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DESIGN OF CONCRETE MIX USING ARTIFICIAL INTELLIGENCE

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ABSTRACT

Concrete is the most widely used building material because of its ability to flow into the most complex shapes, allow it to take any desired shape when wet, and build strength when hardened. Concrete is the most widely used building material because it can be shaped when wet and improves strength when hardened. Concrete is often used as a means of protecting structures subjected to significant loads. Concrete is the most used building material. The presence of high-level chemical parameters such as pH and TDS affects the strength and durability of concrete. The purpose of this article is to examine how the strength and durability of concrete can vary depending on the type of water used in its manufacture. Base material, filler, binder, and additives are the four general categories used to describe the materials used in this study. Both reactive and inert materials were used for this study. Here is a discussion of the various materials used in this project, their properties and test results. Statistical analysis is a numerical measurement that can describe the characteristics of a sample and is a type of data collection.

keywords: *Concrete, Artificial Intelligence*

INTRODUCTION

Concrete is the most widely used building material because of its ability to flow into the most complex shapes, allow it to take any desired shape when wet, and build strength when hardened. Concrete is the most widely used building material because it can be shaped when wet and improves strength when hardened. Concrete is often used as a means of protecting structures subjected to significant loads. Concrete is the most used building material. Cement, water and aggregate are the three components that must be combined to form this composition. Concrete production requires a series of processes adapted to the characteristics of the place where it is made. It is possible to produce concrete of acceptable quality by combining several elements, each with unique properties. The properties of the components entering the concrete play a role in determining the strength, durability and other properties of the concrete together with the amount of mixture, type of compaction and other controls applied. The fact that concrete is made of readily available components contributes to the widespread use of the material in the construction industry. It is generally accepted that the compressive strength of concrete is the most important property, but it also has many other properties. However, the workability of the concrete is an important factor in the formulation of the mixture. In mix design, other factors such as the water-cement ratio, the fineness modulus of the aggregate and the density of the cement each have their own importance.

For the production of normal concretes, also called mixed designs, certain empirical correlations between design parameters are used. These relationships have developed from past experiences.

After a series of experiments with different amounts of mix it is possible to produce a typical concrete mix with the correct strength. An artificial neural network, also known as ANN, is a network of multiple nodes called neurons. The weight of the connection between these neurons allows you to define the relationship between the input data and the data produced. ANN is a method that can be used when there is no known algorithm to solve the problem. The design of the concrete mix can also be considered as part of the same issue. Here, too, the production of concrete, which requires many test series, is an extremely complex subject in itself. The ability of ANN to relate input and output data can be used to determine various design parameters for standard and high-performance concrete. This can be done using the function that allows the ANN to establish a relationship between the input and output data. The use of neural networks in the concrete mix design process has the potential to reduce the number of tests required. To create a concrete mix using an artificial neural network, it is necessary to adequately sum the mix ratios together with the characteristic forces involved, the water content and the fineness of the aggregates to train the neural network. Due to the lack of suitable blend design data, experimentally generated blend design data corresponding to the above features were prepared in order to construct the ANN. In addition, ANN modeling was applied to design concrete mixtures using these data.

Concrete is the most widely used building material because of its ability to take the most difficult shapes (i.e., any shape when wet) and its reinforcing properties after hardening. . Its production requires a large number of activities, all depending on local conditions. The properties of the materials entering the concrete, together with the mixing ratios, compaction process, and other controls applied, affect the strength, durability and other properties of the material (Neville, 1996). Compressive strength is often considered the most important property among many other properties of concrete, and for good reason.

Concrete is a popular building material because it can be shaped to meet the functional needs of a particular environment while being made from readily available components. This contributed to the widespread use of concrete. Since the quality of concrete is determined primarily by the skill in which it is made and placed, it is important that the concrete be satisfactory both in its plasticized and cured state. Although concrete is in a plastic state for a short time, what happens in this state after it hardens determines the properties of the concrete.

The qualities of concrete, both in its plastic stage and in its hardened state, are often largely governed by the relative amounts of the various components involved in making the concrete. It is possible to improve or change the properties by adding a chemical additive or a more cementitious material, and this additive will be in the right proportion to produce the required or desired concrete.

High-strength concrete (often abbreviated as HSC) is characterized by greater durability and strength than ordinary concrete compared to ordinary concrete. The addition of the mineral-chemical mixture makes HSC a very complex material, making it difficult to simulate the behavior of the material. The compressive strength of concrete is a primary and important mechanical property and is usually determined by measuring concrete samples after a standard curing time of 28 days. In fact, compressive strength is directly related to concrete's ability to withstand compressive force. Traditional methods for estimating the compressive strength of concrete after 28 days are based on statistical analysis, in which multiple linear and nonlinear regression equations are generated to model such a estimation problem. These equations are used to model the problem.

The process of obtaining test values for initial strength concrete is time consuming with a 28-day delay in strength estimation. Selecting an appropriate regression equation is also not an easy task, as it requires skill and experience and careful consideration. Traditional predictive models are designed using a fixed form of equations based on a limited set of data and parameters. These models are limited by the amount of data and parameters they can use. If the new data is significantly different from the old data, the model should be updated to include both its coefficients and the shape of the equation. This is the case where there are large differences between the two data sets.

There is no need to use such a special equation format for ANN. Instead, it requires a fair amount of input and output data. You can also constantly train with new data to adapt to new data quickly and easily. Investigations have been made on the ANN to resolve issues with incorrect or insufficiently detailed information

In the field of structural engineering, several authors have used ANN. For example, Yeh (1998), Kasperkiewicz et al. (1995), Lai and Sera (1997) and Lee (2003) used ANN to predict the properties of high-performance concretes and standard concretes.

In 2003, Bai et al. created neural network models that provide strong predictive power for the workability of concrete containing metakaolin (MK) and fly ash. These models successfully predicted concrete workability (FA). Guang and Zong (2000) developed a method to predict the compressive strength of concrete after 28 days of material use using multilayer predictive neural networks. Dias and Pooliyadda (2001) used backpropagation neural networks to make predictions about the strength and stability of ready mixed concrete, high strength concrete and high strength concrete containing additives and chemical additives.

The term "mix ratio" refers to the process of determining the amount of each element in the concrete mix to achieve the desired qualities in the final product. These amounts should be found in a properly balanced concrete mix.

- Freshly mixed concrete has satisfactory workability.
- Longevity, durability and regularity are key features. The appearance of the concrete after hardening.

To obtain these qualities, the engineer must calculate the appropriate amount of cement, water, fine and coarse aggregates and additives. A solid understanding of the basic theory of asphalt design is also necessary to perform the calculation that determines asphalt percentages. In concrete structures, achieving the quality described above is possible only with careful verification of the components of the mixture and the components of the mixture itself. Before dosing a concrete mix, you must select the properties of the mix. This selection depends on the intended use of the concrete, the exposure conditions, the size and shape of the structural members, and the physical properties of the concrete required by the structures (e.g. when dimensioning a building, architects and planners often specify or assume a specific concrete strength or modulus of elasticity. The concrete has the properties specified by the designer. It is the responsibility of the engineer to ensure that it is properly proportioned, mixed, placed and cured so that it is properly proportioned. The dosage of the cement mix affects the quality of both new and hardened concrete. When the material is in a plastic state, the engineer is concerned with important properties of the material such as strength, durability, porosity and modulus of elasticity. B. Effects of curing Other factors such as shipping, curing times and weather conditions can also affect the properties of in-situ concrete, but these are often secondary factors and require you to make only minor adjustments to the mix ratios as you work. Other factors that may affect their curing are delays in curing, shipping, placement, and the effects of weather conditions.

Theoretical calculations are based on a large number of assumptions and estimates, so the mixing ratios of the real elements to be used do not give the correct answer. Therefore, the properties of these mixtures are evaluated and modified using test mixtures and laboratory tests until a completely adequate mixture is produced.

The dosage of concrete mixes is influenced by a large number of esoteric factors, the interrelationships of which are so complex that it is not possible to develop mathematical models that can represent their interactions and reactions. Adjustments are always made based on information from actual quality control testing, expert advice, experience and other available research; However, the final mix ratios remain statistical and contain uncertainties and various errors even after adjustments. However, it is always impossible to avoid personal, physical and mechanical errors and uncertainties caused by materials, test environments, construction environments and other factors such as shipping, placement delays and environmental conditions. These errors and uncertainties can be caused by a variety of factors, including but not limited to:

Concrete, in its most complex form, is the most widely used building material due to its fluidity, that is, its ability to take any shape when wet and its strength properties when hardened. Because concrete only improves its strength when it hardens. Concrete production is a complex process that requires consideration of the influence of a number of processing parameters on concrete quality control in terms of workability, strength and other properties. These different properties can be effectively combined in a single level of compressive strength to achieve the desired result.

In most engineering fields, artificial intelligence has demonstrated the ability to mimic and predict the behavior of a wide variety of physical phenomena. The construction industry is starting to show more interest in AI as a decision support tool in a variety of fields, including diagnostics, design, repair and renovation. Formulating a concrete conglomerate can be a difficult and delicate process in civil engineering. The traditional approach to determining the design of a concrete mix relies on an element of uncertainty and is dependent on industry experts' opinions.

OBJECTIVE OF THE STUDY

1. To study on artificial intelligence has demonstrated the ability to mimic and predict the behavior of a wide variety of physical phenomena
2. To study on database of various models was compiled from the existing literature on concrete mix design using artificial intelligence.

CONCLUSION

Based on the premises of the studies conducted in the study, the following conclusions can be drawn in this regard. Research into the quality of blending water carried out within the scope of this study has demonstrated this. Except for the pH value, the concentrations of all water quality measurements measured in the groundwater in the study area are above the maximum allowable values. The total dissolved solids level in groundwater is significantly higher than permissible and exceeds the limit values more than twice. Chloride and sulfate amounts in groundwater are also well above the maximum allowable values. Groundwater is not allowed to be used as mixing water for concrete, as the groundwater quality does not meet the requirements. All mixtures made with ground water have a longer setting time than concrete made with treated water. It was like that everywhere. We came to this conclusion after evaluating the results of the preliminary tests on setting times. Due to the use of fly ash instead of cement, the initial setting time increased in treated waters and in groundwater mixtures. Adding silica fume does not greatly affect the overall time it takes for the item to cure.Concrete setting time results show that all mixtures made with ground water have a longer setting time than concrete poured with treated water. This is because the purified water is used to prepare the concrete. However, the time required for the final preparation of each mix is less than 600 minutes. The use of fly ash instead of cement affects the overall setting time of the material and this effect can be changed.

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