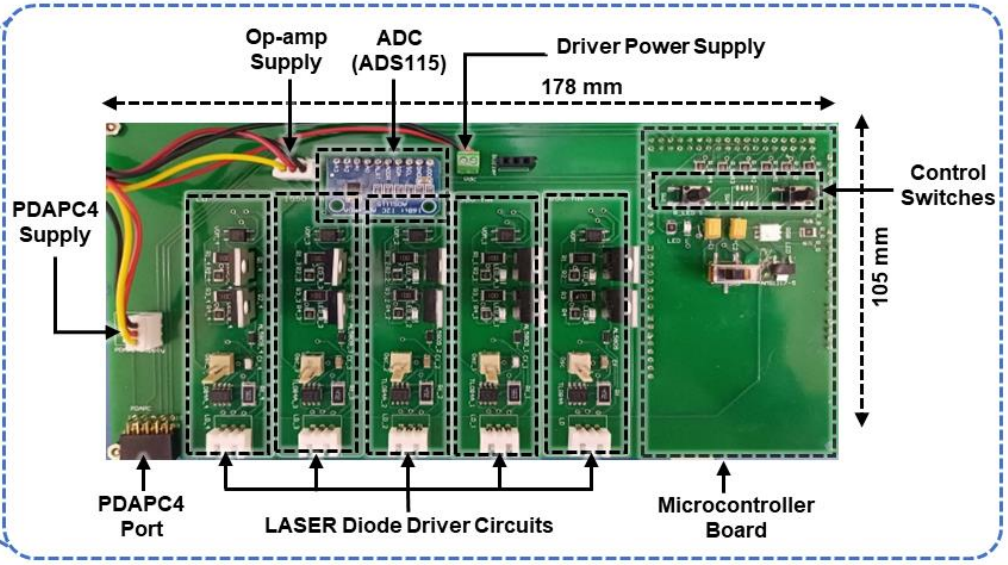
System Design



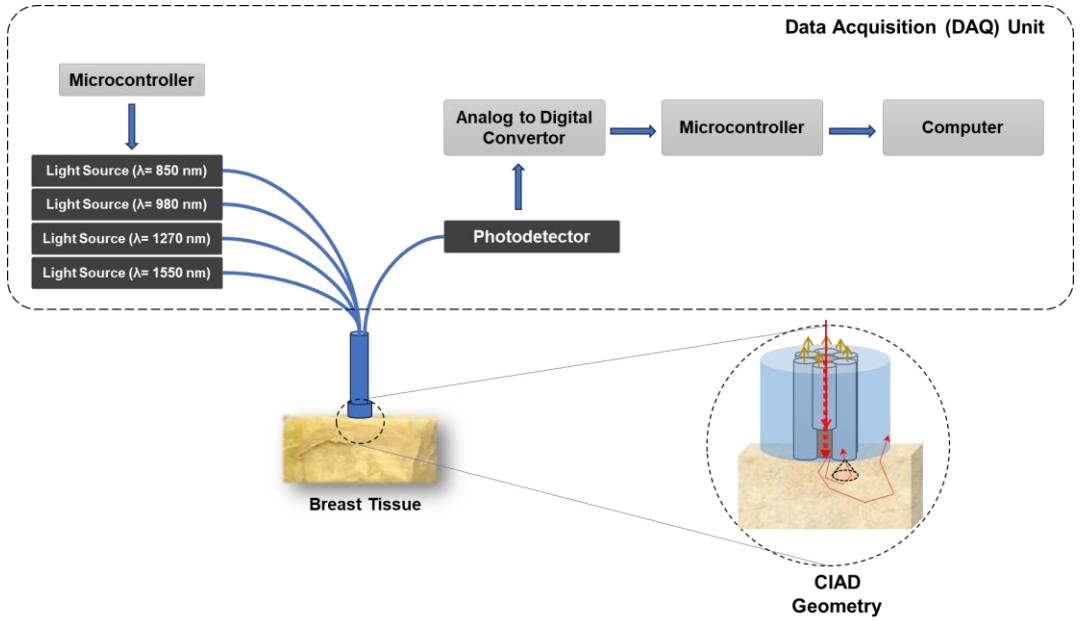


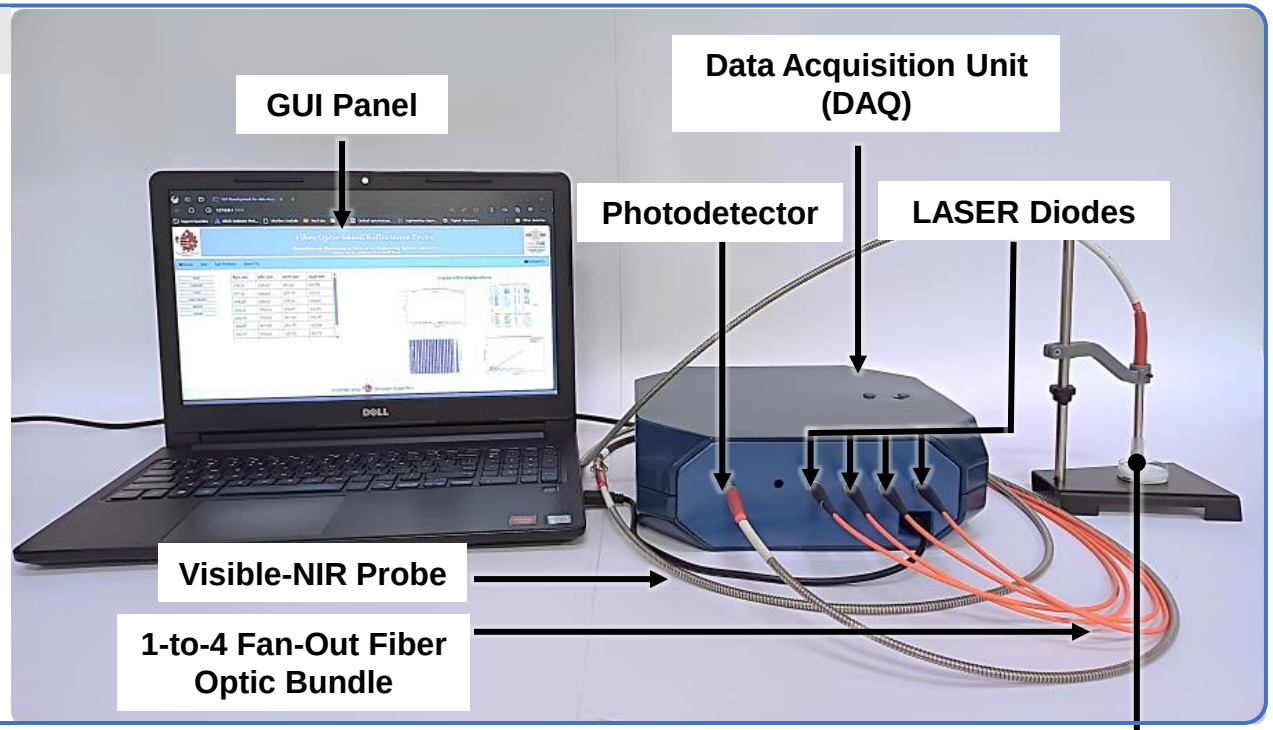




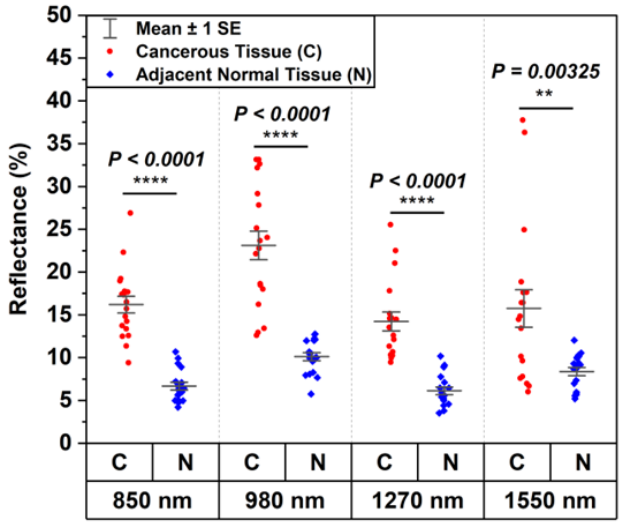


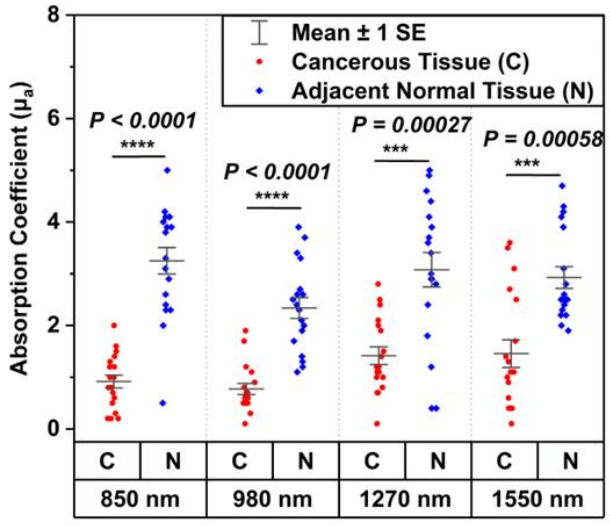
Experimental Setup

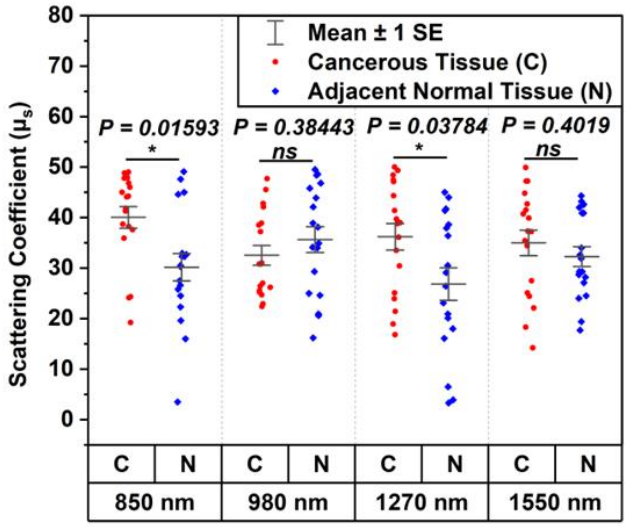




Results





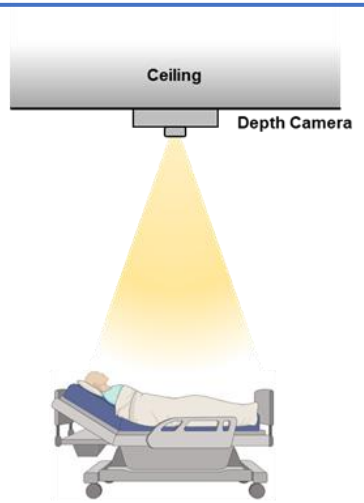


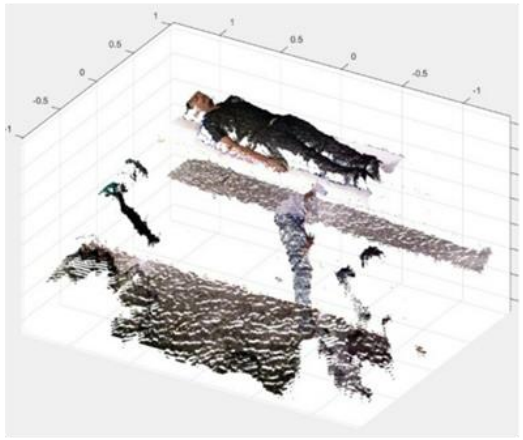
Estimating Body Weight of a Lying Patient for Adjustment of Intravenous (IV) Contrast Dosage During CT Scans

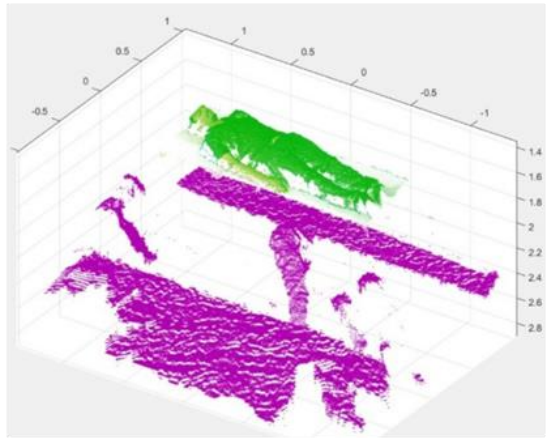
Problem Statement:
An optimum dosage of IV contrast is necessary to improve the accuracy of the examination while preventing overdose.

Methodology:
- The developed system uses an RGB-Depth camera to generate a 3D Point cloud of the patient lying on the bed.
- The data is preprocessed to acquire the patient's point cloud after removal of background data.
- The anthropometric feature values are then extracted from the patient point cloud and given to an ANN model as input values, predicting the patient's body weight.

Results:
Achieved an accuracy of 73% in body weight prediction







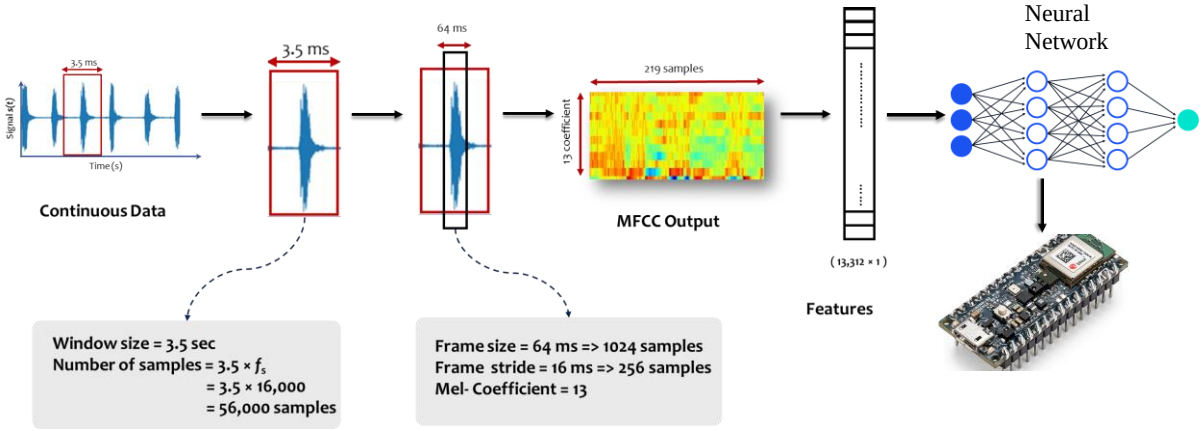
Extracted anthropometric features
(surface area, volume, number of points, density, eigenvalues, sphericity, flatness, linearity, gender, and the distance between the patient and the camera.)

Neural Network
Input Layer: 12 neurons
Hidden Layer: 10 neurons
Output Layer: 1 neuron

Output
Estimated weight of the patient lying on the bed

Selected Projects

Project 1: Birds and Animal Call Detection for Edge Devices



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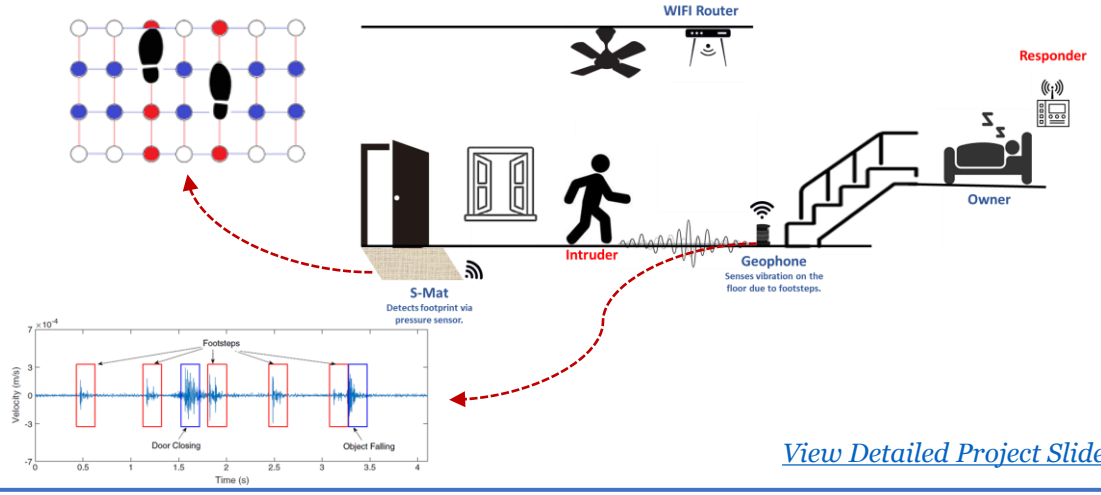
Project 2: Wireless Intruder Detection using Pressure and Vibrational Signatures



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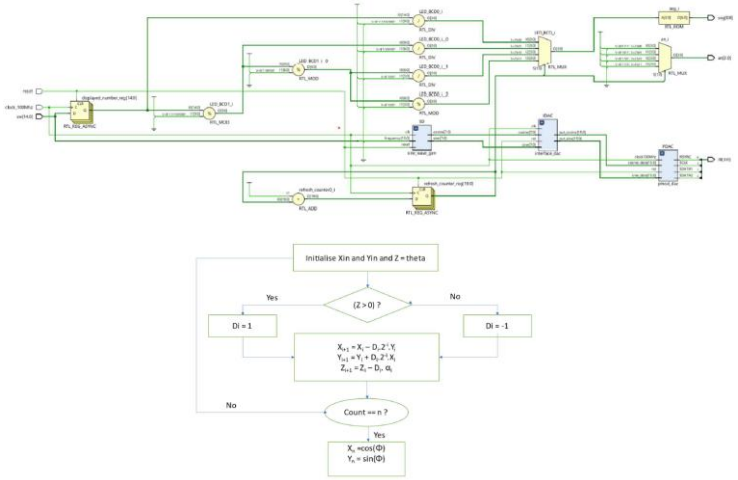
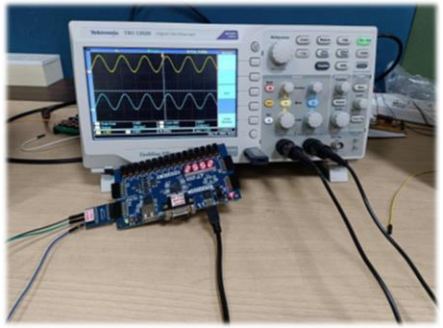
Project 3: Architectural Design and Implementation of CORDIC-Based Sine Wave Generator on FPGA





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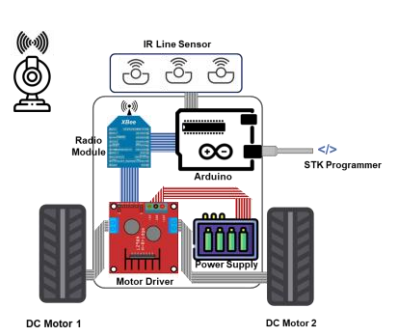
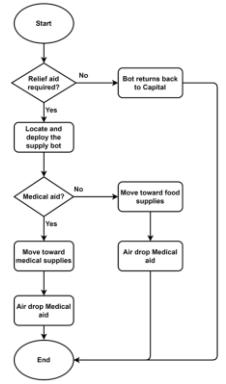
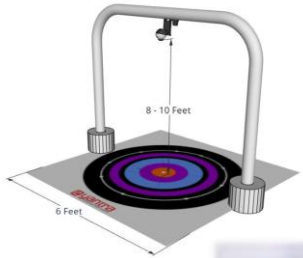
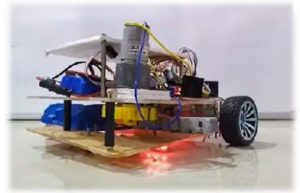
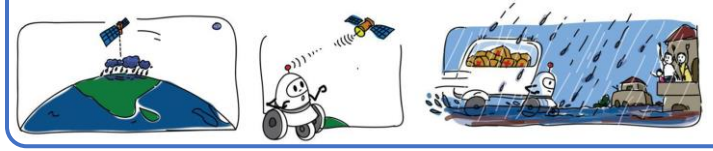
Project 4: Supply Bot to Deliver Relief Aid at Flood-Affected Zones











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