International Journal of Advanced Science and Technology
Vol. 29, No. 12s, (2020), pp. 2663-2668

Smart Construction System

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Abstract

The. suppliers and constructors don't have any system which can bridge between them to fulfil supplier's need for marketing products and constructor's need for cost estimation. Government and construction activities have not transparency. Constructor need lot of time to decide the material suppliers as they need to get quality products within lowest cost.
This project idea will provide a solution for centralizing raw material suppliers and constructors as well as maintaining the transparency between them and government. The supplier module will provide the solution for suppliers for marketing their products. The constructor module will provide the solution for constructors such as project cost estimation. The admin module will provide the solution for government to track illegal suppliers as well as constructors' activities. The coordination of these modules will help to build smart construction system.
Keywords:*AI: Artificial Intelligence, K-Nearest Neighbors(KNN), Machine Learning*

1. Introduction

The current lifecycle management of government construction project is manual and has lack of information due to which it results into excess payment to contractor. Our system aims to develop automate system that can enable a consistent information and which will create awareness of the availability of the raw material. It keeps the record of availability of highway raw material which help for optimum cost assessment and it will register geo-location of the government permitted suppliers to provide their least distance from the project sites.

2. Machine Learning for Construction

Machine Learning is a process in which machine learns from self learning without being programmed.Shown in the **figure2.1.** A machine learns with E, against some T and P where E is Experience,T is Task and p is Measure Performance, if performance of the given task which is measured by P improves because of task experience. The difference between human beings and machine-program is that human beings learn from experience task whereas machine-program work based on instructions given . But we can make even machine-program work from experience and task this is called machine learningl.
That is how machine learning came into existence. Learning is process of getting knowledge, behaviour or any skill through previous experience and studying. Machine learning is computer science. The process of learning starts with observations or data, such as examples prediction of cost, some experience, or some instruction, or some material experience with perspective to look for patterns in experience data and make accurate decisions in the incoming examples that we provide to system. The primary aim is to allow the computers learn from self without human work or adjust actions accordingly.

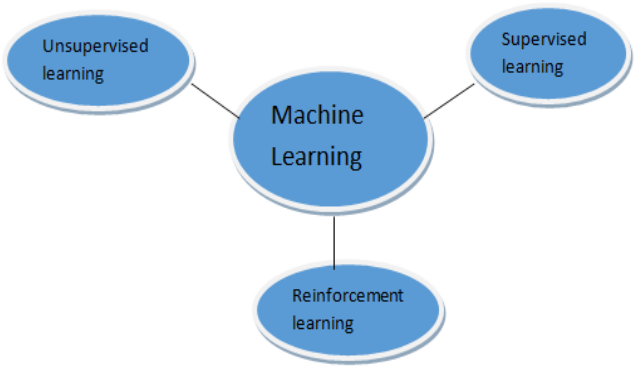

Figure 2.1 Machine learning

3. Literature Survey

3.1. Literature survey of related product's prediction using machine learning algorithms

	Paper 1	Paper 2	Paper 3	Paper 4
Authors	N.L. Chourasiya, P. Modi, N. Shaikh, D. Khandagale,	Monali Paul, Santosh K. Vishwakarma, Ashok Verma,	P.Priya, U.Muthaiah & M.Balamuruga n	Sriram Rakshith.K, Dr. Deepak.G ,Rajesh M
Algorithms used	Multiple linear regression	KNN	Random Forest	Neural Network(NN)
Accuracy	90.20	89.78	90.43	91
Concept used	It is used for predict the value of a variable based on the value of two or more than two other variables	To identify new incoming instances neighbour is classified highest vote of neighbour	The test features must be randomly created tree. As result of this predicted random forest for same test feature.	They based on collection on connected nodes called as neurons. Signal transmitted between in neurons. This neurons weight associated with updated and adjusted neurons
Conclusion	The proposed system takes into consideration the data related to customers, and suggests best material and profitable deals for the client and cost effective for the constructor.	The system "Smart construction" prediction using data mining technology" is developed and tested successfully and satisfies all the requirement of the client.	Random Forest algorithm achieves a largest number of products quality models with a lowest model. It is suitable for massive products quality prediction in project planning.	Various techniques studied via artificial neural network, multi-linear regression, support vector machine. It is concluded Artificial Neural Network(ANN) is better method for system and required less number of inputs

2. Cost Estimation of Civil Construction Projects using Machine Learning Paradigm

Authors	Addressed Issue	Machine Learning Technique	Performance
Gwang-Hee Kim et. al.	Input: Years, Time Continuance, Roof Types, Overall Floor area type, FDN types grades of Finishing Types, Finishing grades. output: Construction Cost No. of Instances: 530 Projects built between 1997 to 2000 in Seoul, Koria.	MRA(Multiple Linear Regression), NN, CBR(case-based Reasoning)	NN>CBR>RA(rehumatic Arthritis)
Huawang Shi et. al.	Input: Structure type, time period, height, level of project management and basement area output: Construction cost. No. of instances: 54 samples of Beijing city.	Fuzzy Logic theory of Rough set+NN	EPNN(Enhanced Probablistic Neural Network)>BPNN(Back propagation neural network)
Mohammed Arafa et. al.	Input:number of column in site, number of story, type of column, number of story, type of fitting number elevator, typical floor area ng number elevator, typical floor area n, number of story, type of fitting number elevator, typical floor area Output: Construction Cost. No. of instances: 71 building projects from gaza strip. palestine.	NN	97%
H.M. Gunaydin et. al.	Input: Ratio of ground floor area to whole area of building, whole area. Output: Construction cost. No. of instances: Residential Building in turkey	NN	93%
Gwang-Hee Kim et. al.	Input: year, budget, school level, land acquisition, class number, building area, floor height Output: construction cost No.of instances: school building construction projects	RA, NN, SVM	NN>RA, SVM(Support Vector Machine)
Huseyin Karancl et. al.	Input: whole construction area, number of apartments, earthquakes region, whole number of elevators. Output: Construction cost. No. of instances: 41 mass housing projects from turkey.	RA, NN, CBR	RA>NN, CBR

Ibrahim Mahamid et. al.	Input: Earthquake, Base works, Road lengths, Road width. Output: Construction cost No.of instances: 52 projects in Saudi arabia implemented during 2011.	RA	0.65<$\mathbf{R}^2$<0.97,17<MAPE(Mean Absolute Percentage Error)<42
Richa Yadav et. al.	Input: cost of cement, sand, steel, aggregates, masons, skilled worker. Output: Construction cost. No. of instances: 23 years cost from schedule of rate book 1993 to 2015.	ANN	R=0.9960, =0.9905, MAPE(TEST)=27.18
Proposed Method	Cost of Digging, reinforcement cement concrete, expansion joint, oil painting, wood mark, etc.	OLS (Ordinary Least Square),RA	0.8439<R<0.9961, 0.7122<$\mathbf{R}^2$<0.9923, 2.0217<MAPE<9.6617

4. Conclusion

In this survey paper we studied various machine learning algorithms such as Random forest, Linear regression, KNN, Neural network for taking proper decision for selection of related products. We also studied various algorithms for estimating project cost such as RA, SVM, NN, OLS RA.

However, the lacks of appropriate knowledge in deciding which parameters to be include or excluded to estimate the project cost can be misguiding. From the experimental evaluation, we believe that the developed system can provide budget cost estimation parameters at satisfactory level. The system can be extended to country level to centralize all suppliers and constructors with government and can achieve the transparency

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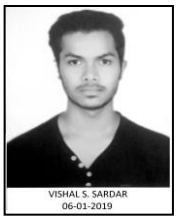

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