



## Location of Dream House System: A Case Based Expert System Based on Footprint Internal Layered Assessment Retrieval Algorithm

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**Abstract**— Expert system played a very important role in day to day life of human being to help in making a wise decision. So, many studies had done and still going on to increase the decision making ability of expert system. Expert system used reasoning, one of it is case based reasoning whose success judge by the performance of retrieval algorithm and exclusively on the efficiency, competence and quality characteristics. A new retrieval technique has been proposed is footprint internal layered assessment (FILAR) that is guided by a model of case competence by discriminating features, layer assessment analysis while retrieval a case, also interact with user to increase the acceptance level of solution and also increase the knowledge engineering cost to improve the decision making ability of the system. FILAR applied in location of dream house (LDH) application which assist the user for finding the location of dream house by taking some basic detail. This result as a better efficiency, quality with a wise decision making ability in the system.

**Keywords**— Expert System, Case Based Reasoning, FBR Algorithm, Footprint Internal Layered Assessment (FILAR) Algorithm.

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### I. INTRODUCTION

Expert System reason with information or knowledge about themselves. Reasoning associated with thinking, cognition etc. Case Based Reasoning generate new idea by manipulating previously acquired knowledge. An important step in the CBR cycle is the case retrieval process which responsible for finding the case which is closest to the current case within the case base to solve the target problem. There must be some criteria and mechanism to control how the case base is searched. The case is organized in some fashion and case attributes itself represent the problem as well as solutions. Now focus is given on the selection process, how to reduce the search area, how to do the searching process fast etc. how to carry out case retrieval so that case is judged to be appropriate for retrieval without compromising the quality of result. Many researches and implementation are going and still continue to find the most intelligent process, because every process have their pros and cons and some process is specific for some application. So, there is extremely diverse ranging method. One, of the retrieval method is Footprint Based Retrieval (FBR) use footprint cases and their related sets. [1] The Proposed work focus more on how to increase the decision making ability of expert without degrading the quality and efficiency of solution. Proposed work has been done in the field of Case Based Reasoning (CBR) to develop the new technique and algorithm within the CBR problem solving cycle. The proposed algorithm is Footprint Internal Layered Assessment Retrieval (FILAR) Algorithm is potential enough to handle the short comes of previous algorithm Footprint Based Retrieval (FBR).

In Footprint based Retrieval (FBR) Algorithm [1] the target problem set prior, and when user enter a query problem then dynamically find an edited case base of the original case base which closely related to the target problem, and examine the best case within it. Whereas FILAR algorithm also deals with edited case base just like FBR and introduced the concept of discriminating features to make a cluster of cases instead of thinking target problem prior. It works in layer. The layer work in synchronize manner where output of one layer work as input for next layer. Each layer works with discriminating features of case and if found any difference between the searching cases and user query case then further action take place at the right time to suggest other solution to user whose acceptability is high. Knowledge Engineer interact with user and with the help of them fill the distance between them and increase the acceptability of solution. Such a way every layer work with different discriminating features of case and follow the same process as above and at final layer retrieved a best match case or solution to the user problem.

This paper organized as follow. Section 2 describes the proposed work in detail. Section 3 explain the proposed methodology for retrieval procedure with the help of flow chart and updated algorithm. Section 4 discuss the implementation and their result. Section 5 deals with conclusion and their future work.

### II. PROPOSED WORK

Proposed an approach which deal with the techniques and algorithm within the CBR problem solving cycle. The proposed approach introduce a number of important modification which may increase the efficiency, general applicability, effectiveness and the ability to take a wise decision

**A. Competence Model**

CBR system has to deal with a cases which may available in the huge form. Now, if the cases rises, than query within the large amount of database may give a negative effect to the CBR system. So, competence model is introduce to reduce the search area by compressed the cases. This compressed cases works like a whole database for a particular problems. The previous works gives understanding of, importance of modelling CBR competence. But they are also suffer from some short comings. Since it is *unmanageable to prior recognise all the possible future target problem*.

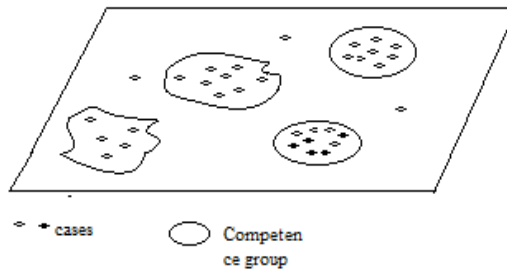


Fig 2.1 shows local competence.

When a case entered is put into the competence to get the position in specific cluster of cases as show in fig 2.1 and if the case not getting any position in the competence group and left as it is, as if there is no target problem set. These cases will not come in any use if they are not come under any competence.

**Proposed Solution:** To improve this potential problem, proposed a different approach for computing case base coverage. As case itself represent a problem space and made up from the related attributes. So, introducing the concept of discriminating features for getting relief from thinking the future target problem prior. Discriminating features has one or more collection of related attributes of case. It helps in making cluster of cases but it may increase the knowledge engineering cost.

**B. Wise Decision improves Efficiency and Quality**

Retrieval played an important role in CBR cycle. Number of cases inspected during retrieval process inverse of it measure as *efficiency*. *Wise decision* here means is giving solution to user which is acceptable. If exact match of solution is not exist then without knowing the acceptance level giving the other related solution to user simply degrade the efficiency and quality of the solution.

The Proposed process deals with retrieval process of a CBR cycle which overcome the potential problem is show in fig given below

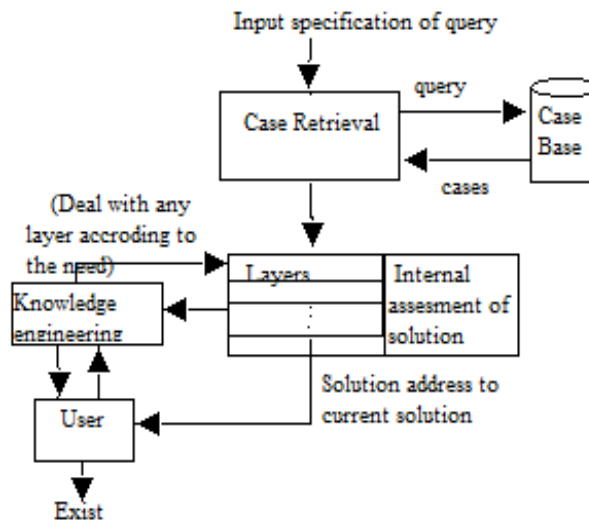


Fig 2.2 Proposed Work on Process involved in CBR

In the above fig 2.2 According to the input specification of query the case retrieval process take place after retrieval of group of cases it goes to internal assesment of solution in which every layer has their own specific task to do. This layer work in synchronise manner where the solution of one layer is work as input for other layer. As case features itself represent the problem specification and solution to. In each layer move closer to our solution. So every layer work with discriminating features of cases and in each layer determine whether a case is close enough to the problem case or whether search parameter need to be modified according to that appropriate action take place. There can be a significant time saving if the correct choice is made at a right time and if we know before giving the final solution that the case is not close enough to the problem case it increase the *efficiency* of system. So to improve the *quality* of solution, at right time take a help of knowledge engineer which take an appropriate action to increase the acceptance level and the most important thing is that it direct interact with the user to known the acceptance level. If acceptance level seems very low then it doesn't go for further searching as it just waste of time but if user accept the available solution then further

assessment take place to give a better quality solution. As working in layer it help to take a wise decision at a right time as any layer can interact with knowledge engineer as per the need but however, it may increase knowledge engineering cost.

There are number of factors to consider when determining the method of retrieval.

The amount of domain knowledge available

- Effortlessness able to determine the weight for features of cases.
- Ease to discriminate the case according to the weightage of features.
- The weightage of feature of case should remain constant throughout the application.

### III. PROPOSED METHODOLOGY FOR RETRIEVAL PROCEDURE

While retrieving a solution, moving more close to the best matched case as proceeding in a layer. **Internal Layered Assessment** with the discriminating features of case has been helps in retrieving a case and while retrieving a case, there is usually a phase to determine whether a case is close enough to the problem case or whether just go far away from user problem case. If the retrieved case is closed enough to the user problem case then with the selected reference cases it go for next layer where further search carried out within the edited case base. While retrieving the case if found any difference between the searching cases and user query case then further action take place at the right time to suggest other solution to user whose acceptability is high. To make this the knowledge engineer make a user involvement to know whether the user is ready to accept the other solution or not. Showing such result which is a related solution and having acceptance level low may chance of unlikely to be successful and it simply degrade efficiency and quality of solution.

Flow chart and Updated Algorithm are given below

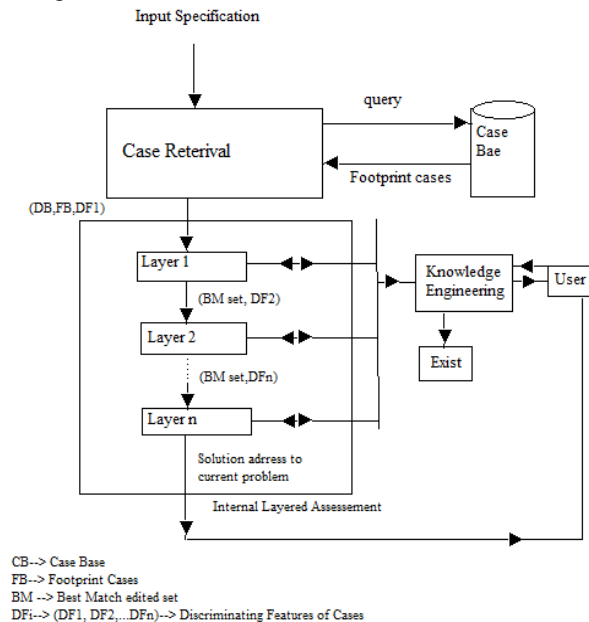


Fig 3.4.1 Flow Chart of Retrieval Process

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Target → Current target problem.
CB → Case-Base, FP → Footprint set, KE → Knowledge Engineering
FBR (CB, FP, Discriminating Feature) {
Layer 1:
If (best Match case in FP to target, Discriminating Feature)
While (FP is not null) then RefCase1 ← closest Match End While
Layer2(RefCase1)
End If
Else
KE interact with User and Show Other Suggestion;
Layer1 (User selected Option) Or exist.
End Else
.
.
Layer n:
If (best Match case from RefCase(n-1), Discriminating Feature )
While (FP is not null) then RefCase(n) ← closest Match Retrieve (Case) End While
End If
Else
KE interact with User and Show Other Suggestion;
Layer n (Selected Option) or exist End Else }
    
```

Algorithm 1. Proposed retrieval procedure.

#### IV. IMPLEMENTATION, RESULT AND DISCUSSION

Discuss about the implementation of Location of Dream House (LDH) which is a case based expert system based on the Footprint Internal Layered Assessment retrieval algorithm. LDH helpful in searching location of your dream house by giving basic detail about your dream house. It just a small application to show the concept of research work. For making it more useful in the real world further can updated it more. There are two separate application is made to show the concept of two different algorithm. One is FBR (Footprint Based Retrieval Algorithm) and another one is FILAR (Footprint Internal Layered Assessment Retrieval Algorithm).

##### Experimental Setup

The environment and experimental setup is keeps same for both the algorithm. This research use a standard data set. The size of case base is of 800 cases from the property domain. Each case describe the location, price, bedroom, bathroom, size, size/sq.ft , status etc. in a particular region. This data set is publically available. These data sets are further managed to provide different case base sizes and target problem sets for FBR. Generate 7 case-base sizes from 20-300 cases and 230 target problem. For every case base of size n the target problem set. User problem query randomly produced to test both the algorithm FBR and FILAR in the same condition and the analysis paradigm is same for both the algorithm.

##### A. Efficiency

During retrieval how many number of cases is inspected through process the inverse of it, is termed as Efficiency. Here we are going to generate the efficiency in term of number of case examined for finding the best match to the problem case

**Method:** Each case-base of size n is tested with respect to its associated set of target problems and the efficiency show the number of cases examined during the retrieval of best match case. The case is averaged for each of the k case base size to compute a mean. The different size k of case bases are showing in this graph are (80,100,140,180....etc.)

These retrieval efficiency result are show in fig 5.2.1 plot as reference set size verses number of cases retrieved.

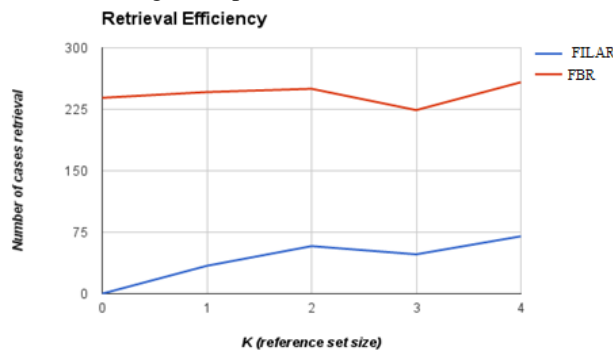


Fig 4.1 Retrieval Efficiency

**Discussion:** The blue line represent the result of FILAR based application while red show the result of FBR based application. As expected FILAR performs better than FBR.

- The average case retrieval during each case base size is much higher in FBR which is negative sign to the efficiency.
- The average case retrieval during each case base size is much comparably lesser in FILAR which is positive sign to the efficiency

Result shows that to reach to the conclusion or the solution FBR make a more effort on searching then FILAR. As show in fig 4.1 both the line is not increasing constantly because for searching the best match, have to deal with edited case base and size of case base is not constant. The efficiency of FILAR is much better than FBR.

##### B. Wise Decision improve Quality and Efficiency

*Wise decision* here means giving other solution to user whose acceptance is high if exact matched case is not available. It increase the efficiency and the quality of the solution.

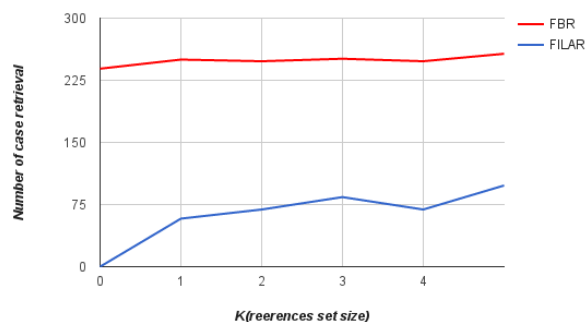


Fig 4.2. K (reference set size) versus number of case retrieval.

**Method:** Each case-base of size  $n$  is tested with respect to its associated set of target problems and the efficiency show the number of cases examined during the retrieval of best match case. The case is averaged for each of the  $n$  case base size to compute a mean. The different size  $k$  of case bases are showing in this graph are (180,190,200,210,220....etc.)

The retrieval of such other case which improve the quality of solution when no exact match is available such wise decision helps to improve the efficiency also. Result are show in fig 42 plot as  $k$  reference set size verses number of case retrieved and graph describe after how many search of case we get know that the no exact match is available.

**Discussion:** As in graph in fig 4.2 the blue line represent the result of FILAR based application while red show the result of FBR based application

- Show clearly that in FILAR it know as soon once a distance between the problem case and targeted solution cases are start increases
- While the FBR just give the close enough cases as a solution to user which may have acceptance level low and more unlikely to be successful and it may degrade the quality so solution.

As show in the result that as soon as know that there is no exact match of case and the dissimilarity between problem and solution case start increasing then FILAR at right time take an action to provide a better quality result and if acceptance level of other solution is low then no need for searching the other cases and degrading the efficiency of system. Whereas in FBR when there is no exact match available then after searching all the cases give related solution whose acceptance may be low.

### C. Model Competence for Coverage of cases

Competence model, introduce to reduce the search area as well as grouping cases in such a way that for a target problem the bundle of cases works like a whole database, it edited the unwanted and noise cases for a specific problem set.

**Method:** Each case-base of size  $n$  is tested with respect to the no of cases got coverage. Coverage means cases in a case base getting place in cluster of cases. The different size  $n$  of case bases are showing in this graph are (20, 40, 60, 80, 100, 140, 180, and 220....etc.)

These competence coverage result are show in fig 4.3 as plots of competence coverage (number of cases got coverage in the competence group) versus case base size.

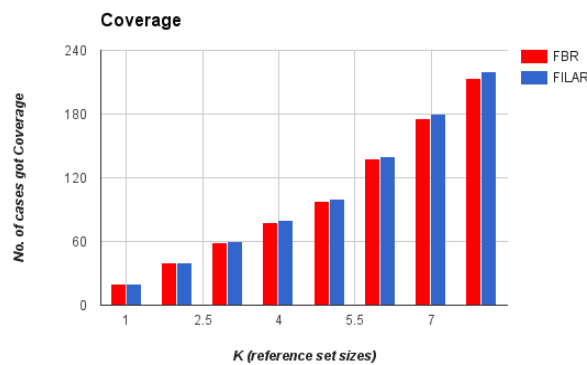


Fig 4.3 Competence Coverage

**Discussion:** As in bar graph in fig 4.3 the blue block represent the result of FILAR based application while red show the result of FBR based application

- As result show clearly that proposed work gives full competence coverage to all the cases
- While in the previous work FBR may not able to give full coverage to all cases

In previous work the case won't get the place in competence group and left as it is if there is no target problem set. These cases will not came in any use if they are not come under any competence. While in proposed work FILAR the competence model is design in such a way that it give full coverage to all the cases.

## V. CONCLUSIONS

Expert system which give an expert advice. The study focus more on how to increase the decision making ability of expert without degrading the quality and efficiency of solution. Work in the field of Case Based Reasoning (CBR) to develop the new technique and algorithm within the CBR problem solving cycle. The proposed algorithm Footprint Internal Layered Assessment Retrieval (FILAR) Algorithm is potential enough to handle the short comes of previous algorithm Footprint Based Retrieval (FBR) Algorithm. It deal with the edited case base just like FBR and also introduce, discriminating features to make a cluster of cases instead of thinking target problem prior and also the concept of Internal Layered Assessment for retrieval and adaptation of solution, which works in layers. The layers work in synchronize manner with specific discriminating features of case and if addressed any difference between them then Knowledge Engineering take a wise decision means it check the acceptance level of solution by interacting with user which overall improve the efficiency and quality of solution. The result of experiments are very forceful and positive to the proposed technique. In Future will need to work on updating and maintain a cases in a particular competence cluster. Also try to improve the application usability by adding more features of application

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