



Prediction of environmental indicators in land leveling using artificial intelligence techniques

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Introduction

Land leveling is one of the most important steps in soil preparation and cultivation. Although land leveling with machines require considerable amount of energy, it delivers a suitable surface slope with minimal deterioration of the soil and damage to plants and other organisms in the soil. Notwithstanding, researchers during recent years have tried to reduce fossil fuel consumption and its deleterious side effects using new techniques such as; Artificial Neural Network (ANN), Imperialist Competitive Algorithm –ANN (ICA-ANN), and regression and Adaptive Neuro-Fuzzy Inference System (ANFIS) and Sensitivity Analysis that will lead to a noticeable improvement in the environment. In this research effects of various soil properties such as Embankment Volume, Soil Compressibility Factor, Specific Gravity, Moisture Content, Slope, Sand Percent, and Soil Swelling Index in energy consumption were investigated. The study was consisted of 90 samples were collected from 3 different regions. The grid size was set 20 m in 20 m (20*20) from a farmland in Karaj province of Iran. The aim of this work was to determine best linear model Adaptive Neuro-Fuzzy Inference System (ANFIS) and Sensitivity Analysis in order to predict the energy consumption for land leveling. According to the results of Sensitivity Analysis, only three parameters; Density, Soil Compressibility Factor and, Embankment Volume Index had significant effect on fuel consumption According to the results of regression, only three parameters; Slope, Cut-Fill Volume (V) and, Soil Swelling Index (SSI) had significant effect on energy consumption. using adaptive neuro- fuzzy inference system for prediction of labor energy, fuel energy, total machinery cost, and total machinery energy can be successfully demonstrated. In comparison with ANN, all ICA-ANN models had higher accuracy in prediction according to their higher R2 value and lower RMSE value. The performance of the multivariate ICA-ANN and regression and artificial neural network and Sensitivity analysis and Adaptive neuro-fuzzy inference system (ANFIS) model was evaluated by using statistical index (RMSE, R2)). The values of RMSE and R2 derived by ICA-ANN model were, to Labor Energy (0.0146 and 0.9987), Fuel energy (0.0322 and 0.9975), Total Machinery Cost (0.0248 and 0.9963), Total Machinery Energy (0.0161 and 0.9987) respectively, while these parameters for multivariate regression model were, to Labor Energy (0.1394 and 0.9008), Fuel energy (0.1514 and 0.8913), Total Machinery Cost (TMC) (0.1492 and 0.9128), Total Machinery Energy (0.1378 and 0.9103). Respectively, while these parameters, for ANN model were, to Labor Energy (0.0159 and 0.9990), Fuel energy (0.0206 and 0.9983), Total Machinery Cost (0.0287 and 0.9966) Total Machinery Energy

(0.0157 and 0.9990) respectively, while these parameters for Sensitivity analysis model were, to Labor Energy (0.1899 and 0.8631), Fuel energy (0.8562 and 0.0206), Total Machinery Cost (0.1946 and 0.8581), Total Machinery Energy (0.1892 and 0.8437) respectively, respectively, while these parameters for ANFIS model were, to Labor Energy (0.0159 and 0.9990), Fuel energy (0.0206 and 0.9983), Total Machinery Cost (0.0287 and 0.9966), Total Machinery Energy (0.0157 and 0.9990) respectively, Results showed that ICA_ANN with seven neurons in hidden layer had better.

During the only remaining century because of expanding human populace, requests for farming wares have been tremendously expanded. These days, one of the cardinal natural difficulties on the planet is vitality creation and utilization. In spite of delicate development of sustainable power source utilization, for example, sun-oriented vitality, wrong use and absence of legitimate administration have prompted a serious ascent in petroleum product vitality utilization in this field. It likewise ought to be considered that ecological preservation and market globalization will be subject to food security later on farming. Concerning, some unique strategies ought to be routed to consider vitality perspective related to the ecological issues to tackle the issue. Land leveling is one of the heaviest and expensive tasks among farming practices that expend significant measure of vitality. Moreover, moving hefty machines on the ground makes the dirt denser, especially in the wet areas where the dampness substance of the dirt is high and it makes a circumstance that isn't effectively recoverable. Then again, land leveling streamlines the water system, improves field circumstances in different practices identified with farming and directs the dirt surface and standardizes its slant. Purportedly, there are three critical variables which have impact on grain yield including the impacts of land leveling, strategies for water application and the communication between land leveling and water applied. Okasha et al. watched a critical association among slant and various water system conspire in various seasons. A few specialists have utilized different methods, for example, Internet of Things (IoT) to enhance the water system measure dependent on the physical qualities of soil. Notwithstanding, these strategies don't participate in land leveling measure. Different strategies for land leveling can influence the physical and synthetic properties of the dirt, and consequently can make contrasts in plant foundation, root development, elevated spread and in the end crop yield. As an immediate outcome, one of the most significant strides in soil planning and a key factor in food creation that ought to be streamlined is land leveling. Furthermore, diminishing petroleum product utilization for land leveling lessens air contaminants and improves the ecological condition. There is a developing comprehension of significance and impacts of water and soil the executives which thus uncovers the criticalness of streamlined laser land leveling from social, budgetary and agronomic perspectives. Despite the fact that some improving procedures have been proposed for the improvement of activities identified with nature, they have different unfortunate impacts

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Utilizing PCs and the Internet has demonstrated an extraordinary potential to tackle these kinds of issues by diminishing the previously mentioned unwanted impacts. There are heap of PC based methods and as of late IoT that are utilized generally to tackle building issues. ANNs are one of these techniques. ANN is a reasonable procedure, the yield or construed variable of which can be demonstrated as far as different boundaries that are applicable to a similar cycle.

This method has been generally utilized in building field for advancement and forecast. Ahmadi et al. proposed ANNs prepared with Particle Swarm Optimization (PSO) and Back Propagation (BP) calculation to appraise the balance water dew purpose of a flammable gas stream with a Triethylene Glycol (TEG) arrangement at various TEG focuses and temperatures. They revealed that this methodology, PSO-ANN, can help in better comprehension of liquid supplies' conduct through recreation situations and factual outcome hushed up observable. In another examination, a feed-forward ANN improved by PSO was utilized as a man-made consciousness displaying instrument to anticipate asphaltting precipitation because of common consumption. They additionally proposed another organization dependent on feed-forward ANN upgraded by Hybrid Genetic Algorithm and Practical Swarm Optimization (HGAPSO) and contrasted it and regular BP-ANNs. They announced that consequences of this methodology were superior to traditional techniques, in light of factual examination. This strategy has been additionally utilized for foreseeing boundaries with diminishing vulnerabilities. In an exploration, Ahmadi et al. utilized man-made consciousness strategies to precisely decide the measure of Dissolved Calcium Carbonate Concentration in oil field salt waters with least vulnerability. In another examination, Multi-Layer Perceptron (MLP)- ANN models and Adaptive Network-Based Fuzzy Inference System (ANFIS) models were embraced to foresee and reproduce the groundwater level of the Lamerd plain; the necessary outcomes were acquired by accentuation on higher precision and lower dissipating for displaying ANFIS with RMSE of 0.9987 and R2 of 0.0163 in preparing stage, and RMSE of 0.9753 and R2 of 0.0694 in test stage . ANN and ANFIS were additionally used to anticipate the subsurface water level in paddy fields of Plain Areas among Trajan and Nectarous Rivers. The relationship coefficient of the proposed models was 0.8416 and 0.8593 and RMSE of them were 0.2667 and 0.249, separately. In like manner, ICA is another transformative calculation in the Evolutionary Computation field dependent on the human's socio-political development. This calculation has been proposed by Atashpaz- Gargari and Lucas in 2007

It reenacts a streamlining issue by analogizing factors to settlement and magnificent nations. This strategy has been generally utilized in tackling designing issues, for example, information grouping, Nash balance point fulfillment, ANNs preparing composite developments, creation organization confusions, and improvement difficulties. Ecological Impact Assessment (EIA) was likewise tended to in writing which includes the examination and assessment of booked occasions so as to guarantee naturally solid and supportable enhancements

Since, land leveling with machines requires impressive vitality, in this manner, advancing vitality utilization in the leveling activity is normal. Accordingly, here, five methodologies including ANN, incorporating Artificial Neural Network and Imperialist serious calculation (ICA-ANN) and Sensitivity Analysis, Regression, ANFIS models have been tried and assessed in forecast of ecological pointers for land leveling. In addition, since a predetermined number of studies related with the vitality utilization in land leveling have been done, the goal of momentum vitality and cost research is to discover a capacity for all the lists of the land leveling including the slant, coefficient of growing, the thickness of the dirt, soil dampness, unique weight earth and the expanding. To check the precision and pertinence of the proposed straight model, a contextual investigation was completed dependent on necessities of the task in a farmland at Karaj, Iran. The homestead territory was 70 ha and was situated in west of Karaj, 31°28'42" north scope and 48°53'29" east longitude

Biography:

Isham alzoubi has completed his PhD at the age of 27 years from Doctor of Philosophy Degree in Agricultural Mechanization Engineering (University of Tehran – Iran) University and Postdoctoral Studies from School of Surveying Geospatial Engineering-Department of Surveying and Geomatics Engineering, University of Tehran. Current Job: General commission for scientific Agricultural Research – Damascus – Syria (Mechanical Engineer) He has published more than 16 papers in reputed journals and has been serving as an editorial board member of reputed.

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