Chapter 12
Competency Mapping in Academic Environment: A Swarm Intelligence Approach

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ABSTRACT

This chapter will discuss and present a new model to perform a competency map in an educational institute which has moderate number of faculty members on whom the map has to be performed. Performing such a map is a tough but essential task. Hence utmost objectivity must be followed for the procedure. In this chapter the authors performed academic load assignment to the faculty members of a particular dept at the onset of a semester. Few parameters that have been considered as the input parameters are depth of knowledge, sincerity, class management, contribution towards research, text book publication. part from that one of the main concerns is the assignment is done by taking into consideration the preferences of a particular faculty in terms of teaching a subject. There are number of constraints which need to be considered while making the load assignment. The AICTE guidelines for teaching load allotment have been considered as a baseline. The MOPSO has been used to perform the competency map and the simulation results have been presented to show the effectiveness of the method.

INTRODUCTION

In the recent past there has been a lot of hue & cry about the increasing un-employability of technical graduates in this country. Lot many research activities and studies have been conducted to gain insight into the actual problem behind this menace. There is no concrete evidence to attribute the problem to a particular reason. But generically speaking it has been found that the right kind of skills are not imbibed in the technical graduates and there is a huge gap in what the graduates can do and what the industry requires. One of the prime factors which shape the technical graduates as employable individuals is the

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Faculty members who are largely associated with the students in their formative years of professional education. Hence it is quite essential that the faculty members be motivated enough to perform their duties & responsibilities with utmost zeal & dedication. But what happens when somebody is entrusted in doing something he/she is not interested in? May be less effort will be put in and ultimately the end result will be hampered in a negative way. The same happens, when a faculty teaches a subject he is not interested in or lacks the pre-requisites to teach the subject. In technical schools there are large numbers of faculty members may be with the same background qualifications but not with same skill set, expertise or experience. And moreover each of them has different priorities in terms of teaching.

This process of academic load allocation i.e. assigning/allocating subjects to faculty members is normally done by the HODs (Head of departments) manually. Since there are several objectives and constraints to be satisfied it is quite difficult for them to design the best allotment in spite of having the required resources. Simple reason being the inability of the human mind to process a huge amount of information. So the objective of this chapter is to elaborate on the nature of the problem, its implications and propose a computational strategy to generate solutions for the problem and last but not the least performing simulations on actual data to show the efficacy of the method proposed.

Till date there is negligible literary evidence regarding any method based on computational intelligence for academic load allocation. But similar kinds of tasks have been undertaken in other domains. Those have been discussed in the section on related work

BACKGROUND

Any academic institute imparting any kind of course has to undergo the task of load assignment/allotment to the concerned teachers or faculty members at the beginning of the academic year or semester. In technical institutions normally this is done by some senior faculty members and the Heads of department. But exactly there is no specified norm. For large departments the concerned heads spend a number of days to make such an allotment. And the basis of allotment is subjective assessment of HOD's generally guided by heuristics & instincts. Past performance of the faculty members in terms of student feedback, student results, years of experience etc normally contribute to those assessments.

But what are the implications of such an allotment? Compliance with the regulations, satisfaction of the departmental needs, satisfaction of the faculty members and most importantly the right map between the subject, faculty & student. Now with the manual process of allotment, most of the time the objectives are not satisfied. Moreover as the strength of the department increases it's difficult to find solutions which comply with most of the objectives. Hence a manual allotment often results in a sub-optimal solution which leads to resentment and demotivation among faculty members.

This necessitates a well-defined methodology which can generate optimal solutions taking care of all the objectives simultaneously. In this context the most important constructs are competency, competency mapping in academic scenario, optimal solutions & objective satisfaction. This narrows down to three broad aspects namely- *Competency, Academics & Mutli-Objective optimal solutions.* The mentioned aspects have been discussed in the next section with reference to relevant literature wherever necessary.