Add your PROJECT FULL TITLE in capital only

A PROJECT PHASE I REPORT

SUBMITTED BY

STUDENT NAME (EXAM SEAT NO.)

STUDENT NAME (EXAM SEAT NO.)

STUDENT NAME (EXAM SEAT NO.)

UNDER THE GUIDANCE OF

PROF. GUIDE NAME (in capital only)

BE (ELECTRONICS AND TELECOMMUNICATION)

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION

HOPE FOUNDATION'S

INTERNATIONAL INSTITUTE OF INFORMATION TECHNOLOGY,

HINJAWADI, PUNE(MH)-411057

SAVITRIBAI PHULE PUNE UNIVERSITY

A.Y. 2021-22

CERTIFICATE

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION

HOPE FOUNDATION'S

INTERNATIONAL INSTITUTE OF INFORMATION TECHNOLOGY,

HINJAWADI, PUNE-411057

This is to certify that

Name of student (Exam seat no)

Name of student (Exam seat no)

Name of student (Exam seat no)

Class: BE(E&TC) have partially completed Project titled, '**Project Name**' under my supervision as a part of Semester I of Final Year of Bachelor of Engineering in **Electronics and Telecommunication (A.Y. 2021-2022)** of Savitribai Phule Pune University.

Prof. Name of Guide
Project Guide

Prof. Name of HOD
HOD(E&TC)

Principal

Place : Pune
Date :

External Examiner

Declaration

We declare that this written submission represents our ideas in our own words and where others' ideas or words have been included, we have adequately cited and referenced the original sources. We also declare that We have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in our submission. We understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed. We take sole responsibility of the work presented by us in this report. We also declare that we will submit our completed project along with all necessary hardware and software to the department at the end of the 2nd semester.

Signature.....

STUDENT NAME .....

Signature.....

STUDENT NAME .....

Signature.....

STUDENT NAME .....

Place : Pune

Date :

Abstract

The Abstract in the project report shall have three parts:

The first part with 500-words highlighting the important features of the project done.

The second part with the layout of the report giving a brief chapter-wise description of the work and

The Third part with the keywords.

Sample Abstract:

Over the last era the world of wireless communication has been undergoing tremendous changes. This has resulted in the advent of a whole range of innovative technologies such as Wi-Fi, WiMax, 802.22, wireless mesh networks and Software Defined Radio. In wireless communication domain, with increasing demand for radio spectrum, management of the valuable but natural resource of radio spectrum is a herculean task. The available static allocation techniques result in underutilised spectrum bands. To handle this problem, an efficient and emerging technology, aimed towards Dynamic Spectrum Allocation is Cognitive Radio.

A Cognitive Radio (CR) can alter its communication process in line with its understanding of the context in which it is present. The intelligence and smartness of the Cognitive Radio is mainly due to the presence of Cognitive Engine. This Cognitive Engine primarily consists of knowledge base, reasoning block and learning phase. As part of cognitive process, the radio observes, orients, takes decisions and evaluates the outcomes of decisions taken which is part of the learning phase. There are a variety of learning techniques enabling prediction of various operating and functional parameters of Cognitive Radio.

The proposed work in this report contributes in this direction, towards building predictive learning schemes based on soft computing techniques for Cognitive Radio. Predictive schemes towards forecast of key functional parameters of data rates and through-

put is built. The different learning schemes used in the proposed work range from basic supervised algorithms like Feed Forward Network, Focussed Time Delay Neural Networks, recurrent networks to unsupervised algorithms based on Self-Organising Maps.

Hybrid network of Adaptive Neuro Fuzzy Interference is developed towards improvement of prediction accuracy. It has been found that ANFIS approaches have high prediction accuracy up to 97%. Subsequently Self-Organised Maps based learning scheme is used to investigate improvement in design flexibility. It has been found that these learning schemes aid in adding more input parameters without altering the network design with prediction accuracy up to 85%. Stochastic time series model based learning schemes have also been built to find if there are alternative approaches to soft computing methods. It has been found that stochastic time series Auto-Regressive and Auto-Regressive Moving Average models are able to perform accurate predictions based on input-output relationships.

Finally, Dynamic spectrum allocation has been performed incorporating the learning accomplished through the learning schemes. These learning schemes form useful inputs which results in improved Cognitive Engine, leading to enhanced Dynamic Spectrum Allocation in Cognitive Radio. In future, these algorithms are to be integral part of Cognitive Engine in large scale, leading to intelligent spectrum management and allocation and hence a smart radio.

Keywords:

Cognitive Radio, soft computing techniques, Feed Forward Network.

Contents

List of Figures

List of Tables

Chapter 1

Introduction

The goal of this chapter is to create the research background for learning schemes for Cognitive Radio using soft computing. Initially, the existing scenario in wireless networks is introduced to illustrate the need for development of Cognitive Radio. This is followed by the fundamental concept of Cognitive Radio. The heart of the Cognitive Radio is the Cognitive Cycle. The importance and role of Cognitive Cycle is detailed. The intelligence in Cognitive Cycle is incorporated through Artificial Intelligence and soft computing techniques. Hence the next section introduces the significance of Artificial Intelligence and various soft computing techniques that can be part of Cognitive Engine.

1.1 Overview of the Monitoring System

IoT or Internet Things refers to the network of connected physical objects that can communicate and exchange data among themselves without the desideratum of any human intervention. It has been formally defined as an "Infrastructure of Information Society" because IoT sanctions us to amass information from all kind of mediums such as humans, animals, conveyances, kitchen appliances. Thus, any object in the physical world which can be provided with an IP address to enable data transmission over a network can be made part of IoT system by embedding them with electronic hardware such as sensors, software and networking gear.

IoT is different than Internet as in a way it transcends Internet connectivity by enabling everyday objects that utilizes embedded circuits to interact and communicate with each other utilizing the current Internet infrastructure Since then the scope of IoT has grown tremendously as currently it consists of more than 12 billion connected devices and according to the experts it will increase to 50 billion by the end of 2020. With the advent of IoT both manufacturers and consumers have benefited. Manufacturers have gained insight into how their products are used and how they perform out in the real world and increase their revenues by providing value added services which enhances and elongates the lifecycle of their products or services. Consumers on the other hand have the ability to integrate and control more than one devices for a more customized and improved user experience.

In this paper, we are going to propose a system for the immediate cleaning of the dustbins. As dustbin is considered as a basic need to maintain the level of cleanliness in the city, so it is very important to clean all the dustbins as soon as they get filled. We will use ultrasonic sensors for this system. The sensor will be placed on top of bin which will help in sending the information to the office that the level of garbage has reached its maximum level. After this the bin should be emptied as soon as possible. The concept of IoT when used in this field will result in a better environment for the people to live in. No more unsanitary conditions will be formed in the city. With the help of this system minimal number of smart bins can be used around the whole city and the city will still be much cleaner.

There has been an unprecedented growth in the number of devices being connected to the Internet since past few years. All these devices connected to the internet are part of the IoT infrastructure which can communicate with each other. The IoT network consists of embedded electronics, sensors and software that allows these devices to send and receive data among each other. This is why it is beneficial to use such an

existing infrastructure for designing the proposed security system. The disadvantages of the existing system are that the employees have to go and check the bins daily whether they are filled or not, it results in high cost. If the bin doesn't get emptied on time then the environment becomes unhygienic and illness could be spread. The proposed system will help in removing all these disadvantages. The real-time information can be gained regarding the level of the dustbin filled on the system itself. It will also help in reducing the cost as the employees will have to go only at that time when the bin is full. This will also help in resource optimization and if the bins will be emptied at time then the environment will remain safe and free from all kinds of diseases. The cities will become more cleaner and the smells of the garbage will be much less. We are living in an age where tasks and systems are fusing together with the power of IOT to have a more efficient system of working and to execute jobs quickly! With all the power at our finger tips this is what we have come up with.

The Internet of Things (IoT) shall be able to incorporate transparently and seamlessly a large number of different systems, while providing data for millions of people to use and capitalize. Building a general architecture for the IoT is hence a very complex task, mainly because of the extremely large variety of devices, link layer technologies, and services that may be involved in such a system.

One of the main concerns with our environment has been solid waste management which impacts the health and environment of our society. The detection, monitoring and management of wastes is one of the primary problems of the present era. The traditional way of manually monitoring the wastes in waste bins is a cumbersome process and utilizes more human effort, time and cost which can easily be avoided with our present technologies. This is our solution, a method in which waste management is automated. This is our IoT Garbage Monitoring system, an innovative way that will help to keep the cities clean and healthy. Follow on to see how you could make an impact to help clean your community, home or even surroundings, taking us a step

closer to a better way of living.

The idea struck us when we observed that the garbage truck use to go around the town to collect solid waste twice a day. Although this system was thorough it was very inefficient. For example let's say street A is a busy street and we see that the garbage fills up really fast whereas maybe street B even after two days the bin isn't even half full. This example is something that actually happens thus it lead us to the "Eureka" moment!

What our system does is it gives a real time indicator of the garbage level in a trashcan at any given time. Using that data we can then optimize waste collected is either dry or liquid using sensor. It allows trash collectors to plan their daily/weekly pick up schedule. An Ultrasonic Sensor is used for detecting whether the trash can is filled with garbage or not. Here Ultrasonic Sensor is installed at the top of Trash Can and will measure the distance of garbage from the top of Trash can and we can set a threshold value according to the size of trash can. If the distance will be less than this threshold value, means that the Trash can is full of garbage and we will print the message "value of moisture sensor" on the message and if the value is less than 300 the motar will rotate towards the dry side and when it is greater than 300 it will rotate towards the liquid side.

The mixing waste management is a big challenge in the any country. The smart garbage collection system is used of the smart home and smart city. The system is used of the separate garbage such as dry garbage is separate container and the wet garbage is separate container with the help of a motor mechanism and the IR sensor though. The garbage is place of motor mechanism then the IR sensor detects and the moisture sensor is the find out the garbage is wet or dry. Suppose the garbage is wet then the motor mechanism is rotated to left side and if the garbage is dry then motor mechanism is rotated of right side and the garbage is collected in the container.

When the garbage container is full then it will display to the nearest municipal office that the container is full and send the code or address. And the municipal office will inform of the garbage collector driver via sms through GSM module .The total process is wireless through and IOT based through.

An efficient waste management is a pre requisition for maintain a safe and green environment as there are increasing all kinds of waste disposal. There are many technologies are used for waste collection as well as for well managed recycling. The Information gathering is big and cumbersome. The concurrent effects of a fast national growth rate, of a large and dense residential area and a pressing demand for urban environmental protection create a challenging framework for waste management. The complexity of context and procedures is indeed a primary concern of local municipal authorities due to problems related to the collection, transportation and processing of residential solid waste today the garbage collection is manual which takes a lot of efforts and is time consuming.

In this project humans and vehicles were used to do that work and here we are using automatic technique to detect garbage level in Garbage Can. For that, ID number is given to each can. Also as soon as the Garbage Can is full / over flowing then a SMS is sent to the server from where all the garbage collection vehicles are allotted.

Chapter 2

Literature Survey

This chapter presents a review of the literature relevant to the proposed research work. The primary aim of this section is to establish the motivation, need, and relevance of this research work through an exhaustive literature survey.

2.1 Satellite Navigation Technology

In the satellite navigation technology, dramatic changes have been taking place due to the rapid development of multi-constellation GNSS to provide services for precise positioning applications [37]. However, radio signals transmitted by GNSS satellites are vulnerable to space weather effects, including solar radio bursts and ionospheric perturbations. Intense solar radio bursts are potential threats for the tracking performance of L-band-based GNSS receivers and safety-critical systems based on GNSS [38].

Large gradients have been observed in the ionospheric TEC during different intense geomagnetic storm events at various geographical locations over low-latitude regions [10, 39, 40]. The random ionospheric electron density irregularities cause L-band signal scintillations [3]. Aarons and Kintner et al. [6, 17] have suggested that post sunset scintillation phenomenon seriously inhibits reliable operations of GNSS systems. Conker et al. [41] have reported that amplitude and phase scintillations of radio signals could be attributed to either diffractive or refractive mechanisms of ionosphere.

The signal availability and positioning accuracy of Space-Based Augmentation Systems (SBAS), Aircraft-Based Augmentation Systems (ABAS) and Ground-Based Augmentation Systems (GBAS) have been affected due to extreme ionospheric scintillations over equatorial regions, such as the Ascension Island [42].

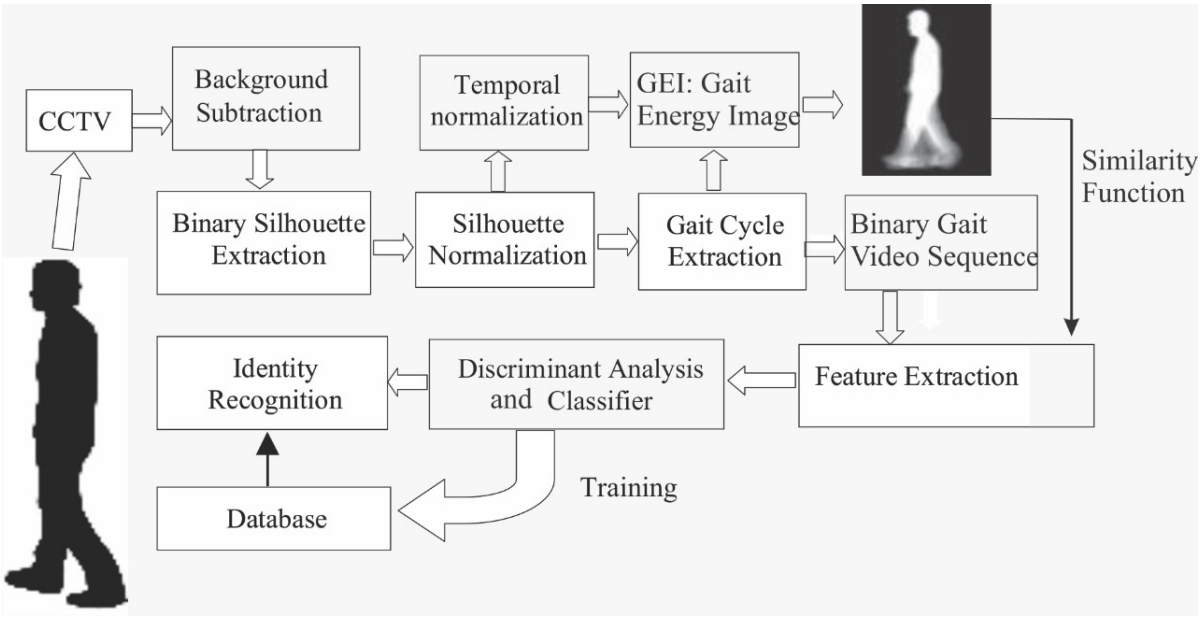

Figure 2.1: Basic block diagram for gait based human identity recognition

The general framework for segmentation and pre-processing of video sequence is shown in Figure 2.1.

Chapter 3

Proposed Methodology

This chapter begins with the problem statement and research objectives formulated for the proposed work. This is followed by Work Flow Diagram depicting the various activities in the proposed work. Following this, a complete elucidation of the various stages in the proposed methodology is discussed in detail in line with the Work Flow Diagram. A brief overview of the methodologies and techniques as well as simulation platforms used in the methodology is detailed subsequently.

3.1 Start sections

3.1.1 Table creation

Write here [4]

Table 3.1: Cost of fruits in India

Fruit details		Cost calculations		
Fruit	Type	No. of units	cost/unit	cost (Rs.)
Mango	Malgoa	18	50	
	Alfonso	2	300	1,500
Jackfruit	Kolli Hills	10	50	500
Banana	Green	10	20	200
			Total cost (Rs.)	2,200

3.2 Requirement analysis

3.2.1 Hardware Requirement

Explain about the appropriate Hardware Requirement with proper reasoning. (This is mandatory section)

3.2.2 Modern Engineering Tools and Software Requirement

a) Open Source Libraries / Softwares / Tools Requirement:

Explain about the appropriate Open Source Libraries / Softwares / Tools Requirement with proper reasoning. (This is mandatory section)

b) Proprietary Softwares / Libraries / Cloud Requirement:

Explain about the appropriate Proprietary Softwares / Libraries / Cloud Requirement with proper reasoning. (This is mandatory section)

3.2.3 Techniques Requirement

Explain about the appropriate techniques Requirement. (This is mandatory section)

3.2.4 Resources Requirement

Explain about the appropriate resources Requirement. (This is mandatory section)

3.3 Impact analysis

3.3.1 Impact of project on society

Positive Impact of project on society:

(This is mandatory section)

Negative Impact of project on society:

(This is mandatory section)

3.3.2 Impact of project on environment

Positive Impact of project on environment:

(This is mandatory section)

Negative Impact of project on environment:

(This is mandatory section)

3.4 Professional ethical practices to be followed

Please mention about the professional ethics and responsibilities and norms of engineering practices to be followed. (This is mandatory section)

Chapter 4

Project Implementation

This chapter commences with the details on how the proposed system has been developed with insights on the environment. Following this, description of all techniques and their implementations, simulations have been covered comprehensively.

4.1 Hardware Implementation

Applicable if the project is hardware project.

4.1.1 System Specifications

Write here

4.1.2 Design Calculations

Write here.

We will demonstrate the creation of equations with some samples. Let us start with

the model of an inverted pendulum:

$$\frac{d}{dt}\begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = \begin{bmatrix} 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & -\gamma & 0 & 0 \\ 0 & \alpha & 0 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ -\delta \\ -\beta \end{bmatrix} \Delta\mu \tag{4.1}$$

Proportional, integral, derivative controller is most popular in industry. It has three tuning parameters: K, τ_i and τ_d. The integral mode includes the term $\int_0^t()dt$.

$$u(t) = K\left(e(t) + \frac{1}{\tau_i}\int_0^t e(t)dt + \tau_d\frac{de(t)}{dt}\right) \tag{4.2}$$

Let us go through the discrete equivalent of equation 4.2

$$\begin{aligned} u(n) - u(n-1) = K\Bigg[e(n) - e(n-1) + \frac{T_s}{2\tau_i}\{e(n) + e(n-1)\} \\ + \frac{\tau_d}{T_s}\{e(n) - 2e(n-1) + e(n-2)\}\Bigg] \end{aligned} \tag{4.3}$$

Section 4.1.2 shows how to write equations.

4.1.3 Circuit Diagram

Circuit diagram with all component values and proper discription.

4.2 Software Implementation

Applicable for both hardware and software based projects.

4.2.1 Algorithm

Detail algorithm.

4.2.2 Flow Chart

Clear flow chart.

Chapter 5

Results and Discussion

This chapter begins with detailed tabulation of results obtained through implementation of various techniques. Further, observations and analysis of the results is also done along with the results in this chapter. From the analysis of the results, inferences have been made.

5.1 Simulation Results

Commonly, for all settings the difference between the neural network outputs and desired outputs has been found. Based on this Root Mean Square Error has been calculated. The major aim is towards minimization of this RMSE. Fig.5.1 show the differences obtained between the neural network outputs and the desired or actual outputs for reference bit rate or the data rate over the training data set. Further irrespective of the setting as the numbers of epochs are increased, the major performance parameter RMSE reduces steeply as it has been observed in Fig. 2.1.

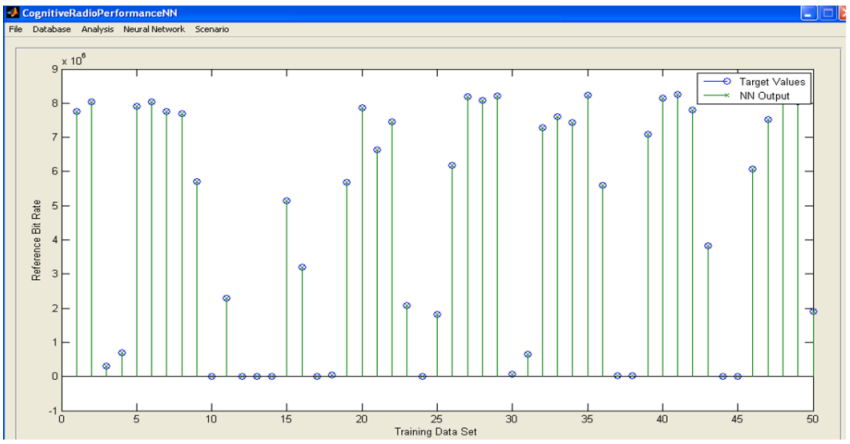

Figure 5.1: Differences obtained between Neural Network output and target or desired values

5.2 Hardware Results

Please mention all the results with proper and clear images with detail explanation of results.

Chapter 6

Conclusions and Future Scope

6.1 Conclusions

Write here

6.2 Future Scope

Write here

References

[1] Linda Doyle, Essentials of Cognitive Radio, *Cambridge Wireless Essential Series*, May 2009

[2] Kwang-Cheng Chen, Ramjee Prasad , Cognitive Radio Networks, *Wiley Publications*, April 2009.

[3] Simon Haykins, "Cognitive Radio: Brain-Empowered Wireless Communications", *IEEE Journal on Selected Areas in Communications*, Vo. 23, No.2, February 2005.

[4] Simon Haykin, "Cognitive Dynamic Systems", *Proceedings of the IEEE* , Vol. 94, No. 11, November 2006, 1910-1911.

[5] Carlos Cordeiro, Kiran Challapali, and Dagnachew Birru, "IEEE 802.22: An Introduction to the First Wireless Standard based on Cognitive Radios", *Journal of Communications*, vol. 1, no. 1, April 2006.

[6] Charles Clancy, Erich Stuntebeck, "Applications of machine learning to Cognitive Radio Networks", *IEEE Wireless Communications* , August 2007.