King Saud University
College of Engineering
Electrical Engineering Department **Semester:371**

Senior Design Project Proposal Form

Project # CTR1

Project Title: Real-Time Authentication using ECG Signals

Professor(s) Name(s): Prof. Abdullah Alsuwailem and Prof. Saleh Alshebeili

Number of Students: Two

Students Qualifications

1. Knowledge of digital signal processing,
2. Excellent skills in programming

Statement of Problem

Biometrics, which is a key solution for security issues, deals with identity-recognition problems by utilizing the biological peculiarity; e.g., voice, retina, fingerprint, blood vessel, face, and cardiovascular cycle. Among them, cardiovascular signals were proposed as biometric signals measured by electrocardiogram (ECGs). Since the ECG is intrinsically connected to biological functions, circumvention is significantly more difficult than other biometrics such as retina, fingerprint, hand, or face. In this project, we consider the real-time implementation of a practical biometric authentication method using ECG signals.

Objectives

The main objectives of this project are as follows:

1. Conducting literature review to determine schemes well suited for biometric authentication using ECG signals,
2. Writing codes for an algorithm proposed for authentication using ECG,
3. Assessing the performance of selected biometrics algorithm using real data,
4. Implementing the selected biometrics algorithm on FPGA platform,
5. Testing the harware implementation in a real-time environment

Technical Approach

Literature review and biometrics programming will be conducted using KSU electronic library and LABVIEW software, respectively. Hardware implementation will be conducted using NI transceivers and accompanying software available at KSU.

Expected Deliverables

Real-time ECG-based biometrics authentication platform.

King Saud University
College of Engineering
Electrical Engineering Department **Semester:**

Graduation Design Project Proposal Form

Project # CTR2

Project Title: Advanced control design for optimum performance of a DC motor

Professor(s) Name(s): Dr. Irfan Ahmad

Number of Students: Two

Students Qualifications

Background in analysis and design methods of a Control System. Interested students must have good programming skills with MATLAB / Simulink.

Statement of Problem

The development of high performance motor drives is very important in various industrial applications. These motor drives must be equipped with an intelligent control methodology in order to achieve the desired performances. Speed control of a DC motor, which is vital in many industrial applications, is usually performed with classical PID controller where the parameters are fixed manually by the operators. To enhance the performance of a DC motor in terms of speed control accuracy and rapidity, FUZZY controller and FUZZY based self-tuning PID controller will be analyzed in this project.

Brief Description of the Project

This project will cover the dynamic modeling with classical and advanced control design of a DC motor. After literature survey, a dynamic model of a DC motor will be developed in MATLAB. The desired performance will be highlighted. In order to achieve the desired performance of a DC motor, first classical PID controller will be designed and simulated in MATLAB. Then, advanced FUZZY controller and FUZZY based self-tuning PID controller will be tested in simulation. A comparison of achieved performance in terms of accuracy and rapidity with all these controllers will be performed in this project.

Objectives

Following tasks will be performed during this project:

1. Literature survey
2. System dynamic modeling
3. Classical PID controller design
4. Advanced fuzzy controller design
5. Fuzzy based self-tuning PID controller design
6. Development of simulation software and performance comparison of a DC motor with different controllers

Technical Approach and Expected Deliverables

Complete analysis will be performed in MATLAB / Simulink software. Simulation software with detailed analysis is expected to be delivered at the end of this project.

King Saud University
College of Engineering
Electrical Engineering Department **Semester: 371**

Graduation Design Project Proposal Form

Project # CTR3

Project Title: Passive Magnetic Levitation System

Professor(s) Name(s): Dr. Wonsuk Ko

Number of Students: Two

Students Qualifications

Students should have good background in control and electromagnetics.

Statement of Problem

Nowadays to reduce traffic congestion, air pollution, and energy useage, alternative transportation system is suggested. One of the attractive apporach is the Maglev system. Maglev (derived from **Mag**netic **lev**itation) uses magnets to carry vehicles rather than with wheels, axles and bearings. The levitation and guidance of the small scale train can be implemented by either active or passive methods. Active levitation requires high powered electromagnets, super cooling systems, or complex controllers. Passive levitation requires a method of propulsion to induce levitation forces. The passive levitation Magnetic Levitation System is being pursued for the project.

Brief Description of the Project

The basis of the suggested method, Passive Magnetic Levitation System is placing strong permanent magnets in a special arrangement called a Halbach array. This array creates a strong magnetic field on one side of the arrangement while nearly canceling the magnetic field on the other side. The objective of proposed project is to study modelling electromagnetic field and control design.

Objectives

(1) Understanding Magnetic Levitation System
(2) Modelling of Passive Magnetic Levitation with Halbach array
(3) Simulation of the proposed system
(4) Design and build small scale train.
(5) Test of the system and study of performance.

Technical Approach and Expected Deliverables

- Literature search of the Maglev under project
- Modeling Halbach array using Software such as Vizmag, COMSOL Multiphysics.
- Carry out Simulation using MATLAB or similar tool
- Design and Build small scale train
- Report