CRITICAL LITERATURE SURVEY

Structural Audit of Buildings [1]

Aim: This paper proposed a structural audit of building. The need of structural audit is for maintenance and repairs of existing structures whose life has exceeded the age 30 years to avoid any mishaps and save valuable human life. Structural Audit is an overall health and performance checkup of a building like a doctor examines a patient.

Dataset:

Methodology: Structural audit is done by an experienced and licensed structural consultant. There are 7 stages of structural audit: (1) Study of architectural and structural drawings, design criteria, design calculations, structural stability certificate of existing structures. (2) If architectural and structural drawings are not available, as built drawings can be prepared by an engineer. (3) Visual inspection. (4) Non-destructive and destructive testing. (5) Core testing. (6) Pushover analysis. (7) Identification of critical areas in building. Visual inspection is needed to identify and detect cracks, peel off, fungi and dampness. The person attempting visual inspection has to gather general information about the building. Then the person has to look for deflection and cracks on walls, rusting of steel, false ceiling, alteration of change, alteration or addition of partition wall and detection of dampness on walls, ceiling, etc. For performing destructive and non-destructive testing concrete strength is tested using hammer rebound test, chemical attacks are done using carbonate test, sulphate test, chloride test. Then in core testing a part of the concrete is taken to the laboratory for chemical tests. In Pushover analysis the seismic evaluation of existing buildings compares their capacity against earthquake demand at specific site and concerns the potential earthquake-caused risk to building systems and elements that are closely related to human life safety. Based on the above inspection, analysis and test results, the report should conclude the critical areas that need immediate repairs and retrofitting.

Conclusion: Structural audit is a very important and responsible job. It is compulsory to carry the structural audit after every given period of time. Structural audit includes chemical testing the building material, visual inception and core testing. The visual inception part can be automated using drone and machine learning. Using neural network and training the model accordingly, the model can analyze that a particular image has crack, dampness or not. This will reduce the human labor and we will be able to analyze the area where humans can’t reach.

Damage Index: Assessment of Mould Growth on Building Materials Using Digital Image Processing Technique [2]

Aim: This paper proposed a Digital Image Processing Technique to detect the mould (fungi) growth on building. Use of this technique can help us to preprocess our data and also speed up the process of dataset generation.

Dataset:

Methodology: It consist of 4 stages: Image Pre-Processing stage (IPPS), Image Segmentation Stage (ISS), Mould Infestation Analysis (MIA) stage and Mould Grading Stage (MGS). In the Image Pre-Processing stage there are five steps (1) RGB image is converted to a grey scaled image. (2) Intensity matrix is extracted In from the Hue Saturation Intensity obtained from step 1. (3) Image from step 2 above is fed to the edge padding section for edge padding effect. (4) Image filtering on the image so as to reduce impulsive noise. (5) Perform Global Local Adaptive (GLAPOW) on the image obtained in step 4 above. Image segmentation stage (ISS), the objective is mainly to group image into regions with same properties or characteristics. It is achieved by the use of k-means algorithm. In Mould Growth analysis stage, (a) Ratio of axis- area where mould in grown and (b) Compactness test- area where mould is grown to the complete image. This values are used in the Mould Grading Stage for grading the mould growth.

Conclusion: This DIP technique to detect the mould can be used in data preprocessing of our dataset and help us to speed up the process and the accuracy of our ML model can be increased. This technique uses image processing and rest of the work is done by the user. By using machine learning we can automate this task and reduce users work. We can use the neural network for identifying the image and rating it accordingly.

Road Crack Detection using Deep Convolutional Neural Network [3]

Aim: This paper proposes the crack detection using Deep Convolutional Neural Network as an alternative to existing Digital Image Processing techniques. This paper also states a method of generation of huge volumes of dataset from few images.

Dataset: The dataset is generated using 500 images of size 3264 × 2448 captured using a mobile phone camera. Various sub images are generated from these images resulting into a huge volume (1 Million) of dataset containing images of 99 × 99 pixels.

Methodology: Road safety is an important aspect in structural engineering. Inspection of cracks and other faults on the roads need to be done in a correct and responsible way. To reduce the manual work, and to increase the accuracy of the existing Digital Image Processing techinques, this paper uses Machine Learning to solve this problem of crack detection. The Machine Learning methodology used in this paper is Deep Convolutional Neural Network. The paper proposes the architecture containing several convolutional layers, max pooling layers and fully connected layers. Out of 1 million images in the dataset, 640K images are used to train the model, 160K images are used to cross validate the model, and the final 200K images are used to test the model.

Conclusion: Using Machine Learning and Deep Learning techniques increased the accuracy of the model and is able to detect complex features in complex background and lightings that was not possible in previous Digital Image Processing Techniques. We have taken guidance of the dataset generation methodology that this paper has proposed.

References:

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