Novel Approach to Structural Failure Prediction of Multistoried RC Building by KNN

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Abstract- Reinforced concrete is a combination of concrete and steel plates which enhance the strength of the concrete. This type of concrete is able to resist the applied force together. The combination of steel and concrete gives effective strength and able to handle the larges vibrations of earthquakes, winds and other forces. Basically it is and economic building material which is used now the days in most of the building construction. It is used in construction of beams, columns and storage structure like dams, tunnels and water tanks.

In this work Failure prediction in RC buildings is proposed by using the Genetic algorithm and K-nearest neighbor algorithm. These algorithms give the optimal result of the classification and prediction in this work. Optimization techniques play an important role in structural design, the very purpose being to find the best ways for a designer or decision-maker to make the most of available resources. The basic idea of intuitive or indirect design in engineering is the memory of past experiences, subconscious patterns, incomplete logical processes, random selections, or sometimes mere superstition. This, in general, will not lead to the best design.

Keywords- RCC,optimization,learning,prediction ,KNN

I. INTRODUCTION

Reinforced concrete is a combination of concrete and steel plates which enhance the strength of the concrete. This type of concrete is able to resist the applied force together. The combination of steel and concrete gives effective strength and able to handle the largest vibrations of earthquakes, winds and other forces. Basically it is and economic building material which is used now the days in most of the building construction. It is used in construction of beams, columns and storage structure like dams, tunnels and water tanks.

Development method play a significant role in the design of structures, the objective which is to find super ways or techniques by which the designer or the decision makers can generate the maximum profit from the existing resources at hand. An engineer's main aim is to progress with an 'optimum design' for the concerned design job. An absolute solution usually demonstrates a beneficial structure without destroying the useful purposes. There is huge number of promising beam sizes and increased ratio's that outcome for the same moment of struggle, then it became tough tasks to achieve the least-cost construct by knowable iterative prospective. The mechanism of optimization can help designers to grab the best design.

The main idea behind indirect architecture in engineering is the past experiences, inspire behind design, unfinished logical processes, or sometimes irregular environmental conditions. This therefore doesn't lead to best design or optimum design. This shortcoming of this type of indirect design can be overcome by adopting optimum design approach, which of only logical decisions. In this the designer sets out the pressure and then minimizes or maximizes the objective functions like cost, weight or merit. The structural optimization techniques can also be according to the construct philosophy employed. The purpose function is attained by calculating each event and multiplying it to the respective possibility. The total of all such entries will be the total purpose function.

II. RELATED STUDY

M.Z Cohn and A.J Macrae in their paper developed the approach that permits the expansion for many feasible merit functions, acknowledge all important limit state design restraints by any of the design code. This is valid for reinforced pre stressed, and moderately pre-stressed concrete members. Problem formulation and non-linear programming techniques for its solutions are explained [1].H.Moharrami and D.E. Griesrson in their paper provide an effective computer aided technique for the finest design of the concrete building formworks. The dimensional parameters of width, depth and longitudinal reinforcement of members are taken as design variables. Both the member capacity sensitiveness and structure ability sensitiveness are taken into deliberation while formulating all the strength constraints. The techniques shows that it provides an efficiency way to optimise with iterative optimization which converges in a few cycles to a least cost design of reinforced concrete frameworks satisfying all relative requirements of the design codes [2].

C. A. C. Coello et al In his paper developed a simple Genetic algorithm for the design of supportive concrete beams; organise an optimization model for the design of rectangular reinforced concrete beams subject to a particular set of constraint. Their model is more materialistic than published formerly because it reduces the cost of the beam on fortifying design procedures, although the cost of concrete, steel and shuttering is also examined. Thus their design proceeds to very practical design. There is a number of unlimited numbers of possible beam dimensions and yield a same moment of struggle. An efficient search technique is favoured over the more traditional alternate methods. They also engage a simple genetic algorithm as a search engine. They also compare the results with those achieved via geometric programming. However the adjustment of parameters in a genetic algorithm is asignificant issue for any application, they represent their own methodology to deal with this issue [3].

.C Sarma and H.Adeli in their research say that as the construction of the concrete designersincludes at least three separate materials namely concrete, steel and formwork. Thus the design optimization of concrete structures should not base on weight optimization, but instead on cost optimization. In this study analysis of numerous papers on cost optimization of concrete structures is accessible. The conclusion from it states that three is requires to research on cost optimization of three dimensional structures especially where huge savings can be made. Also supplementary research on cost optimization based on life cycle of structures, where instead of the initial cost of the structures, the life cycle cost is minimized [4]. C.C. Ferreira et al. In this approach, finest design of reinforced concrete T-sections in winding present optimization of the steel area and the steel localization in a T-beam under bending is performed in the current work. The expressions giving the equilibrium of a single and double reinforced T-section in the various stages introduced by the non-linear behavior of the steel and concrete are derived ones. The final material behaviour is defined accordingly to the designs codes alike EC2 and Model Code 1990. The objective is to gain the analytical optimal design of reinforcement of a T-section in terms of the unlimited design. The established expressions are applied to examples and design abacuses are supplied. A judgment is made with the available practice technique as indicated in CEB [5].

V. Govindaraj and J. V. Ramasamy inthis paper presented the optimum design of reinforced concrete regular beams using genetic algorithms as per the design deliberation of the Indian standard codes. The optimum design is such designed that it observes with all the serviceability, ductility, durability, and all other design constraints of the code. In this examine only the cross sectional dimensions of the beam are considered as design variables. An example issue is illustrated and the results are presented [6].B. Saini et al Studied Genetically, improved artificial neural network on the basis of optimum design of single and double fortify concrete beams, research optimum design of singly and double support beams with uniformly dispersed and concentrated load has been done by compromising exact self-weight beam. On the basis of steepest descent, flexible and malleable and back-propagation learning a technique, this design is skilful has also been composed of genetically optimized artificial neural network. With the use of limit state design, the initial solution has been achieved [7].

A.B Senouci and M.S Ansari This paper is about cost optimization of composite beams using genetic algorithm. It is based on the load and confrontation factor design specification of the AISC. The cost of concrete, steel beam and sheer studs are involved in the establishment of model. In this proposed model two designs are studied to illustrate its ability in optimizing composite beam design. The outcome achieved shows that the model is able to attain cost saving. Research has also been done to analyse the effects of beam spans [8].A.Nimtawat and P Nanakorn This paper shows that PSO algorithm for beam slab layout design distribute with measurement of the design of beam slab layout is analysed and not algorithmic because the procedure cannot be segmented into an algorithm. In this research, the design work is written as an optimization issue, which can be solved by following suitable target and reducing functions on the basis of engineering consideration. A simple PSO used to resolve the problem of optimization. It has also been found that it is the best popular method due to its simplicity and excellent presentation. In order to employ this technique certain coding strategy for beam slab layout is used [9].

III. PROPOSED WORK

Step1: Start the process.

Step2: Pre-processing of data. Remove the duplicate data.

Step3: Initialize the Genetic algorithm randomly.

Step4: Learn the Building Features by KNN.

Step5: Update the weight.

Step6: If the weights are optimized then train the model otherwise again initialize the algorithm value.

Step7: Analysis the Precision, Recall and Accuracy.

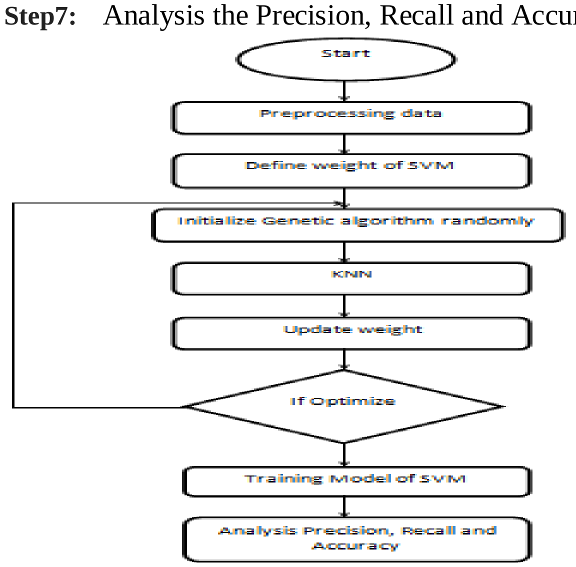

Fig.1 Flow Chart of the proposed methodology

IV. RESULTS

Table 5.1 Results on the different algorithms

Classification	Accuracy	Precision	Recall
PSO	60	55	66
G.A+KNN	70	94	96
KNN	67	67	56

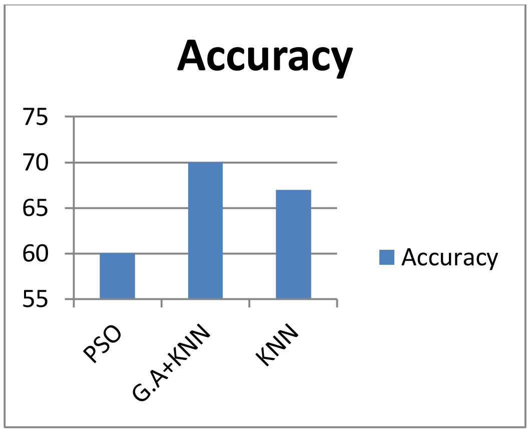

Fig.2: Accuracy graphs of classifiers

Figure 2 depicts the accuracy of the Particle Swarm Optimization, Genetics Algorithm + K-Nearest Neighbor, and KNN classifiers. The high accuracy 70 % in graph shown by G.A+KNN and minimum by PSO 60.

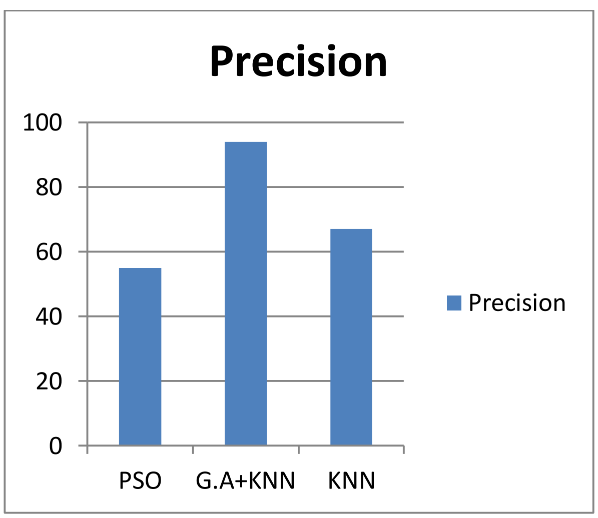

Fig.3: Precision graphs of classifiers

Figure 3 depicts the precision of the Particle Swarm Optimization, Genetics Algorithm + K-Nearest Neighbor, and KNN classifiers. The highestprecisionis 94 % in graph shown by G.A+KNN and minimum by PSO 67.

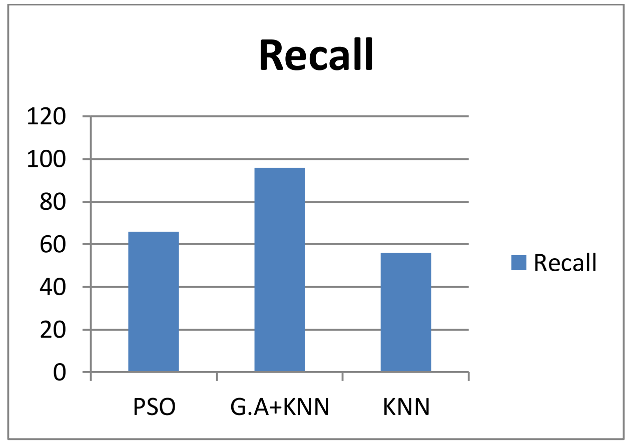

Fig.4: Recall graphs of classifiers

Figure 4 depicts the recall of the Particle Swarm Optimization, Genetics Algorithm + K-Nearest Neighbor, and KNN classifiers. The high recall 96 % in graph shown by G.A+ KNN and minimum by PSO 56.

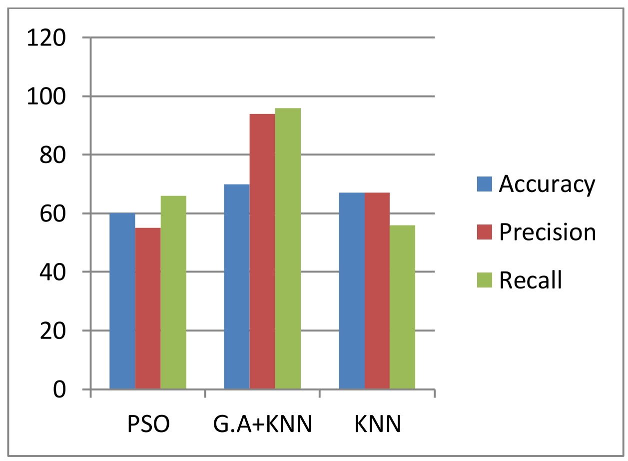

Fig.5: Comparison graphs of classifiers

Figure 5 depicts the comparison of accuracy, precision and recall of the Particle Swarm Optimization, Genetics Algorithm + K-Nearest Neighbor, and KNN classifiers. The outcome of the G.A+ KNN depicts the effective accuracy, precision and recall which help in the failure prediction of the R.C Buildings. The more the accurate results gives the more accuracy in failure and this comes from the optimization of the algorithm we used in the proposed method.

V. CONCLUSION

The bond stress at a particular point is called as local bond. With the variation of bending moment this local bond keeps on varying. Similarly proper anchorage on both sides of the section should be provided, in order to improve full tension in steel placed in the mid-section of the beam. This is done so that whole tension ability of the steel reinforcement is enhanced.

VI. REFERENCES

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