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Improvisation of Web Navigation Usability Using Genetic Algorithm from Actual Usage of Weblog Pattern

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Abstract: In data mining the frequent pattern can be discovered from the hidden information present in web log data in process of web usage mining. The user behavior in analyzing the data can be obtained from the navigation pattern which is extracted from web log data. The problem present in the web navigation usability can overcome by comparing the actual and anticipated usage pattern. In this work genetic algorithm is applied as an optimization method to provide better suggestion for user and improve the navigation pattern related to user search. The results proves that the optimization approach improves better suggestions that the existing methodologies. The effectiveness, satisfaction and the efficiency of an individual user in performing a specific task is high when the usability of web is perfect for an environment. The process of providing more suggestion can be performed in less computational time by the genetic process.

Key words: Genetic algorithm, navigation pattern, web log data, web page usability.

I. INTRODUCTION

The plenteous reservoir of information is the World Wide Web. The user can access the large amount of data in a free manner to obtain useful information. This information should be -organized and contended in a proper way for effective utilization by the users. The information retained form the web is not meeting the coveted expectation of the user. The pith of the competency for the business survival present in building and assuring the easy usage web systems. The structural firmness and presentational delight are the principles present in the web designing.

The experience of the users in the online web navigation can be improved by implementing these principles in designing the web. The performance and the website security are the characteristics that determine the structural firmness. The navigation convenience and the ease of interaction between the user and the interface determined by the functional convenience. The user senses are get induces to a website which is determined by the presentational delight.

The web mining is an area present in the data mining it deals with the extraction of the hidden and useful pattern of knowledge present in the World Wide Web [1]. The user can achieve effective result by this mining. Web log file put in the information about the websites which the user surfed. This data is used to obtain the interaction type of the user with the websites and the pattern of navigation.

The web log files which contain copious information should get mined in a proper manner to prevail the useful information for decision making. The process of mining the web log files is known as web log mining. Data contain the web usage pattern includes the data from different sources. Fig 1.1 represents the web mining process.

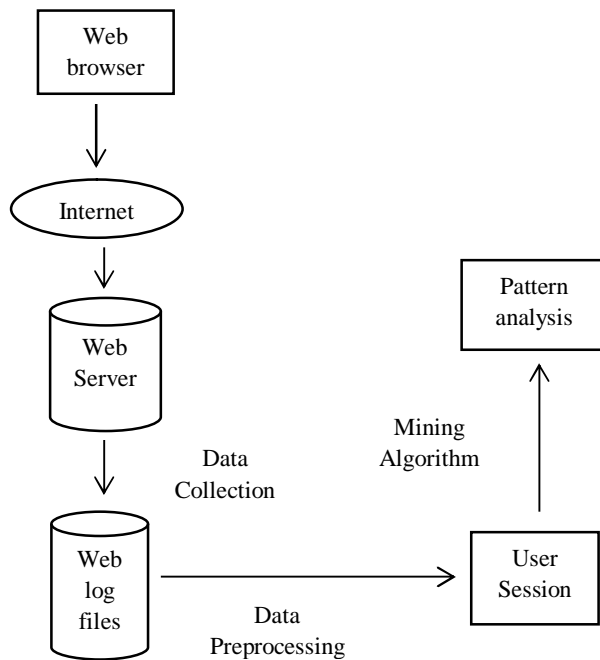


Fig 1.1 Web mining process

Weblog is a web site that consists of a series of entries arranged in reverse chronological order, often updated on frequently with new information about particular topics. The information can be written by the site owner, gleaned from other web sites or other sources, or contributed by users. Two types of logs, i.e., server-side logs and client-side logs are commonly used for Web usage and usability analysis. Just about every website has some form of navigation. Most of the time, website navigation is put together by Web designers who know a lot about making decorated websites, but very little about marketing a website or creating a website built from the users point of view, which results into web navigation usability problems for users.

A. Challenges

The challenges which are present in retaining the useful data from the collected information are listed below [1].

- 1) Other data are get mixed with the useful information
- 2) Single user generates the multiple request
- 3) Same request for the server generated by multiple users
- 4) They won't record the data involved in the navigation.

The data collected from the web mining includes data from different sources and different formats which gets segmented by various methods [4]. The different data types present as,

- 1) The content which is present in the website to describe the information to the user. The main theme to expose the clear meaning to the client by using the text and the images.
- 2) The contents present in the website are displayed in an organized manner which is known as structure. The structure is designed in a manner that is easily understandable to the user. The HTML links arranged inside the same page is known as intra page relation. The pages connected with one another are known as inter page relation.
- 3) The data contains the usage details, as the web page accessed, time spend in each page, pattern of usage.
- 4) The user profile describes the information of the user about their profile.

The navigational pattern of particular user is analyzed from their pattern of browsing which is known as web log mining [1]. When a request for the web server is submitted by the user, it will record in the web log file. The web access log is a raw data in the ASCII format present as a main source [2].

The common type of log format are access and error log. The extended type of log format is referrer and access log process. Preprocessing, pattern analysis and pattern extraction are the main process in the web log mining. Different types of rules and algorithms are present for extracting the useful pattern including the session and task identification for a user. The web log mining also known as web usage mining, main aim to discover the frequent pattern which is present in the form as page set, page sequences. The process of web log mining is shown in fig 1.2. The web logs are automatically got stored in the server [3]. Each single access which is present in the server provides the log entry. The web log supports

- 1) Improve the performance of the server
- 2) Improve the navigation of the web log
- 3) Improve website applications system design

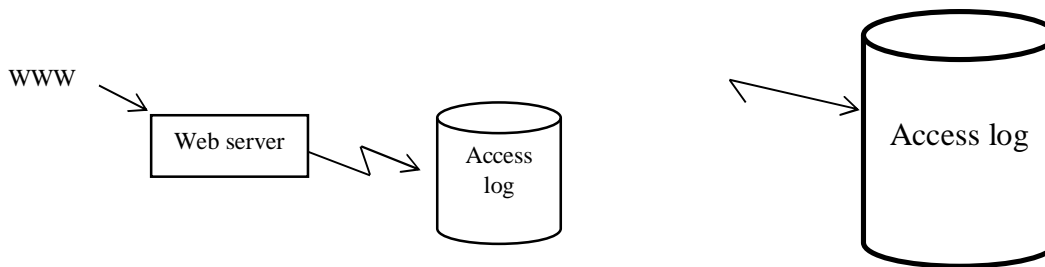


Fig 1.2 Web log mining

When the navigation pattern need to be analyzed for large scale application then the actual and anticipated pattern of user takes long process. The improvisation should be performed to develop a plan to discover the web log patterns and to solve the generalization in the usability problems. The supporting tools present are not capable to support the complex tasks. The satisfaction on the web usability for the users cant obtained while dealing with the complex and huge tasks [6]. The main aim of this work is to improve the usability of web for each user by analyzing the behavioral pattern. The navigational pattern helps in identifying the next web page the user will prefer for the reference. The cognitive models used to identify the pattern by using the time spend for each session. The fast alarms are developed while predicting huge amount of data. To overcome these issues the genetic algorithm is implemented in an iterative approach to obtain the better navigation pattern and better suggestion to improve the web navigation even in huge data set. The remaining sections are organized as follows section 2 describes the related work, section 3 presented a architecture of the proposed system, section 4 reports the experimental results, Section 5 Concludes the paper.

II. RELATED WORKS

A. A Review on Analyzing Actual and Anticipated Usage to Promote Web Navigation Usability

RafatRana S.H. Rizvi1, Ranjit R. Keole (2015) proposed that usability is characterized as the viability, proficiency, and fulfillment with which particular clients can finish particular errands in a specific situation [8]. This paper introduces another strategy to recognize route related Web ease of use issues taking into account looking at genuine and expected use designs. The genuine use examples can be removed from customer side logs routinely recorded for operational sites by first handling the log information to distinguish clients, client sessions, and client task oriented exchanges, and after that applying a utilization mining calculation to find designs among real use ways. The foreseen utilization, including data about both the way and time required for client arranged assignments, is caught by our optimal client intelligent way models in view of their insight of client conduct. The examination is performed for checking results and distinguishing client route challenges.

B. User Navigation Pattern Prediction using Statistical Classifier and Modern Techniques

YogeshRajaramBhalerao , Prof. P. P. Rokade (2015) described that web Usage Mining (WUM) are purposefully framed to do the client route design in web log records. Associations gather huge volumes of information in their day by day operations through online Interface produced consequently by web servers and gathered in server logs and this thought is utilized for examining the information speaking to use in space and to anticipate the future activities by clients [9]. The enhanced pairwise closest neighbor calculation is utilized to assemble the potential groups and the most extreme probability characterization calculation with choice tree

is to predict clients future solicitations. The Experimental result indicates change in the nature of grouping for client route design in web utilization digging and for the forecast of client's next solicitation.

C. Identifying web sessions with simulated annealing

T. Arce, P. E. Romn, J. D. Velquez and V. Parada (2014) delivered about productive administration through a site makes it mandatory in the upgrading stage to consider the conduct of the clients, which can be concentrated on by method for a web log document that in part records data about client visits [10]. The recreation of the greater part of the groupings of pages that are gone by clients who scan a site is known as the web sessionization issue, and it has been detailed by method for a whole number programming model; in any case, in light of the fact that a web log can collect a lot of data, it is important to reproduce the sessions over a time of weeks or months, in this way the answer for this issue requires a long computational preparing time. This paper introduces a heuristic methodology in view of mimicked tempering for the sessionization issue. Utilizing this methodology, it has been conceivable to decrease the preparing time up to 166 times contrasted with the time that is required for the whole number programming model. Besides, the meta heuristic arrangement finds new ideal qualities, which accomplish increments on the request of 17% in the best cases.

D. Genetic Algorithm in Web Search using inverted index representation

Ammar Al-Dallal, Rasha Shaker (2009) proposes in this paper hereditary based calculation that utilizations altered file model as a preprocessing step called GAWS. It is utilized as a strategy for discovering best arrangement of records identified with the entered client catchphrases [11]. These watchwords are isolated into three sorts: principle catch phrases ought to exist catchphrases and ought not exist catchphrases. Diverse arrangements of information are utilized to assess GAWS each of which is twofold of the underlying space size. Trial results demonstrate that GAWS exhibit high caliber furthermore observed to be focused with the standard web indexes

E. Web Pages Classification and Clustering by Means of Genetic Algorithms: A Variable Size Page Representing Approach

Zahra Hossaini, Amir MasoudRahmani, Saied Setayeshi (2008), arranging mass of information in related gatherings is a vital way that helps us to choose about them better, bunching and order are two productive strategies for gathering colossal volume of information, a large portion of grouping and characterization techniques that work on Web pages gathering issues, use altered size vectors in their learning calculation. In this present reality of WWW this assumption is not solid. In this paper we utilize hereditary calculation (GA) for arrangement and grouping, the calculation chips away at variable size vectors [12]. At the GA part we joined standard hybrid and transformation administrators with K-implies calculation, for enhancing differences and rightness of results. By method for this technique more exact classes are accomplished, and their subclasses are characterized as groups. This technique indicates more exact results than altered size strategies, the precision rate is around 90.7%, and furthermore over-burden of superfluous components in vectors is bypassed.

F. GAOM: Genetic Algorithm Based Ontology Matching

Junli Wang Zhijun Ding ; Changjun Jiang (2006), In this paper a genetic algorithm-based optimization procedure for ontology matching problem is presented as a feature-matching process [13]. To begin with, from a worldwide perspective, we show the issue of philosophy coordinating as a streamlining issue of a mapping between two thought about ontologies, and each cosmology has its related capabilities. Second, as an intense heuristic pursuit methodology, hereditary calculation is utilized for the metaphysics coordinating issue. Given a specific mapping as enhancing item for GA, wellness capacity is characterized as a worldwide similitude measure capacity between two ontologies in light of capabilities. At last, arrangements of trials are directed to examination and assess the execution of GA in taking care of cosmology coordinating issue.

III. PROPOSED SYSTEM

The web server log records the URL navigated by each user in different usage conditions. The plain data get preprocessed to observe the required data field and transaction get identified. The tree structure is constructed to analyze the transaction pages and the relation exists between the pages. This also helps to analyze each user starting from same page and their path till the end tree, helps in quicker analysis of deviation in path [7]. The states and transmissions of each user get traced.

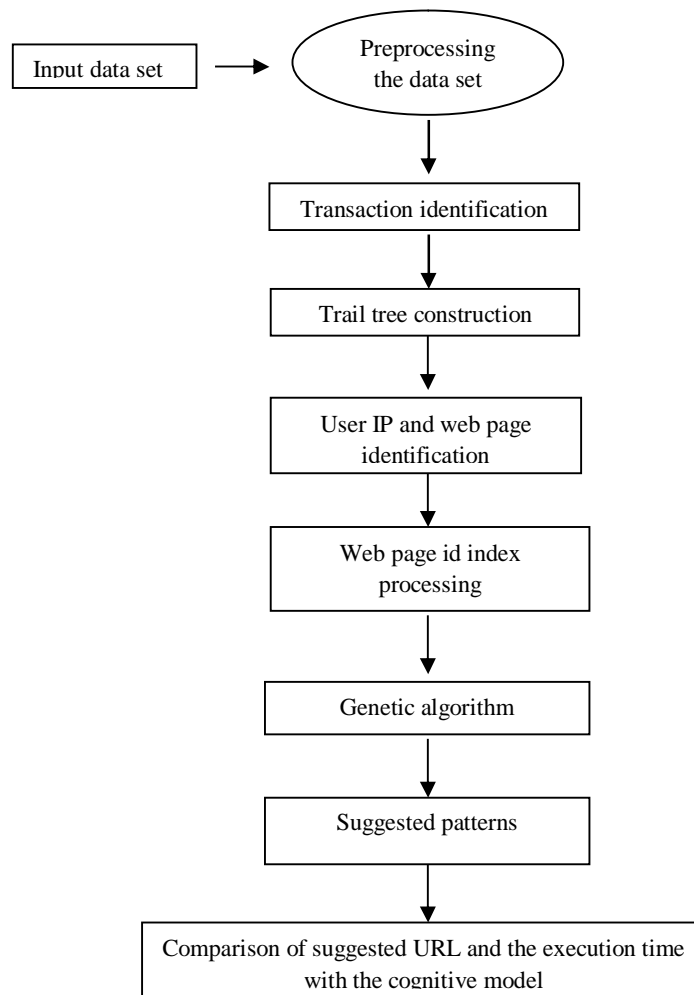


Fig 3.1 Proposed method

The time spends on each task and the session followed by the user helps to build the behavioral pattern. The optimization technique as genetic algorithm get implemented to support the iterations for building the pattern and helps in providing more number of suggestions that is related with user search. The obtained result gets compared with the cognitive model helps to find out the navigation pattern from the time deviation between the actual and anticipated usage pattern. The process of proposed methodology represented in fig 3.1. The proposed system achieves the better efficiency with less computation time.

A. Web log collection

Web server logs are our data source. Each entry in a log contains the IP location of the starting host, the timestamp, the requested Web page, the referrer, the user agent and other data. Normally, the raw data need to be preprocessed and changed into user sessions and transactions to extract usage patterns.

In the weblog file the URL and the click streams which are navigated or visited by a user get updated in a continuous manner. It was important to realize the distinctive methods of use and to recognize what sort of data the visitors look for and read on the website and how this data develops with time. The web log record is contemplated and information in the web log document is sorted and examined utilizing unique tokeniser usefulness and delimiter. The analyzed information is taken as upgraded into the individual columns of the database which keeps up the web log record in structured way. This organized storage make it possible for us to execute the data mining calculation to mine suitable standards and examples based on which the user profile can be refined. This work took the web log file for 5 days and 2 days for processing. These log files store the data about the pages visited in various users in specified URL.

B. Data preprocessing

The data collected from the web log files includes the details about the web usage of the user. It includes the details about the source which is deviated from the web server logs, referral logs. The complete data set need to be formed by integrating the information present in data mining. In order to obtain the better grouping of data from the weblogs they should be filtered or cleaned. The filtering process helps to remove the raw data and also eliminate the outliers. The resultant data after removal of files helps in better prediction. The single visit to the site gets stored as an activity record which get portioned as sessions. The irrelevant data should be getting removed in order to reduce the web traffic. The number of web log files after preprocessing gets reduced which supports for accurate analysis of data in effective manner.

C. Transaction Identification

A task gets isolated into individual information as groups required for web exchanges. The learning of site topology and referrer data, alongside with temporal data got from server logs. A transaction differs from a user session in that the size of a transaction can range from a single page to all the visited pages in a user session. The pages get distinguished from the snap stream in view of the occasion models.

The two different web log files are proceed with the transaction identification, helps in identifying the number of visits made by each user for the url. The user is identified by the user id. These transactions help in analyzing the navigation pattern for the user identifying the browsing pattern and predicting the user behavior in collecting the data.

1) *Helps in analyzing the pattern referred by the user.*

2) *Transaction identification used to find the number of visits made by the user for a particular page.*

The time spent by user on each page helps in classifying the navigation pages or its just a content page. Once the suitable transaction identification modules have been connected to the server log a final preparation of module can be utilized to legitimately arrange the exchanges for the sort of information mining to be accomplished

D. Trail Tree Construction

The collection of path get identified from the transaction occur in each sessions. The tire algorithm is used to construct a tree structure that also captures user visit frequencies, which is called a trail tree. In a trail tree, a complete path from the root to a leaf node is called a trail. Each node corresponds to the occurrence of a specific page in a transaction. It is annotated with the number of users having reached the node across the same trail prefix. The leaf nodes of the trail tree are also annotated with the trail names. The mining can be performed again based on some interesting category [7].

The tree can be constructed depend on the pages related to each other. This construction helps in relating the pages which are referred by the user. The navigation pattern of the user can be analyzed from the trail tree construction. The pattern of information gathering get varies from user to user this variation deviates the prediction. The tree construction helps in relating the pages with the information useful to the user. The path of navigation information gets extracted from the tree construction from the usage pattern. This process is used to generate the intersecting patterns for the user. The trail represents the path representation for each user web page usage, the navigation path combined in to a tree structure. This process represents the structure of each page and the linkage provided between the pages. This process is performed by finding the pages viewed by each user helps in building the tree structure and finding the relation helps in suggesting more patterns for reference.

E. User IP and web page identification

In this process the IP of each user and the web pages visited by them are get splitted. Then each user is provided with the pages they didn't visit. This process helps in analyzing process of various pages related with the user search in the web site. The page id is generated for each pages helps in easy processing. The id for each process helps in differentiating the web pages in effective manner and this process is taken in to the genetic process.

F. Applying Genetic algorithm

In genetic algorithm the three important factors to be gets considered are selection, crossover and mutation. The individuals which are gets proceed to the next generation get chosen in the selection process. This process helps in evaluating better solution from the individuals chosen and the poor ability individuals get removed. The higher quality of the next generation individuals is developed from the selection process. The crossover process helps in combining the individuals and generating new individual. The new generation gets evolved from the individual generated by the crossover.

In the current chromosome the one or more value of individual get selected and altered in the mutation process. The genetic operators used in the process of generation of candidate solution are evolved repeatedly to obtain the solution in a better way. The fitness value is used as a measuring value of the individual quality. The population size plays an important role as the poor solution gets obtained from the small size and the large size results in more computation time. The selection of population size of chromosome helps in achieving better result in less computation time. The chromosome will undergo the fitness process to ensure the support size of algorithm, the best chromosome get proceed for the next process. In the genetic algorithm the population is evolved to obtain the new solution that is present in the fitness value. The quality of the output solution is depends on the fitness value.

There is a repair operator, which can generate a feasible solution from an infeasible solution. Many implementations can be done for such repairing. A simple implementation is to randomly remove a selected customer from the solution until the solution is feasible. The anticipated usage of web navigation gets as input in order to predict in detail about the effective prediction of anticipated web navigation. This process gets repeated until the improvement to obtain the solution is satisfied.

Algorithm:

Input: web log data

Output: Best suggested pages for user.

Begin

Step 1: The web log files get choosed as individuals

Step 2: The individual feasibility get checked

While no.of.generation<Max.generation

Do

{

Step 3: The fitness value get computed,

Step 4: The evaluation get computed for population

Step 5: The selection of suitable individual

Step 6: Process of cross over

Step 7: Mutation process

Step 8: Generation of new offspring

}

Step 9: Comparison of parent and new offspring

Step 10: The best individual are choosed for the next iteration

End

The iterative process helps in effective collection of details regarding the anticipated usage pattern with high granularity of data. The delay and frustration in finding the pattern get reduced and solve the usability problem and also supports the enhancement. The success rate for a task gets improved by improving the efficiency and time on task get measured using the usability. The scalability and effectiveness of a system get improved.

IV. RESULT AND DISCUSSION

The web log data is analyzed for two data sets as five days and three days web log from a manufacturing company. In the observed result the suggestion provided by the cognitive model and the genetic algorithm are getting compared and the result is shown in the graph. The first step is to upload the weblog database to precede the further process. The various processes involved in the pattern detection as dataset preprocessing, transaction identification, trial tree construction and implementation of genetic process. Each process get carried out in each step to filter the unwanted information and obtain the pattern in an effective manner.

The weblog dataset which is updated for five days and three days as they are present in the specified format with twelve attributes. The weblog dataset which is need to be get processed is browsed and choosed from the file. The details of each attribute get displayed as user id contains the id of the user analyzing the information. The timestamp relates the time used for the reference of the page analyzed time.

Comparison Chart Between Uploaded Weblog Files Before Pre-Processing

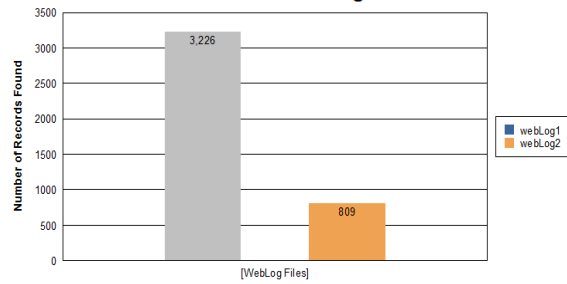


Fig 4.1 Data before preprocessing

The Figure 4.1 shows the data set before preprocessing of data. The preprocessing of the data set are performed in order to remove the irrelevant data from the web log file helps in quicker analysis. The Figure 4.2 shows the data set after preprocessing of data. The table 4.1 represents the number of data present before and after preprocessing of data set.

Comparison Chart Between Uploaded Weblog Files After Pre-Processing

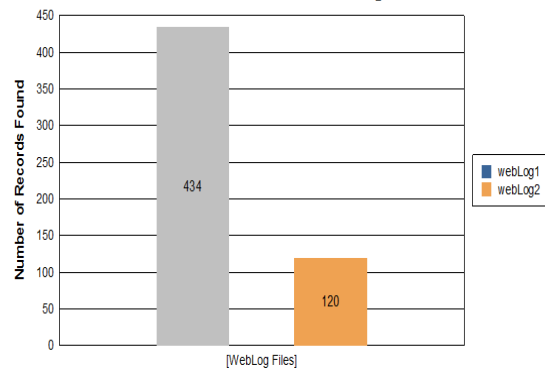


Fig 4.2 Data after preprocessing

Table 4.1: Weblog records before and after preprocessing

ID	Total Records Founded By Web Log File 1	Total Records Founded By Web Log File 2
weblog files before preprocessing	3226	809
weblog files after preprocessing	434	120

The transaction identification is performed for the preprocessed data. This process helps in identifying the pattern which is referred by the user. The user refers various pages on order to gather the information. This transaction is identified by the number of visit made by the user to obtain the information. This process helps in obtaining the logs which contain the useful information to the user. Then the trail tree construction for the web log data is performed. The tree construction helps in finding the link present between the pages present in the website referred by the user. The links present between the pages containing the related and useful information are presented in the trail tree construction process. These helps in finding the navigation pattern of each user in obtaining the information. These logs helps in finding the navigation which helps in predicting the user behaviour and thus predicting more number of suggestions. This process describes the pages visited by the user in a particular website, this helps in better analyzing of

the detail of user behavior. The trial tree construction is used to build the relation between the pages helps in analyzing the pattern of navigation.

The web page id is generated for each web page in order to support the genetic process. The id is generated by the priority of the web pages used by the user. The genetic process after generating the page id is performed. The comparison graph shown in Fig 4.3 represents the navigation suggestion provided by both the methods for data set 1 and the genetic process is showing the more number of suggestions.

Web Navigation Suggestion Pattern For IUIP Modeling Vs Genetic Algorithm

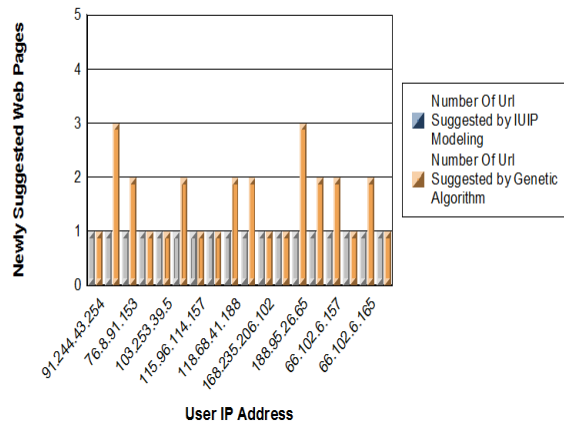


Fig 4.3 Comparison of navigation suggestion

The number of pages suggested between the IUIP model and the genetic process is shown in fig 4.4. The computational time for the IUIP model is high and the genetic process is less with more number of suggestions for navigation for each user is provided by the genetic process. The table 4.2 represents the suggestion of pages by each method for web log data 1 and data 2.

Table 4.2: Number of pages suggested

Techniques used	Number of Pages Suggested
IUIP modeling for 5 days	18
Genetic algorithm for 5 days	29
IUIP modeling for 2 days	14
Genetic algorithm for 2 days	22

Comparison Chart For Page Suggestion

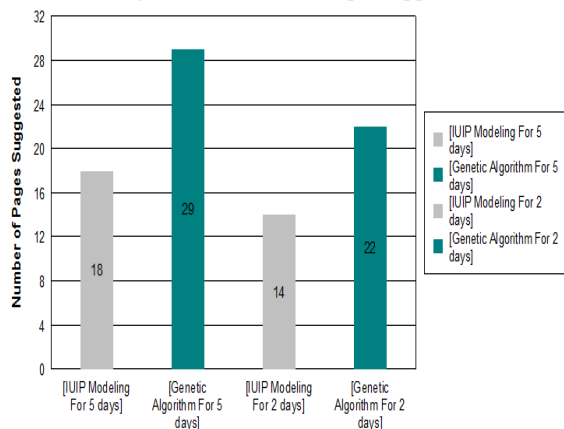


Fig 4.4 Comparison of Page suggestion

The Execution time between the IUIP model and the genetic process is shown in fig 4.5. The computational time for the IUIP model is high and the genetic process is less with more number of suggestions for navigation for each user is provided by the genetic process. The table 4.3 represents the execution time for suggestion of pages by each method for web log data 1 and web log data 2.

Table 4.3 Execution time for web log

Techniques used	Execution time in sec
IUIP modeling for 5 days	36
Genetic algorithm for 5 days	16
IUIP modeling for 2 days	33
Genetic algorithm for 5 days	15

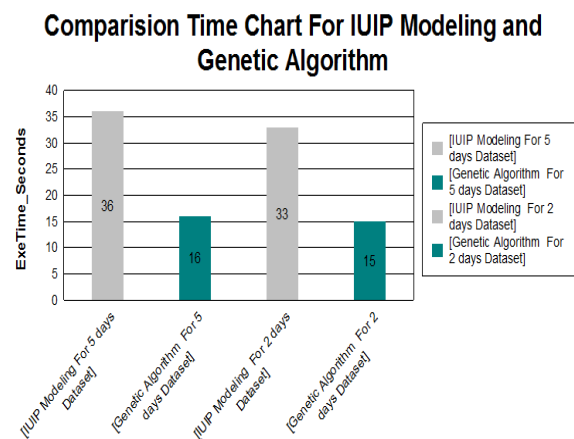


Fig 4.5 Comparison of execution time

The comparison graph between the cognitive model and the genetic process shows that the process of providing more number of suggestion pages and the computational time is achieved less in the genetic process and improves the web navigation usability for each user.

V. CONCLUSION

The weblog information of a user helps to improve the usability of his web navigational pattern. The behavior of the user is analyzed by the actual usage pattern and the anticipated pattern gets generated from the cognitive model as IUIP. The deviations in the time between the patterns are identified. The new method to solve the web related navigation problem by analyzing the actual and anticipated pattern is implemented in this paper. Once a site is operational, this strategy can be consistently connected and drive continuous refinements. Conversely with conventional programming items and frameworks, Web based applications have abbreviated improvement cycles and delayed support cycles. This technique can contribute altogether to ceaseless convenience change over these delayed support cycles. The ease of use change in progressive cycles can be measured by the logically better viability. Further the genetic procedures get executed in iteration to enhance general nature of the investigating time and proficiency of web application. The experimental results show the improved performance by the genetic algorithm in providing more number of suggestions, less time taken for the computation and the improved scalability.

In future this work can be extended to improve the pattern suggestion by the semantic approach. This method will support the efficient reconstruction of the sessions.

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