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Financially Assisted Student and Information Management System (FASIM) Using concept of Page Rank algorithm for Auto-Allocation of Funds.

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Abstract ---- *Developing a client- server, cloud based client-server application for Educon, a non-profit organization, for selection and monitoring of students, applying for financial assistance. We are developing a real time system for the financial assessment and monitoring of students, applying for financial help, instead of denoting a fixed amount to the students, we are auto-allocating the funds depending on the current need, available funds, urgency and background of the students which includes various factors. Shortfall of the students will be advertised which will be helping in inviting more donors. The clients include website and mobile app. Technologies such as Node.js would be used for the server side along with Express.js as a web application framework, whereas Angular JS for client side, MongoDB as database and Elasticsearch as search engine (MEAN Stack)*

Keywords-*Auto-Allocation, Page Rank, Information Tracking, Analytics, Secured Information Wallet.*

I. INTRODUCTION

Education is a freedom to all. Education is a medium of acquiring skills required to develop and rise above all the socio-economic differences.But the same socio-economic differences should not possess a barrier for the willing. Now a days, many organizations are providing financial help for the needy students but this a manual process. It is not accessible for everyone especially in rural areas. Therefore many websites have been developed nowadaysfor easy access and fast application processes. However, in this current system the process takes place in two stages first verification and then manual fund allocation which may lead to unfair and biased distribution of funds. Hence, in our proposed system we have developed a mechanism for auto-allocation of funds to the applied students taking into consideration various criteria predefined by the organization.

To built our mechanism we have taken motivation from the Google PageRank(PR) algorithm which makes use of the link structure of the web. It is used to determine a page's relevance or importance. Important pages receive a higher PageRank and are most likely to appear at the top of the search results.Google PageRank(PR) is based on backlinks. PageRank works by counting the number and quality of links to a page to determine a rough estimate of how important the page is. Fig.1 iilustrates the PageRank(PR)

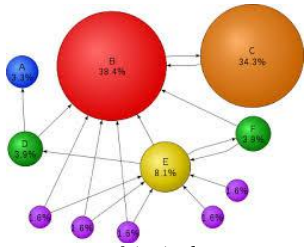

Fig. 1 PageRank(PR) of various items.

The PageRank of a page A is given as follows:
PR(A)=(1-d)+d(PR(T1)/C(T1)+ …….. + PR(Tn)/C(Tn))

PageRank or PR(A) can be calculated using a simple iterative algorithm.

Here,PR(Tn): PageRank of page Tn ,C(Tn): count of total number of outgoing links for page Tn ,d: damping factor, which can be set between 0 and 1,usually it set to 0.85.

In this paper, we consider a graphical model to determine optimal matches for the donation and needy students.

The remainder of the paper is organized as follows. We first present the relevant mathematical formulation and algorithm for the auto-allocation in detail in Section II. Then a descriptive outline of computerized decision support software present in Section III. Finally we conclude and propose future work in section IV.

II. FORMULATION AND ALGORITHM

A.Mathematical Formulation

The fund auto-allocation program can be represented as a directed graph G=(V,E). Fig. 2shows an example.

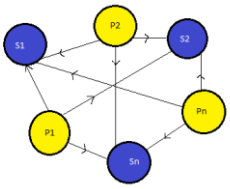

Fig. 2

Let |V| be the number of vertices (nodes) and |E| the number of edges in the graph, where |.| denotes cardinality. Each vertex in the graph either represents a student or their properties. Each directed edge from vertex j(Property node) to vertex i (Student node) indicates the value of the student for that particular property. In this directed graph each edge can be assigned a weight representing the edge utility u□ᵢ. Edge utility could be obtained from the weights obtained with respect to the corresponding values of student attributes.

The goal of optimization for fund allocation is to achieve maximum utility on the graph G. Therefore the task of optimizing matches on graph can be realized by solving the following problem:

If there is an directed edge from node i to node j**then**

$$Rank\ of\ student(i) = \sum_{i=0}^{n} \sum_{j=0}^{m} W\square_{i}$$

Where,

n=total number of students applied for scholarship,

m=total number attributes,

W□ᵢ is the weight of the directed link from node j to node i.

III .COMPUTERIZED SUPPORT SYSTEM

A. *Computerized system*

Inorder to implement the auto-allocation algorithm to compare different applicants, we developed a novel computerized decision support system that appropriately reflects real world scholarship programs. The flow chart of such a system is illustrated in Fig. 4.

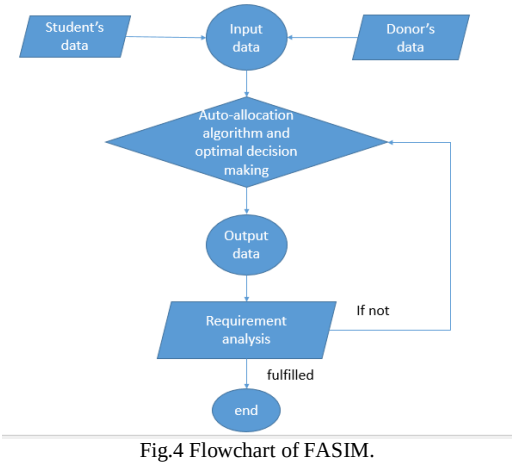

Fig.4 Flowchart of FASIM.

In the system, we defined three basic components:

1) *Data Input:* The system deals with a collection data from input sources such as user's input data, existing secured scholarship program's database.
2) *Optimal Decision Model:* Utilizing donor and candidateinput data, the system launches inquiries to a computationserver in an independent process to make optimal solutionsas described in Section II.
3) *Output Data:* The system fairly auto-allocates funds among selected candidates taking into consideration different parameters.

A. Graphical User Interface

We also developed a graphical user interface (GUI) to supporteasy communication between front-end inputs or outputs andback-end computation algorithms of our computerized decisionsupport system. The state transition diagram of such a system is illustrated in Fig.5. In detail, the current GUI supports the followingfeatures:

1) *Data extraction and save:* It currently allows displaying input data, taken through user login and registration from the database.
2) *Approval and rejection:* Approval or rejection of a particular applicant and accordingly the status updates.
3) *Donation Information:* The donor makes a donation and depending on the type(whether cardinal or open donation) it is allocated.
4) *Dynamic allocation/reallocation*: Allocation of funds and then again analysing needs, if fulfilled or not.
5) *Recommendation:* To advertise recipients for recommendation to the donor.

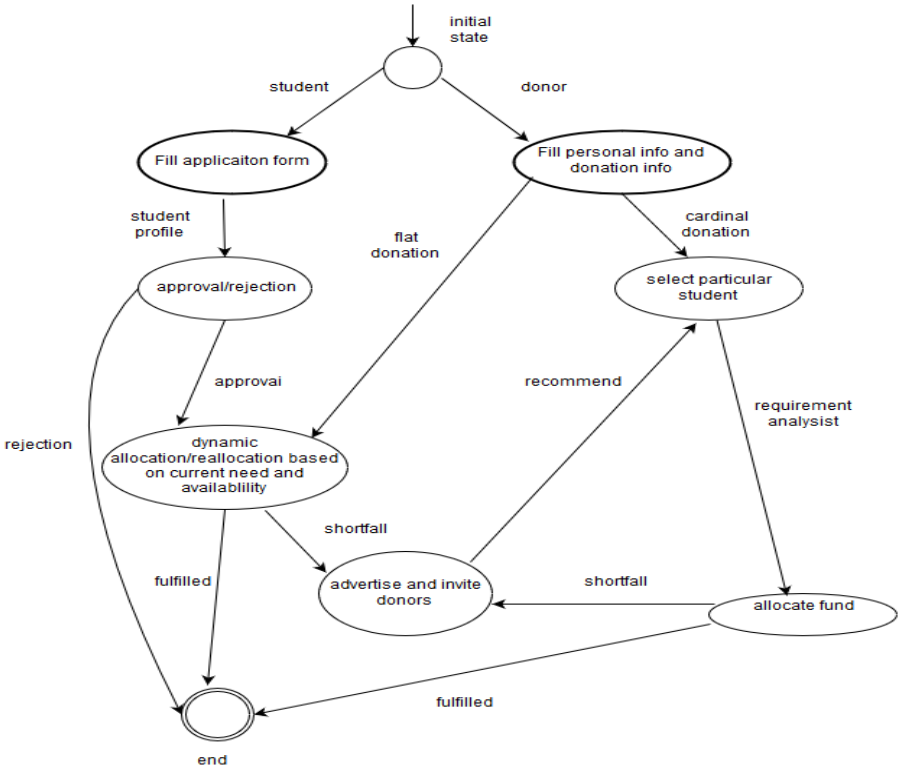

Fig.5 State transition diagram for FASIM.

IV CONCLUSION AND FUTURE WORK

In this paper, we investigated weighted graph to efficiently priorities applicant'srequest. The system is updated regularly so that by adding more and more parameters it can take optimal decisions. For the implementation we have used MEAN Stack.

Our Future plan, will focus on incorporation of additional existing or new auto-allocation algorithm into current system. It will be implemented on multi-platform (like mobile application) as we are using MEAN Stack so that it can be accessible to many applicants. Security wallet can be used to preserve privacy of documents of applicants.

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