Algorithms and Problem-Solving

TEACHER LOAD ASSIGNMENT

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ACKNOWLEDGEMENT

We express our sincere regard and indebtedness to our project internal guide Dr. Hema N and Mrs. Jyoti, for their valuable time, guidance, encouragement, support and cooperation throughout the duration of our project. We would sincerely like to thank CSE Department for giving the opportunity to work on enhancing our technical skills while undergoing this project. This project was done under the guidance of Dr. Hema N and Mrs. Jyoti.

This project helped in understanding the various parameters which are involved in the development of a software application and the working and integration of the concepts such as backtracking algorithm to create a fully functional software application.

We would like to thank DEF, Head of Department and whole of department for their constant support.

INTRODUCTION

In the teacher load assignment problem, we are given a set of N teachers and a set of M subjects. Each teacher has an integer workload capacity, which you can think of as the number of hours that the teacher is available to teach. Each teacher also has a list of subjects they have the background to teach. Each subject has an expected number of hours it takes to teach.

We would like to propose a program which solves the above discussed problem. It is complied in Code::Blocks with GCC complier where the concepts of Graphs, Ford Fulkerson Algorithm for Max Flow and File Handling is used. The source code for this program is around 300 lines. This system is designed to help an institution allocate the subject hours to teachers in an efficient and equally distributed way.

OBJECTIVE

Consider the following example:

Teachers:

- Capacity of T1: 10, background for S1, S2, S3.
- Capacity of T2: 10, background for S1, S3, S4.
- Capacity of T3: 10, background for S2, S3, S5.

Tasks:

- S1: 7 Hours
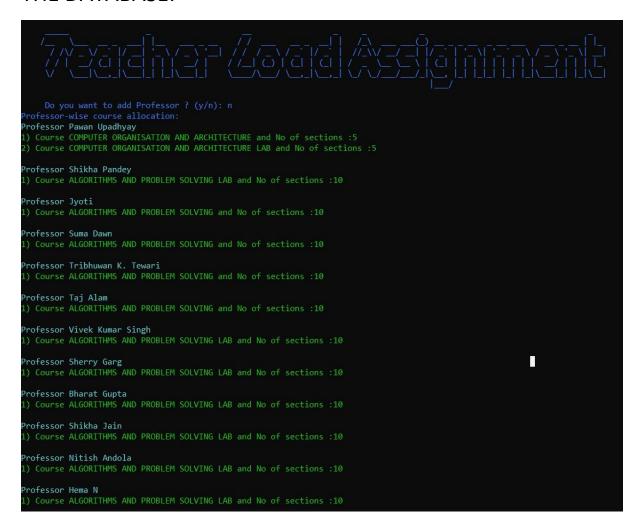- S2: 5 Hours
- S3: 5 Hours
- S4: 2 Hours
- S5: 3 Hours

In the example above, we might assign teacher T1 to subjects S2 and S3 (maximizing T1's workload), teacher T2 to subject S1 (the larger of the two tasks still available to it), and teacher T3 to subject S5 (the only subject still available to it), leaving T4 unassigned. In this model, we complete 22 of the 20 hours available.

Using the same mentioned approach, we determine the maximum flow for each teacher and we reach with a residual capacity graph. Using the residual capacity graph, we can determine the number of subject hours a teacher will teach. The following is a formula for computing the same:

$$No.\,of\ Subject\ Hours = Total\ Capacity - Residual\ Capacity$$

OUTPUT

SECTIONS ASSIGNED TO PROFESSORS PRESENT ALREADY IN THE DATABASE:

ADDING A NEW PROFESSOR:

```
 ___ ___ ___  ___ ___ ___ ___
/_  _/ ___/ _` / ___/ __/ __/ _` /
 / /  __/ _` / ___/ _ / /  /_  //
/_/  ___/___/ ___/ /_/  /___/
Teacher Load Assignment

    Do you want to add Professor ? (y/n): y
 Enter Professor name: XYZ
 Enter no. of preffered subjects: 2
 Enter subject :INTRODUCTION TO BIOINFORMATICS
BIOINFORMATICS LAB
Professor Added!
```

UPDATED ASSIGNMENT OF SECTIONS:

```
Professor Rachana
1) Course ENVIRONMENTAL STUDIES and No of sections :10

Professor Smriti Gaur
1) Course MICROBIOLOGY and No of sections :8
2) Course MICROBIOLOGY LAB and No of sections :2

Professor Sonam Chawla
1) Course GENETICS AND DEVELOPMENTAL BIOLOGY and No of sections :10

Professor Shazia
1) Course INTRODUCTION TO BIOINFORMATICS and No of sections :10

Professor Sujata Mohanty
1) Course GENETICS AND DEVELOPMENTAL BIOLOGY LAB and No of sections :10

Professor Neeraj Wadhwa
1) Course GENETICS AND DEVELOPMENTAL BIOLOGY LAB and No of sections :10

Professor Chakresh Jain
1) Course BIOINFORMATICS LAB and No of sections :10

Professor XYZ
1) Course BIOINFORMATICS LAB and No of sections :10


Process returned 0 (0x0)   execution time : 1.250 s
Press any key to continue.
```

CONCLUSION

From the output screenshots above, it is evident that we have reached to a solution to optimise the teacher workload assignment.

Further, we would like to add that this problem also holds great opportunities for further exploration such as increasing the teacher intake limit etc.

REFRENCES

E-book

[1] Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein , Introduction to Algorithms, MIT Press, 3rd Edition, 2009

[2] Steven Skiena ,The Algorithm Design Manual, Springer; 2nd edition , 2008

Internet sites

[1] https://github.com/Sebastiao-Assuncao/Process-Processer_Assignment

[2] https://www.cs.toronto.edu/~jepson/csc373/tutNotes/tutEx_NetFlow2_2018S_Soln.pdf

[3] https://www.geeksforgeeks.org/

[4] https://stackoverflow.com/

Lecture

Suma Dawn. CSE. Class Lecture, Topic: "Max Flow Using Ford Fulkerson"

Jaypee Institute of Information Technology

Software

[1] Code::Blocks