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Automation of Employee Workload Management using Random Sample Partition Algorithm

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Abstract: ***In any organization which consists of working employees, under their respective teams, there exist a state where the manager of the team takes the charge of distributing the tasks among the various employees who work under him. In this case there arises a possibility of unequal distribution of the tasks among the employees in terms of workload and complexity of the tasks where the one with increased workload gets even more new tasks assigned to him while the one with less workload continues with the same number of tasks. In this case we have developed a system which assists equal distribution of the tasks among the peers in the team by analyzing the task related data and concurrently representing the results of the analysis in a comprehensible manner to the person responsible for assigning the tasks to the employees. This system takes into account the various attributes like number of tasks and the level of complexity concerned with those tasks and thereby performs analysis on the data by employing the random sample partition algorithm. The random sample partition algorithm acts in order to minimize the load on the analysis and thereby improve the performance by splitting the whole data into simpler blocks of data and then performing analysis on it. The results of the analysis provides the user an overview as to how he can distribute the new tasks which arrive into the system so as to serve the purpose of bringing out equality in distribution of the tasks among the peers in the team.***

Keywords : workload distribution, random sample partition, task assignment, performance.

I. INTRODUCTION

Any organization or industry generally consists of a system which includes a team of employees working together under a person who takes the responsibility of leading the team. The tasks which are meant for these employees are communicated by means of a suitable interface where the lead of the team takes the role of assigning the tasks to the other employees. In such a case he takes to his consideration the various attributes like the workload which currently overlie on each employee, the complexity level of the impending tasks and other attributes like the efficiency of the individual to land at a clear conclusion as to whom he may allocate the newly arriving tasks. Performing such an analysis manually on a larger set of data would require more effort which would in turn affect his level of performance on other tasks which are still essential. Thus minimizing the amount of manual contributions with respect to the process of analyzing and allocating the tasks would help the individual provide more attention towards other essential tasks in his team which would in turn help improve the overall performance of the team. To minimize the amount of manual work involved we introduce a system which without any manual intervention analyses the workload on each employee using the previous task assignment data and provides the results of the analysis to the individual who is responsible for performing the task assignment process. The lead of the team in turn makes use of this data to proceed with the process of assigning the tasks to the various employees in his team. This system makes use of the random sample partition algorithm for performing the analysis because of the fact that the RSP algorithm solves the issues which arise when it comes to the case of analyzing larger sets of data by initially splitting the larger set of data into smaller ones after which the actual analysis is performed on the data. After accomplishing the process of analyzing the data the algorithm brings together the results of analysis from each data subset and integrates it. The algorithm works on the task assignment data that is provided to it and breaks it into smaller subsets of the data. Now after simplifying the data into subsets of minimal length it starts to perform the actual analysis on the data by extracting the essential attributes like impending workload, level of complexity of those tasks and other essential attributes from the data. Once the analysis on the data subsets come to an end, it integrates the result of the individual analysis performed so far and provides it as an overall result. The result of this analysis aims to provide a clear overview as to whom the newly arriving may be assigned to. The results of the analysis is finally displayed to the team leader via a suitable interface using which he could get a clear overview regarding the workload which is currently imposed on the team members and thereby he could proceed with the process of assigning the tasks to the members of his team in a cascading manner.

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This system greatly reduces the amount of manual work imposed on the individual by performing the analysis process by itself and unveiling the results to the end user wherewith he may perform the process of assigning the tasks and distributing them among the employees in his team in an efficient manner.

This system also impacts the overall performance of the team as it allows the team lead to provide more attention towards other tasks that would benefit more to the increased outcome of his team.

II. RELATED WORK

Up to this day, there have been several work done on monitoring workload using various methods. We, in our work propose to make use of the random sample partitioning algorithm for promoting the efficiency of the workload monitoring process.

Evans M. Ombati et al. [1] monitors the workload of individuals by use of the triangulation method. Here he collects the data using a variety of methods and then integrates them in order to proceeds with analyzing those data to land at an overview of the workload on the employees. This method appears to provide an accurate result as it involves a collection inter-related methodologies integrated together in order to provide a complete overview of the individual's/team's workload.

Suci Miranda et al. [2] suggests the use of NASA –TLX algorithm for measuring the workload. The algorithm when applied in the process of analyzing the workload, provide improved results by involving the attributes provided by the algorithm that enable to proceed with a in depth analysis on the data. While this method provides improved results, the work done by Jieqiong Zhao et al. [3] on the other hand suggests the inclusion of the MetricsVis which acts as a visual analytics system comparing multiple coordinated views in order to assist the dynamic evaluation and comparison of the individual or team in organization. Thus the algorithms brought out in [2] and [3] provide good scope toward the process of analyzing the data and henceforth claims to be adopted in any good data analysis system.

In addition to these work, Hyun Suk Kim et al. [4] in his paper describes the essentiality of including the attributes regarding behavioral workload along with the subjective workload so as to ensure that we take into account the most appropriate attributes to proceed with the analysis of the data with respect to these attributes. This aspect affects the results of the analysis to a good extent that it provides a realistic result in accordance to it. Jun Chen et al. [5] too in his study brings out a mathematical model for measuring the amount of workload carried over by the employees. The model takes into account three major factors, namely, the utilization factor exhibited by the individual, the request-rate on the person and thirdly the number of interactions. These attributes as chosen with high level of appropriateness, tend to provide a result that is more centralized toward the actual result. The various research works from [1] to [5] thus throw a light regarding the selection of appropriate attribute for analysis, methodology employed in the analysis, the various algorithms used, the features that are taken into consideration in those algorithms and the accuracy level of the results that are provided by those algorithms.

Moreover Liu Haiming et al. [6] in his paper proposes an integer programming model which makes use of the scatter search method to perform analysis. Numerical experiment and algorithm evaluation are also conducted in this case to assist the process. The results indicate better performance and optimized result when compared with the heuristic algorithm. While this methodology proves better performance, Dewei Yi et al. [7] in his paper sketches out the scope of employee clustering aided approaches in analysis of workload. He proposes two approaches in which, the first is clustering-aided regression (CAR) model, in which the regression model for the cluster that has the highest likelihood is adopted. The second which is the clustering-aided multiple regression model, which involves the concept of multiple models further augmented to CAR. Thus he suggests the use of these approaches for efficient analysis of the involved data.

The works that are explored till now, provide a vivid view as to the category of algorithms that has to be adopted for various diversified processes. The papers [8] and [9] unveils few essential methodologies which may be adopted in case of integration of the data and visualization of the data.

Cilcia Pinto et al. [8] introduces the probabilistic method of data integration. Here, making use of this method he integrates the data from different locations into a single data mart and then proceeds with the integration of the data. The method possesses both, it's own pros and cons but anyhow provides an improvised result because of the involvement of the probabilistic method for the integration of data in it's system. Moreover Xinxiao Li et al. [9] in his work, outlines a method which he proposes in order to eliminate the challenges like performance, operability and degree of discrimination encountered in the process of visualizing the data. This method tends to provide an interface that helps the end users comprehend the results of the overall analysis in a clear manner. The integration and visualization of the results contribute an important role in most of the systems as it seems necessary in order to bring the overall results of the analysis process to the end user.

Amidst the various works explored above, the papers from [1] to [7] provide an extended view regarding the various algorithms and methodologies that may be employed in the process of data analysis while [8] and [9] provided and insight on the data integration and visualization methods that may be used in order to bring together the data and represent the results of the analysis to the final benefactors. But anyhow the existing works fail to ensure the efficiency of the analysis in terms of lager amounts of data.

III. EXISTING SYSTEM

The existing system involves the capture and analysis of the data regarding the workload of the employees which it proceeds to analyse in a collective manner in order to arrive at conclusion regarding the workload of the employees. The workload that is followed in case of the existing system is as follows. The system that is provided above in the fig. functions by initially accessing the data from the application that is employed in the system.

These data are then subjected to analysis which is manually performed by the person who is responsible for allocating the tasks to the employees who are present in his team. This analysis it involves attributes like, both the workload and the efficiency of the employee still stands short in the aspect that it proceeds in a manual manner. This attribute of manual analysis and allocation of tasks in the existing system involves drawbacks like increased time factor and high possibility of moving away from the level of accuracy that is expected to be identified in the system.

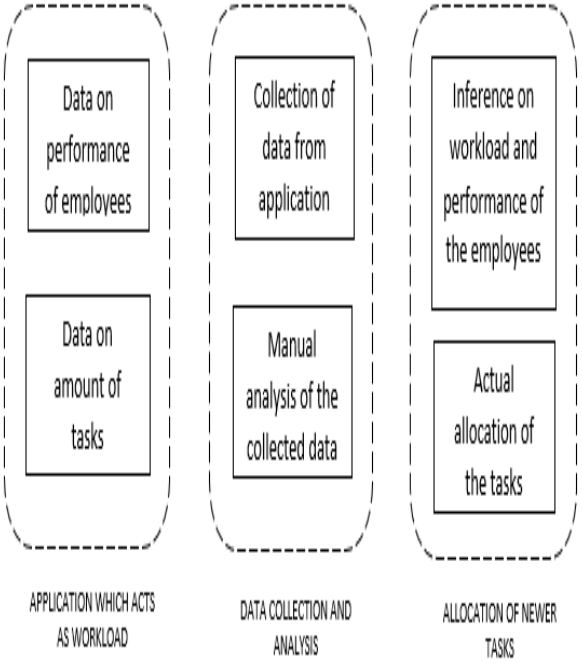


Fig.1 Workflow of the Existing System

In addition to the possibility of drifting away from the expected accuracy there exists another limitation which is the impact of the increased manual work on the tasks allocation process on the overall efficiency of the team. This is because the fact that providing more importance to activities like allocation of the tasks to the employees may, in turn prevent the individual from providing sufficient attention toward the more efficient tasks in the team which may in turn deter the team from the actual performance which they are expected to provide.

IV. PROPOSED SYSTEM

The proposed system consists of a flow where it collects the data from the different sources after which it integrates them into a single block of data. This data, in a cascading manner is fed into the RSP algorithm which after analyzing the data provides the results of the analysis on the data. These inferences from the data is then displayed in a comprehensible UI to the end user.

A. Source of the Data

The source of the data in our case occurs in two various locations namely the application that is considered and the actual database. The new tasks as they arrive are initially collected in the application which is used as an interface in the team. The tasks, once they are tokened are updated in the actual database. Though seems as a form of duplication it occurs necessary to consider the database as it is essential to verify the presence of untokened tasks in the application. Once the presence of untokened tasks is verified the process of collecting the data from these sources begin. Now when the process of collection of the data from the various sources is over the data from the various sources are integrated into a single block of data. This block of data is then subjected to analysis using the RSP algorithm.

B. Role of Random Sample Partition Algorithm

The RSP algorithm receives the data block and then splits the data into smaller sample blocks of almost equal length.

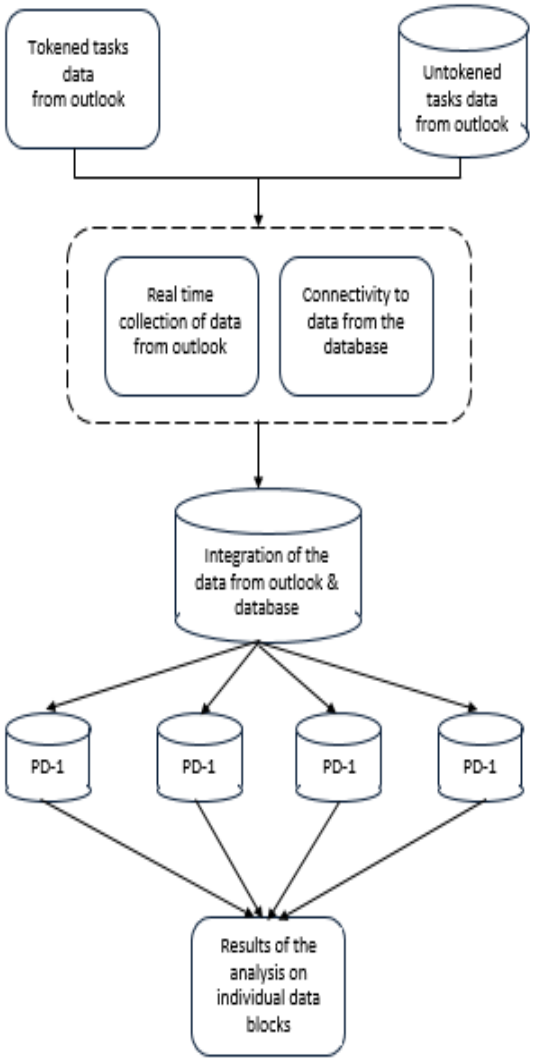


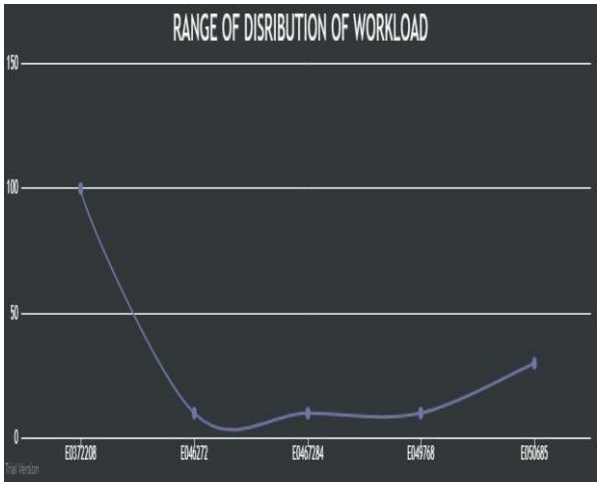
Fig.2 Proposed System Architecture

The process of analysis is then taken over individually on each block of data. The final results of the individual analysis is then integrated in a collective manner as the overall inference from the data bloc. The process of analysis is specifically taken over via the RSP algorithm because of the fact that the algorithm greatly reduces the load on the overall analysis by approaching the data as sub-blocks of the actual data.

Since the algorithm simplifies the data and then proceeds to analysis the data it indirectly impacts the time required for the completion of the analysis of data and in a cascading manner increases the performance of the entire process.

C. Final Result of the Analysis

The results of the analysis is then used to land at a conclusion regarding the overall workload of the peers in the team. It also helps to get an inference as to whom the newly arriving tasks may be assigned based on the current distribution of workload among the peers and the complexity associated with those tasks. In addition, it also provides a view as to how the current tasks may be reassigned to bring equality in the distribution of the tasks among the peers.



X – Employee ID

Y – Amount of Workload

Fig. 3 Results of the Analysis

As mentioned above, the task count and the complexity level that is concerned with the tasks act as the two essential and prime attributes which are taken into account for the purpose of analysis and the results of the analysis done on these attributes are briefed as unveiled in the user interface shown below.

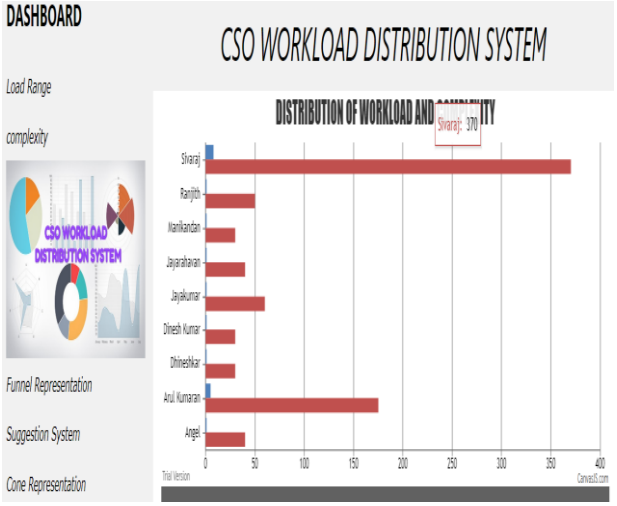


Fig. 4 Results with Task Count and Complexity

Given below is the set of suggestions which are provided for the end user to proceed with the process of allocating the tasks to the individuals who come under him/her in an effective manner by the assistance of the results which are provided in order to enhance the ease of proceeding with the process of allocation of the incoming tasks.

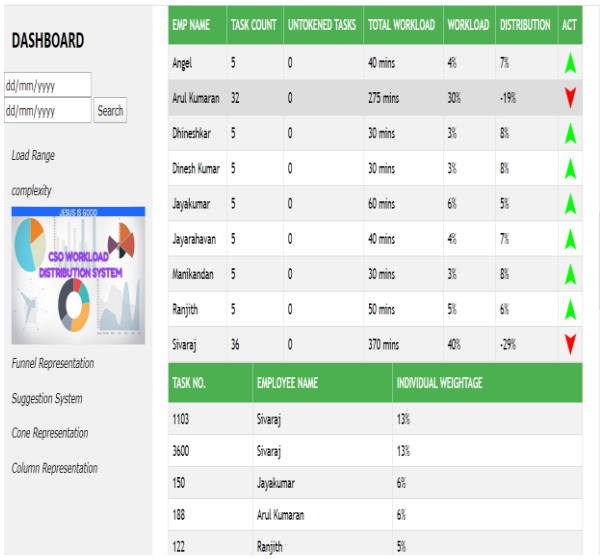


Fig. 5 Suggestion System

In addition to the results of the analysis that is taken over on the data the system also includes provisions to select a specified portion of the overall set of data for the purpose of time based analysis via the use of search option which facilitates this cause by means of receiving the data from the user as input and fetching the specified portion of the results by means of fetching the data from the result set based on the requirements specified by user.

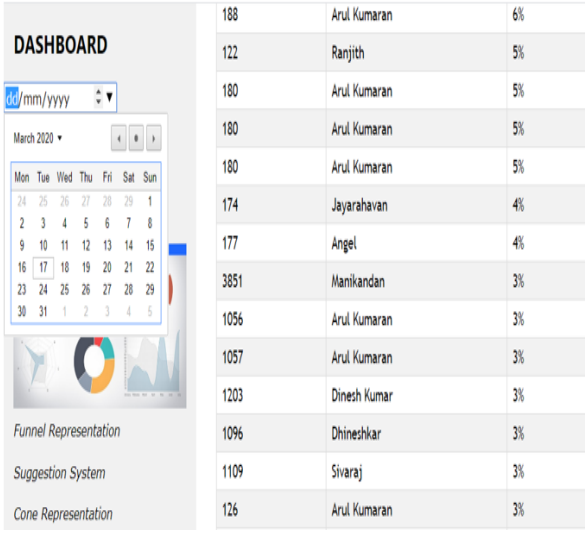


Fig. 6 Selection of the Results

The system also includes the provisions for viewing the results that are extracted from the data based on the UI type which assists the user, comprehend the results of the analysis of the data on an easier manner.

The UI also helps the user comprehend the results of the analysis in an easier manner as it segregates the results in an individual manner with respect to the attributes that are taken into consideration for preforming the analysis.

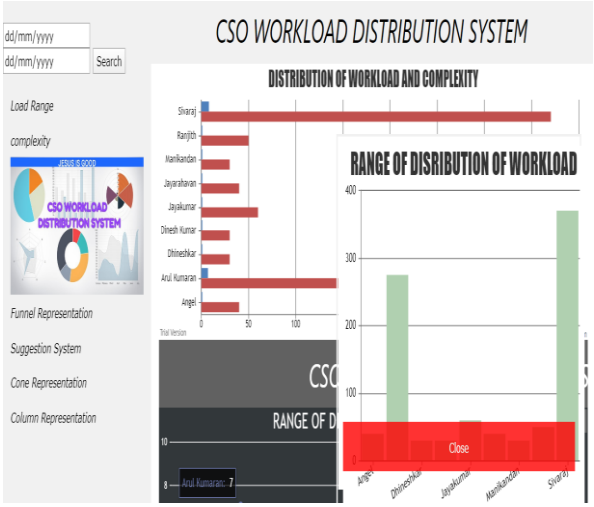


Fig. 7 Comprehensible UI

Thus the results of the analysis that is taken over on the data are conveyed in a comprehensible manner to the end user who in response to the results proceeds to distribute the tasks in an equal manner to the employees and hence in a cascading manner paves the way for ensuring the equality which is expected to be maintained in the task allocation process.

The results of the analysis are finally displayed using a suitable UI which may be a web based system or local application via the usage of suitable data representation tools.

V. CONCLUSION

The proposed workload management system helps to analyze the workload and distribute them in an equal manner among the employees. The practical analysis of the system proves that it would help avoid the accumulation of work pressure and reduce the over accumulation of workload on specific employees. It helps to increase the overall efficiency of the workload analyzing process by replacing the manual interference in the work with automation. The analysis proves the effectiveness of the proposed work by means of the accuracy of the results produced by the system.

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