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ANN model for predicting the significance of parameters in the structural behaviour of an elliptical paraboloid shell roof

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Abstract

In the analysis of various engineering problems, Finite Element Method (FEM) is considered as one of the significant tools and has been broadly used in many fields. Employing this method aids in simulating the deformable complex objects comprising material and structural properties and determines the model's response to definite loading conditions. For an easier, quicker and less expensive analysis of structures, a consistent model has to be developed. However, many techniques optimize the system performance; the intelligent method design is a valuable technique in optimizing the competence of such structures. One of the emerging brilliant techniques is Artificial Neural Network (ANN) which is applied in modelling, simulation and system organization. To resolve difficult and nonlinear problems ANN tool is faster and more precise as compared to other conventional techniques. The present work is carried out to predict the behaviour of Elliptical Paraboloid Shell (EPS) roof based on the output obtained from an ANN model. The results indicate that the ANN technique performs faster and predicts the output with less error and is an appropriate method to model the shell roof structure's performance. The influence of the geometrical parameters of the shell in the prediction of deflection has been studied.

Introduction

Optimization of structural components by means of computational tools has become a most vital research area. Employment of these tools may demand a significant computational rate and time depending on the difficulty of the problem. There are many techniques which have been assessed in order to give best performance within the constraints. In these many diverse systems, Artificial Neural Networks is recognized as one of the new alternatives. ANN when integrated with traditional analysis diminishes the computational effort without disturbing the quality of final result [1]. It is a computational model that aims to imitate the structure and performances of neural networks of human brain. Their computing capabilities have been verified in the fields of prediction and estimation, pattern identification, and optimization. For complex problems, which are tedious to be modeled and solved by classical and traditional procedure, the ANN tools are found to be suitable [2].

A shell is a slender structure comprised of curved sheets of material where the structural behaviour is mainly influenced by curvature [3]. It is the most efficient way of utilizing the material and is widely useful for industrial

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AIR POLLUTION TRACKING IN MANGALORE USING GIS AND RS

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ABSTRACT: Environmental pollution of urban areas is one of key factors that state authorities and local agencies have to consider in the decision-making processAir quality is deteriorated in Mangalore due to the release of toxic smoke from vehicles. Petrochemical industries at Baikampady and Padubidri release large amount of smoke day and night. Trash burning is observed in many places' day and night. Road repairs are left incomplete and dust circulates everywhere. Plastic wrappers, containers are found scattered here and there in public places. The vehicles are also increasing; all these factors along with the petrochemical industries contribute to rising air pollution. Many places within the city of Mangalore need plenty of improvement, as far as cleanliness and sanitation are concerned. All riversides and localities such as Bunder, Central Market, Alake, Hampankatta and Urva ferry point need to be cleansed up.An attempt has been made to Identify major air pollutants, Zoning of air pollution areas, Effects of air polluted areas, Mapping of air polluted areas.

INTRODUCTION

Air is a basic requirement for the survival and development of all lives on Earth. The air quality remains one of the major environmental issues in modern society. Quality of air affects the entire human race as well as plant and animal populations on the earth. Air pollution is made up of a mixture of gases and particles in harmful amounts that are released into the atmosphere due to either natural or human activities such as due to the development of industrialization, the increase in the number of private cars, economic development, the burning of fossil fuels as well as living standards. There are many pollutants in the atmosphere, such as SO_2, NO_2, CO_2, NO, CO, $PM_{2.5}$ and PM_{10}

With an objective to address the above concerns, concept of air quality index (AQI) has been developed and used effectively in many industrialized countries for over last three decades AQI is defined as an overall scheme that transforms the weighted values of individual air pollution related parameters such as sulphur dioxide (SO2), nitrogen dioxide (NO_2) and particulate matter < 10μm (PM_{10}), etc., into a single number or set of numbers.

Mangalore in Dakshina Kannada is one of the most polluted industrial centres in the country. The pollution level at the centre have touched "critical level", says the study which covered 83 of the most polluted industrial hubs in the country. As a municipal entity, the city spans 170 Km^2 (65.64 sq. mi). The Netravali and Gurupura rivers encircle the city. The Gurupura flows around the north and the Netravati flows around the south of the city. The rivers form an estuary in the south-western region of the city, from where they flow into the Arabian Sea. Coconut, palm trees and Ashoka comprise the primary vegetation of the city. The city's topography consists of a plain that stretches up to 30 KM (18.64 m) from the coast and undulating, hilly terrain towards the east near the Western Ghats. The local geology is characterised by hard laterite in hilly tracts and sandy soil along the seashore.

Air quality is very bad nowadays in Mangalore. Automobile pollution has been increased Petrochemical industries at Baikampady and Padubidri release large amount of smoke day and night. Trash burning is observed in many places' day and night. Road repairs are left incomplete and dust circulates everywhere. Plastic wrappers, containers are found scattered here and there in public places. The vehicles are also increasing, all these factors along with the petrochemical industries contribute to rising air pollution. Many places within the city of Mangalore need plenty of improvement, as far as cleanliness and sanitation are concerned. All riversides and localities such as Bunder, Central Market, Alake, Hampankatta and Urva ferry point need to be cleansed up