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Intelligent hybrid system for foundation designing

The design of foundations requires expert knowledge in the field of civil engineering. This project proposes to develop an Intelligent Hybrid system utilizing two technologies viz. Artificial Neural Networks and Expert Systems for foundation designing. The Neural Network was developed using Microsoft Visual C++. The reason being that Visual C++ can easily be integrated with the FLEX Expert Shell, which is used to model the expert system component. Other neural Network modelling tools cannot be integrated with FLEX.

The Neural Network component is used to model the experience based non-algorithmic knowledge required for foundation designing. The type of soil, the number of stories of the house, and whether or not the house has a basement is used as input to the network, while the 'type" of foundation to be used is generated as output from this module. In doing so a backpropogation feedforward artificial neural network is being used. This was mainly due to the fact that the backpropergation learning algorithm has proved to be satisfactory in solving various real world problems. The Neural Network will first be trained using pairs of sample input output patterns. Once the Neural network is fully trained, the output from the Network as well as further user input is fed into the Expert System.

The Expert Systems module generates more analytical information such as materials to be used and the strength and depth of the foundation. Inputs for this module are the number of stories, soil type, ground water level, approximate distance to sea, and the type of foundation. Furthermore the expert system module is capable of providing optional explanations for the proposed design. Thus developing user confidence in the system. The expert systems module can also use heuristic reasoning to model incomplete knowledge. Also a question and answer system is incorporated to the expert system thus, successfully modelling a human expert. An optional certainty factor is provided for each rule thus increasing the user confidence.