ARTIFICIAL INTELLIGENCEINBRIDGE ENGINEERING

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ABSTRACT

Civil engineering and construction have already been used automation for decades and we can simulate, design and test various structures without building them and on the other side, automation has definitely impacted the cost. Artificial intelligence(AI) will take this progress even further by developing more efficient and safer structures, further lowering the cost and minimizing human involvement. It may one day be able to develop a shape-shifting structure to improve efficiency or even decide when and where to build a structure.

Keywords- Artificial Intelligence, Artificial Neural Network, Smart Materials.

I. INTRODUCTION

The research of artificial intelligence has been developed since 1956, when the term "Artificial Intelligence, AI was used at the meeting held in Dartmouth College. Artificial intelligence (AI) is a specialized system to understand intelligent entities, construct them and make the process of decision making simple, quick and efficient. Artificial intelligence is concerned with the automation of intelligent behaviour that thinks and act like humans. It is extremely broad and deeply embedded in our daily lives. It is based on the interaction of several kinds of disciplines, such as computer science, cybernetics, information theory, psychology and neurophysiology. Hence Artificial intelligence is a branch of science, involved in the research, design and application of time-efficient projects.

AI deal with machines that perform functions, which require intelligence when performed by people. Artificial intelligence is a concept already embedded in our day to day lives e.g. in speech recognition, computer's Reasoning, computer vision, EHS compliance, Neural Network in construction and management etc.

Artificial intelligence applied to Bridge Engineering has developed into a large collection of studies specializing in solving various engineering subtask. In a few cases, the studies were conducting closely with practitioners and in most other without such involvement. Even when the task addressed were significant, such as the conceptual design of bridge the knowledge utilised was rather Limited.
Bridge engineering task is coupled with their solution required diverse and intricate knowledge.Bridge engineering evolves continually by the introduction of new loading requirements, new material, new structure forms, new quality construction methods, and other technologies such as smart or intelligent structure.

Some of the important features of Artificial intelligence are: Speech recognition, Object detection, solving problems and learning from a given set of datasets, plan an approach for future tasks to be performed
There are 4 distinct types of Artificial Intelligence and they are:
Purely Reactive - Reacts based on its surrounding environment and does not need any previous data.
Limited Memory - Makes use of current and previous data to complete a given task.
Theory of Mind - Has the ability to understand human emotions and socialize.
Self-Aware - It is the future generation of Machines. They will be super intelligent, sentient and conscious
Artificial Intelligence can be achieved in two ways through:Machine Learning, Deep Learning
Machine Learning provides Artificial Intelligence with the ability to learn and adapt and solve problems on its own based on some algorithms.
Deep Learning makes it possible for Artificial Intelligence to function as a human, and probably even a more intelligent version of a human. It imitates the functioning of a human brain to make decisions and complete a task.

II. LITERATURE REVIEW

Following are various literature reviews of paper that arebased on artificial intelligence and are published on differentnational and international journals.
Yavuz Yardimin his paperdescribe the condition assessment of reinforced concrete bridges is a complex subject imbued with uncertainty and vagueness. This complexity arises from numbers and relations of different kind of problems in reinforced concrete bridges.Condition assessment requires vast knowledge of the behaviour of reinforced concrete structures subjected to different phenomena such as excessive loading, environmental effects and chemical attacks.
This requirement can be achieved throughan expert system, which may represent human expertise. This study presents an Artificial Neural Network (ANN) assisted crack rating system for RC bridge's girder which improves the effectiveness of crack condition rating.
A high-precision model was constructed using ANN for predicting the crack rating which contribute to decreasing many uncertainties in RC bridge assessment and improving the effectiveness of crack condition rating. It is concluded that this ANN model can be used for predicting the crack rating of cracks on RC bridges girder.
Bassuoni and Nehdi developed neuro-fuzzy based prediction of the durability of self-consolidating concrete to various sodium sulphate exposure regimes.Neuro-fuzzy inference systems (ANFIS) can be used topredict the

behaviour of cement-based materials under various exposure regimes of very severe sodium sulphate attack. Such models combine the advantages of artificial neural networks (e.g. self-learning and pattern recognition) and fuzzy inference systems.

Prasad presented an artificial neural network (ANN) to predict a 28-day compressive strength of a normal and high strength self-compacting concrete (SCC) and high-performance concrete (HPC) with high volume fly ash.

Lee used an artificial intelligence technique of back-propagation neural networks to assess the slope failure.

Arunav Chakraborty and Dr. Diganta Goswamiin his paper gives the Prediction of stability of slopes isvery difficult because the stability of the slopes generally existsas the combined effects of geology, hydrology and soilparameters. 100 slope cases were used to develop theprediction model using ANN. The validation of the predictionmodel was done by comparing the predicted results with theactual results of the remaining 10 cases. From the presentedresults, it has been found that the predicted results bear a veryclose relationship with the actual results. Hence, it can befinally concluded that ANN can be used as a good predictiontool for slope stability analysis.

Rajeev S. Kale, Sunil Kutein his paper tell about theSoft computing tools neural network and fuzzy logic can be used for the problems, where nosolution algorithm is known. The mix design of concrete can be put under same category ofproblem. Again, development of required concrete mix, which required large sets of trial, is avery complex problem in itself.The application of Artificial Neural Network (ANN) systems to the design of concretemixture proportioning can help to determine compliance with design codes, standards andguidelines for acceptable practice and provide information on the selection of materials anduse of proper methods for construction. A sample input-output of the model for standardconcrete mixes of grades M20, M30 and M40 has presented to the five layers ArtificialNeural Network (ANN) systems. The outputs in terms of quantity of ingredients of mix havebeen compared with those obtained by conventional method as suggested in codal guidelinesof DOE method. The important parameters considered for comparison are water, cement andtotal aggregate content for M20, M30 and M40 mix.

Akshata Patil, Lata Patted in their paper tellsin many situations of civil engineering, various problems are encountered that are very complex and not well understood. Most of the mathematical models fail to simulate the complex behaviour of these problems. Artificial Intelligence has been successfully applied to many civil engineering areas like prediction, risk analysis, decision-making, resources optimization, classification, and selection etc.AI based computational techniques, adaptive neuro-fuzzy inference systems were particularly suitable for modelling complex systems with known input-output data sets specially to study the behaviour of cement-based materials undergoing single, dual, or multiple damage factors.

Pengzhen Lu, Shengyong Chen, and Yujun Zhengare introduces the intelligent technologies in civil engineering withrecent research results and applications presented in their paper and All aspects of applications of the artificialintelligence technology in civil engineering were analysed. On the basis of the above researchresults, prospects of the artificial intelligence technology in civil engineering field applicationand development trend were represented. Artificial intelligence can help inexperienced userssolve engineering problems, can also help experienced users to improve the work efficiency,and also in the team through the artificial intelligence technology to share the experienceof each member. Artificial intelligence technology will change with each passing day, as the computer is applied more and more popularly, and in civil engineering field will have a broad prospect.

III. CONCLUSION

AI would be a very useful tool in the civil engineer's toolkit. With software that works alongside civil engineers to help them make decisions faster, so that they can focus on the numerical and analytical aspects of it and instead designing more interesting parts on the focus and so on. After reading many research papers, we thought that how artificial intelligence can be used in the protection of structures, So AI based sensor that will be stored on Bridge and flyover to prevent major disasters. The system starts with the sensor with artificial intelligence-based Technology will be fixed between two column of an elevated structure and will constantly monitor the vibration and deflections that occur as will pass over it the signals are then fed into computer where the data is measured. What can the sensor detect. If a bridge is taking on more vehicular pressure then it can bear. If there is any internal structural damage. Vibration that occurs when a vehicle passes over the bridge. The maximum load pressure of a particular structure.

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