CHAPTER 7

CONCLUSION AND FUTURE ENHANCEMENTS

The systems designed concerns with the knowledge management and information retrieval in Edaphology to assist the Edaphologists and those related with agriculture. The systems succeed in organizing the raw data into useful information in Edaphology domain and hence prove very useful for farmers and Edaphologists. The information is collected from various Edaphologists and soil researchers. Here, initially the raw data is transformed into organized data structure. The systems subsequently take in soil features as the input from the user and the best suited plants are retrieved. The systems discuss the existing drawbacks and try to overcome these problems by bringing out solutions. Proper knowledge management and information retrieval in Edaphology can help in having enhanced productivity in agriculture. This is because planting the right crops for the given soil conditions can definitely improve the yield and knowing the right kind of plant for the soil condition is very essential.

The systems are mainly divided into two modules of knowledge storage and information retrieval. In the first module, knowledge storage from the collected data is carried out using various data structures. In the second module, plants are effectively retrieved based on the user input which contains soil features. Structures like trees, quad tree, XML and Self Organizing Maps are used for knowledge storage. For information retrieval the algorithms includes fuzzy search, Depth-First Search (DFS), DBSCAN and linear regression.

The first system gives the implementation of an efficient tree-based system for knowledge management in Edaphology. The second system
discusses the implementation of knowledge management in Edaphology using
Self- Organizing Maps, the third system employs localized matching model for
plant prediction using incremental clustering. The fourth system discusses XML
and fuzzy-based knowledge retrieval methods in Edaphology. The fifth system
discusses the implementation of intelligent knowledge storage and retrieval
using quadtree structure. The first four systems are implemented using JAVA
and the fifth system is implemented using .NET. Evaluation metrics employed
to evaluate the systems are precision, recall, F-measure, ranking efficiency,
number of plants retrieved, memory usage and response time.

The evaluation metric values are obtained for the common nine input
queries for all implemented systems. For the first system, average precision
value came about 0.73, average recall value came about 0.47 and average F-
measure came about 0.50. Average values of precision, recall and F-measure for
second system came about 0.23, 0.27 and 0.23 respectively. The third system,
achieved average precision value of 0.2, average recall value of 0.2 and average
F-measure of 0.2. The fourth system achieved an average precision value of 1,
average recall value of 1 and average F-measure of 1. And the fifth system
achieved the average precision value of 0.56, recall value of 0.27 and F-
measure value of 0.34. It can see that all systems have got good evaluation
metric values for precision, recall and F-measure. Comparing, the best results
were obtained in the fourth system which employed XML and fuzzy based
approach.

An average of 14 plants per user query was obtained in system 1, 17
plants per user query for system 2, 3 per user query for system 3, an average of
42 plants was retrieved by the system per user query in system 4 and an average
of 2 plants was retrieved by the user query in system5. The average memory
used in five systems came about 261 Kb, 367 kb, 502 kb,2035 Kb and 33894 kb
respectively. It can be seen that the first system using Tree structure has
achieved lowest memory usage. The average computation time used in five systems came about 1060 ms, 15 ms, 3 ms, 163 ms and 10 ms respectively. It can be observed that system 3 has the smallest computation time. Overall, it can be seen that the systems have obtained higher number of plants retrieved, low memory usage and low computation time. Good evaluation metric values indicate the effectiveness of the systems and systems would definitely help Edaphologists and agriculturists in obtaining knowledge about the right kind of crop for right soil conditions. This in turn would increase the productivity of the plant.

The future scope of the knowledge management and information retrieval lies in improving the evaluation metric values by having better data management. Also, the computation complexity can be further reduced with the help of effective searching and retrieval methods, leading to decrease in the time delay and improving search accuracy. Decreasing the time delay and improving search accuracy also would improve the system. Better knowledge management can be brought in by incorporating latest smart concepts into data structures. Also, better information retrieval employing latest techniques can also improve the system performance.