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SPECIAL FILTERED LINKED COMBINED OVERLAP BLOCK FUZZY RELATIONAL MAPS (SFLCOBFRMs) MODEL TO ANALYSE THE TEACHER-STUDENT RELATION IN TAMILNADU COLLEGES

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Abstract:

In this paper combined Overlap Block Fuzzy Relational Maps Model and Special Filtered Linked Combined Overlap Block Fuzzy Relational Maps Model are used to analyze the problem. The study pertains to student - teacher relation in colleges. The use of this model has become mandatory as several attributes related with students; teachers and parents were given by the experts. Two models using COBFRMs are constructed, one using student-teacher relation and another parent-student relation. Further the multi-expert model Special Filtered Linked Combined Overlap Block FRMs model is adopted to give the focused view of all the experts. Conclusions based on the study are given.

Key Words: Fuzzy Relational Maps (FRMs) Model, Combined Overlap Block Fuzzy Relational Maps (COBFRMs) Model, Linked Fuzzy Relational Maps (Linked FRMs), Special Filtered Linked Combined Overlap Block Fuzzy Relational Maps (SFLCOBFRMs) Model & Hidden Pattern, Fixed Point.

1. Introduction:

This paper has four sections. First section introduces the basic attributes related with the parents, students, and teachers. They are described in a line or two. Further for working and definition of Fuzzy Relational Maps Model and Combined Overlap Block FRMs Models please refer [1-3]. Section two uses the COBFRMs model to study the student - teacher relations and the analysis of parent - student relations. The SFLCOBFRMs model is applied to link teachers with parents is carried out in section three. Final section gives the conclusions based on this study.

The role of college teachers influencing the students, the response of students to it and the role of parents in educating their children is analyzed here. The relation between student and teacher can be studied by FRMs. Hence one has no other fuzzy model other than FRMs to analyze the relation. Secondly the relation between parents and children or the influence of parents over children can be studied using FRMs. However it is not possible directly to connect the teachers and parents and get a FRMs model. At this juncture the linked FRMs model comes handy.

The nodes / attributes used in this problem are described in a line or two. Nodes / attributes related with the teachers.

T_1: Teacher is devoted to the profession.
T_2: Teacher takes interest in the students.
T_3: Teacher is punctual to class.
T_4: Teacher is kind and considerate with students.
T_5: Teacher is indifferent in class.
T_6: Teacher is rude with students.
T_7: Teacher is partial.
T_8: Teacher is not punctual to class.
T_9: Teacher teaches well and motivates the students.
T_{10}: Teacher whiles away the time without teaching seriously.
T_{11}: Teacher has other business after college hours in which they show more interest than the teaching job they hold.
T_{12}: Some teachers take the job of real estate brokers / dealers/ stocks and shares / saree business etc for extra earning.
T_{13}: Some senior teachers give all work to the junior teachers who are their students.
T_{14}: Some teachers are money lenders and so they spend a substantial amount of time in lending money and collection of the same.
T_{15}: Teachers are disinterested in teaching.
T_{16}: Some teachers earn by tuitions before and after school hours.
T_{17}: Teachers all the time seek for employment in other colleges with better salary.
T_{18}: Teachers are bogged down by academic responsibilities and are made to work for many hours with paltry salary.

Now the attributes related with the students are briefly described.

S_1: Students are regular to class.
S_2: Students take interest in studies.
S_3: Students are punctual to class.
S_4: Students are irregular to class.
S_5: Students are not interested in their studies.
S_6: Students do not score good marks.
S_7: Students are disinterested in studies.
S_8: Students study well and get good marks.
S_9: Students do not listen or cooperate in the class to learn.
S_{10}: Students do not listen to their parents.
S_{11}: Students roam in the street with bad company.
S_{12}: Students waste most of their time frivolously.
S_{13}: They go to petty job before and after college hours to support their educational expenses and family.
S_{14}: Students are ignorant about the importance of education.
S_{15}: Students least care about education.
S_{17}: Students feel the content as well as the way the courses are handled as dry and boring.

Next the nodes / attributes associated with the parents are given in the following:

P_1: Parents take care of their children's studies seriously by keeping a constant tab on their activities.
P_2: Parents are poor and so have no time to spend either money or time on their children.
P_3: Parents are educated and so they advice their children to be regular to college and study well.
P_4: Parents are uneducated and so their children have least respect and regard to education.
P_5: Parents do not encourage their children to attend college for they think it is waste and so force them to take errands or petty jobs to support the family.
P_6: Parents feel that their children are not properly taught in their colleges.
P_7: Parents are ignorant of what their children are studying.
P_8: Parents feel that they have no control or say over their children.
P_9: Parents are busy with their own schedule and so have no time even to know what their children are studying / doing.
P_{10} : Some parents feel low about their children studying in arts and science colleges and so show indifference to their achievements.
P_{11}: Educating children in Arts College is a social stigma.

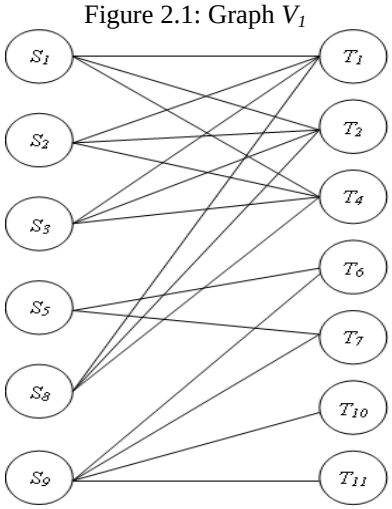
Now linked FRMs are used to study this problem. At the outset one is justified in using FRMs; as the nodes can be got as disjoint classes and secondly most of the data in hand is an unsupervised one and so no other mathematical model other than fuzzy model in general and FRMs model in particular is suited to study this problem.

Finally set of attributes given by the experts is very large and so no expert will wish to work with all these attributes. Each of the experts may use a subset from the set of attributes but for that sake one cannot give the several small FRMs models for it will not be possible to spend so much of time or get the integrated view. So one is justified in using the multi-experts model, the Combined Overlap Block FRMs model to get the integrated opinion of the experts regarding the problem.

2 Combined Overlap Block FRMs to Analyze Student – Teacher Relation and Parent - Student Relation:

In this section Combined Overlap Block FRMs are used to analyse the teacher - student relationship. Three experts have used FRMs and have given their expertise.

Figure 2.1: Graph V_1



The first expert wishes to work with $D_1 = \{S_1, S_2, S_3, S_5, S_8, S_9\} \subseteq \{S_1, S_2, .., S_{17}\}$ as the domain space and $R_1 = \{T_1, T_2, T_4, T_6, T_7, T_{10}, T_{11}\} \subseteq \{T_1, T_2, \ldots, T_{18}\}$ is taken as the range space of the FRMs. The directed graph V_1 of the FRMs given by the expert is as above:

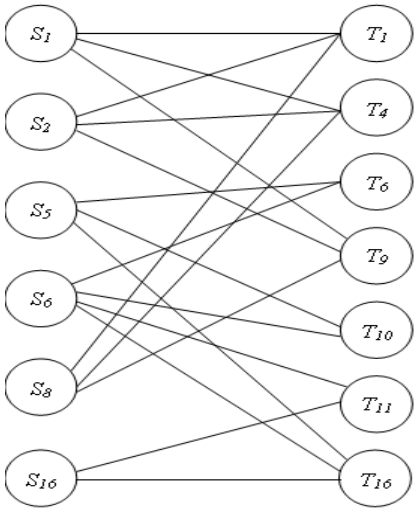
The connection matrix F_1, associated with the graph 2.1 is as follows:

$$F_1 = \begin{array}{c} \\ S_1 \\ S_2 \\ S_3 \\ S_5 \\ S_8 \\ S_9 \end{array} \begin{array}{c} \begin{array}{ccccccc} T_1 & T_2 & T_4 & T_6 & T_7 & T_{10} & T_{11} \end{array} \\ \begin{bmatrix} 1 & 1 & 1 & 0 & 0 & 0 & 0 \\ 1 & 1 & 1 & 0 & 0 & 0 & 0 \\ 1 & 1 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 1 & 0 & 0 \\ 1 & 1 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 1 & 1 & 1 \end{bmatrix} \end{array}.$$

Now the second expert works with the FRMs model using subsets, $D_2 = \{S_1, S_2, S_5, S_6, S_8, S_{16}\} \subseteq \{S_1, S_2, \ldots, S_{17}\}$ and $R_2 = \{T_1, T_4, T_6, T_9, T_{10}, T_{11}, T_{16}\} \subseteq \{T_1, T_2, \ldots, T_{18}\}$ are taken as the domain and range space respectively of the FRMs.

The directed graph V_2 given by the expert is as follows:

Figure 2.2: Graph V_2

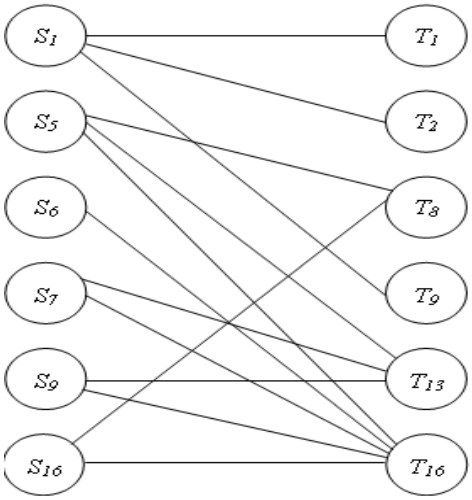


The related connected matrix F_2 of the FRMs for the bipartite graph in Figure 2.2 is as follows:

$$F_2 = \begin{array}{c} \\ S_1 \\ S_2 \\ S_5 \\ S_6 \\ S_8 \\ S_{16} \end{array} \begin{array}{c} \begin{array}{ccccccc} T_1 & T_4 & T_6 & T_9 & T_{10} & T_{11} & T_{16} \end{array} \\ \begin{bmatrix} 1 & 1 & 0 & 1 & 0 & 0 & 0 \\ 1 & 1 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 0 & 1 & 1 & 1 \\ 1 & 1 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 1 \end{bmatrix} \end{array}.$$

The third expert wishes to work with the subsets of nodes, $D_3 = \{S_1, S_5, S_6, S_7, S_9, S_{16}\} \subseteq \{S_1, S_2, \ldots, S_{17}\}$ is taken as the nodes of the domain space for the FRMs. $R_3 = \{T_1, T_2, T_8, T_9, T_{13}, T_{16}\} \subseteq \{T_1, T_2, \ldots, T_{18}\}$ is taken as the nodes of the range space for the FRMs. The bipartite graph V_3 given by the expert is as follows:

Figure 2.3: Graph V_3



The connection matrix F_3 associated with the directed graph is as follows:

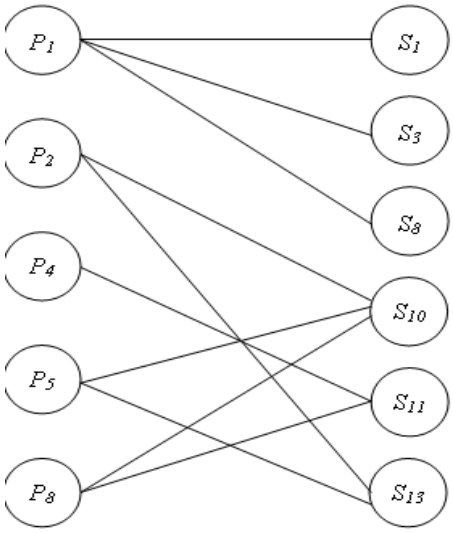
$$F_3 = \begin{array}{c} \\ S_1 \\ S_5 \\ S_6 \\ S_7 \\ S_9 \\ S_{16} \end{array} \begin{array}{c} \begin{array}{cccccc} T_1 & T_2 & T_8 & T_9 & T_{13} & T_{16} \end{array} \\ \begin{bmatrix} 1 & 1 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 0 & 0 & 1 \end{bmatrix} \end{array}.$$

Now using the three experts' connection matrices of the FRMs F_1, F_2 and F_3, the Combined Overlap Block FRMs is built. This has the domain space attributes $D' = \{S_1, S_2, S_3, S_5, S_6, S_7, S_8, S_9, S_{16}\}$ and the range space attributes $R' = \{T_1, T_2, T_4, T_6, T_7, T_8, T_9, T_{10}, T_{11}, T_{13}, T_{16}\}$. The connection matrix F of the Combined Overlap Block FRMs using the matrices F_1, F_2 and F_3 which has D' and R' to be the domain and range attributes respectively is as follows:

$$F = \begin{array}{c} \\ S_1 \\ S_2 \\ S_3 \\ S_5 \\ S_6 \\ S_7 \\ S_8 \\ S_9 \\ S_{16} \end{array} \begin{array}{c} \begin{array}{ccccccccccc} T_1 & T_2 & T_4 & T_6 & T_7 & T_8 & T_9 & T_{10} & T_{11} & T_{13} & T_{16} \end{array} \\ \begin{bmatrix} 3 & 2 & 2 & 0 & 0 & 0 & 2 & 0 & 0 & 0 & 0 \\ 2 & 1 & 2 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 1 & 1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 2 & 1 & 1 & 0 & 1 & 0 & 1 & 2 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 & 1 & 1 & 0 & 2 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 1 \\ 2 & 1 & 2 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 1 & 0 & 0 & 1 & 1 & 1 & 1 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 1 & 0 & 2 \end{bmatrix} \end{array}.$$

Also in this section the problem existing between college students and their parent is analyzed using the COBFRMs. The experts have agreed to choose subsets from attributes described in section one. Three experts agreed to work on this problem using FRMs choosing subsets from the parent's and student's attributes described. The first expert works with following nodes. Let $D_4 = \{P_1, P_2, P_4, P_5, P_8\} \subseteq \{P_1, P_2, \ldots, P_{11}\}$ be taken as the nodes of the domain space. $R_4 = \{S_1, S_3, S_8, S_{10}, S_{11}, S_{13}\} \subseteq \{S_1, S_2, \ldots, S_{17}\}$ is taken as the nodes of the range space of the FRMs. The directed graph V_4 given by this expert is as follows:

Figure 2.4: Graph V_4

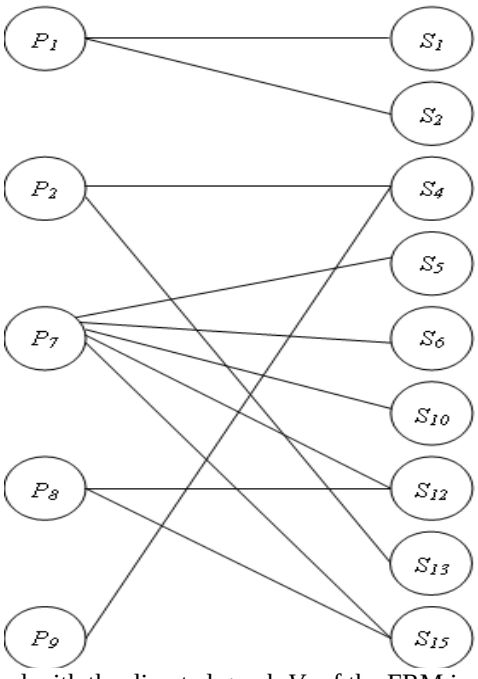


The connection matrix F_4 associated with the bipartite graph V_4 given in Figure 2.4. is as follows:

$$F_4 = \begin{array}{c} \\ P_1 \\ P_2 \\ P_4 \\ P_5 \\ P_8 \end{array} \begin{array}{c} \begin{array}{cccccc} S_1 & S_3 & S_8 & S_{10} & S_{11} & S_{13} \end{array} \\ \begin{bmatrix} 1 & 1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 1 & 0 \end{bmatrix} \end{array}.$$

The second expert has chosen the following nodes ,$D_5 = \{P_1, P_2, P_7, P_8, P_9\} \subseteq \{P_1, P_2, \ldots, P_{11}\}$ is taken as the domain nodes. $R_5 = \{S_1, S_2, S_4, S_5, S_6, S_{10}, S_{12}, S_{13}, S_{15}\} \subseteq \{S_1, S_2, \ldots S_{17}\}$ is taken as the nodes of the range space. The bipartite graph V_5 is given in the following Figure 2.5.

Figure 2.5: Graph V_5

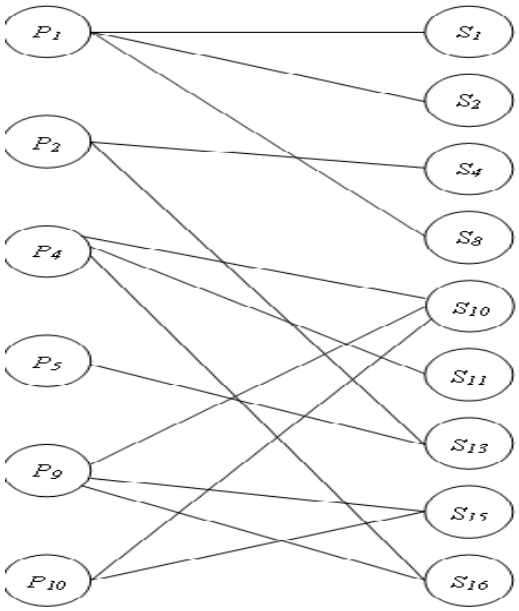


The connection matrix F_5 associated with the directed graph V_5 of the FRM is as follows

$$F_5 = \begin{array}{c} \\ P_1 \\ P_2 \\ P_7 \\ P_8 \\ P_9 \end{array} \begin{array}{c} \begin{array}{ccccccccc} S_1 & S_2 & S_4 & S_5 & S_6 & S_{10} & S_{12} & S_{13} & S_{15} \end{array} \\ \begin{bmatrix} 1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 & 1 & 1 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix} \end{array}.$$

Next the third expert's opinion is given using the following subsets, $D_6 = \{P_1, P_2, P_4, P_5, P_9, P_{10}\} \subseteq \{P_1, P_2, \ldots, P_{11}\}$ $R_6 = \{S_1, S_2, S_4, S_8, S_{10}, S_{11}, S_{13}, S_{15}, S_{16}\} \subseteq \{S_1, S_2, \ldots, S_{17}\}$. The bipartite graph V_6 given by the expert is given in the following Figure 2.6.

Figure 2.6: Graph V_6



Let F_6 be the connection matrix of the Figure 2.6 which is as follows:

$$F_6 = \begin{array}{c} \\ P_1 \\ P_2 \\ P_4 \\ P_5 \\ P_9 \\ P_{10} \end{array} \begin{array}{c} \begin{array}{ccccccccc} S_1 & S_2 & S_4 & S_8 & S_{10} & S_{11} & S_{13} & S_{15} & S_{16} \end{array} \\ \begin{bmatrix} 1 & 1 & 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 1 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 & 1 & 0 \end{bmatrix} \end{array}.$$

Now using the three connection matrices F_4, F_5 and F_6 of the FRMs we build the COBFRMs connection matrix E which is as follows:

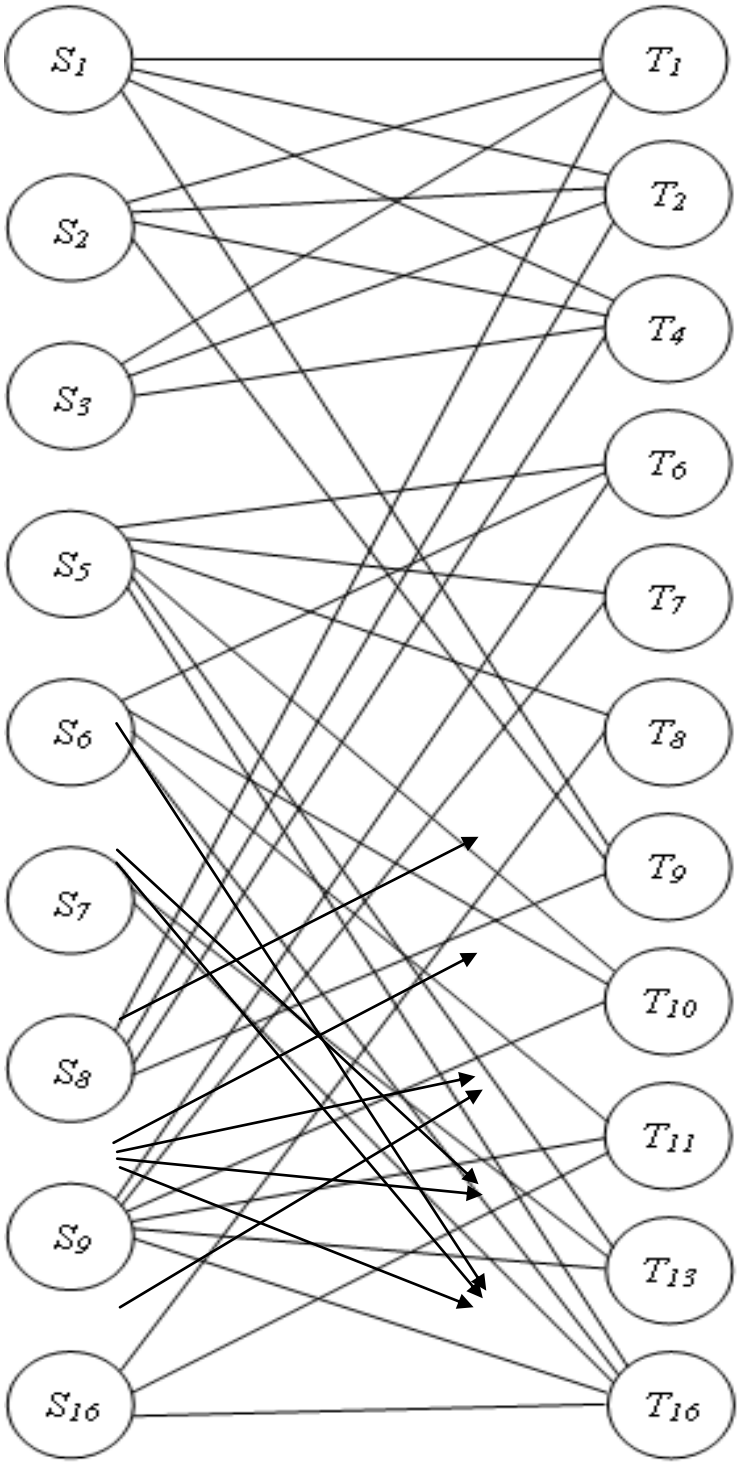
$$E = \begin{array}{c} \\ P_1 \\ P_2 \\ P_4 \\ P_5 \\ P_7 \\ P_8 \\ P_9 \\ P_{10} \end{array} \begin{array}{c} \begin{array}{ccccccccccccc} S_1 & S_2 & S_3 & S_4 & S_5 & S_6 & S_8 & S_{10} & S_{11} & S_{12} & S_{13} & S_{15} & S_{16} \end{array} \\ \begin{bmatrix} 3 & 2 & 1 & 0 & 0 & 0 & 2 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 2 & 0 & 0 & 0 & 1 & 0 & 0 & 3 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 2 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 2 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 1 & 0 & 1 & 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 1 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 1 & 0 \end{bmatrix} \end{array}$$

3 Application of SFLCOBFRMs Model to Study Parent - Teacher Relation:

In this section using the COBFRMs constructed in section two of this paper, the SFLCOBFRMs model is applied and this model links teachers with parents. In this study first filtering was carried out by getting intersection of the student's attributes used in the above said COBFRMs models.

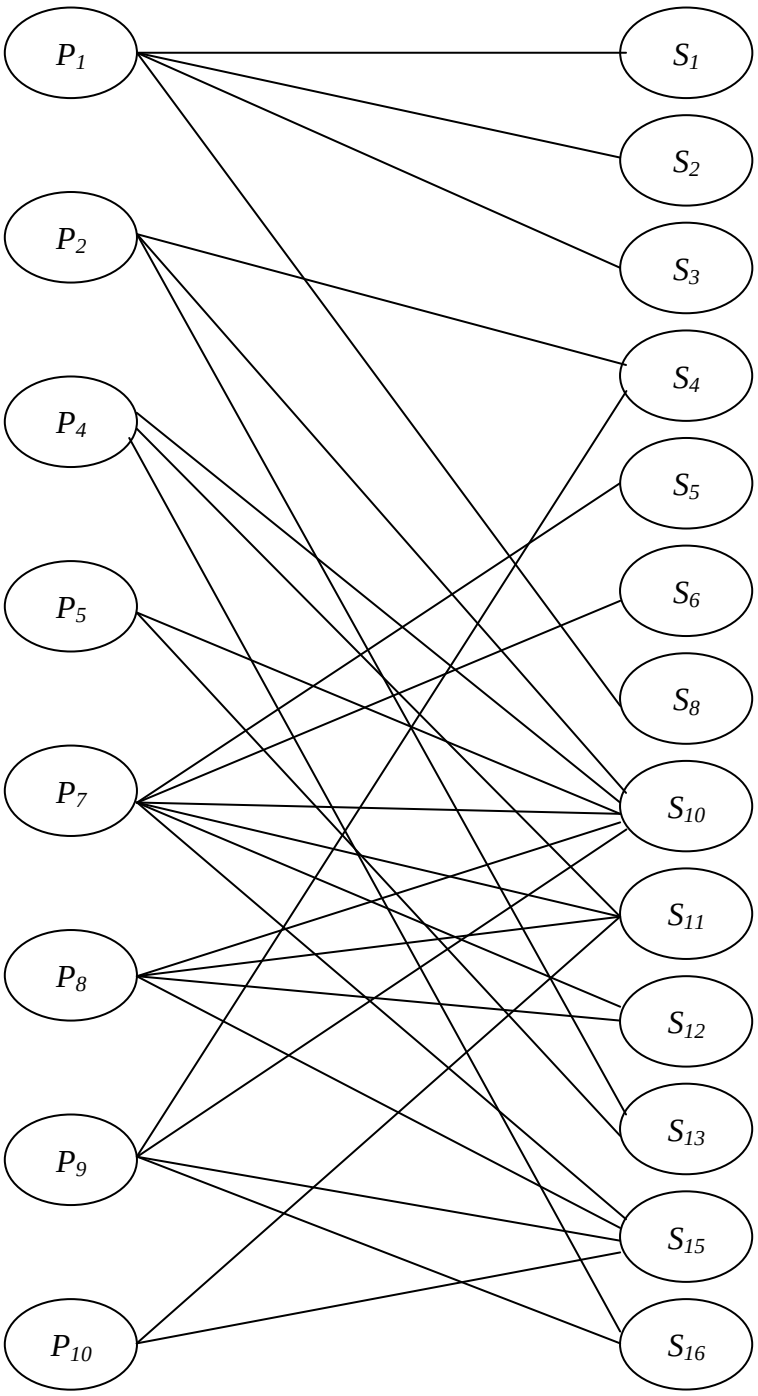
Graph U_1 given in Figure 3.1 describes the COBFRMs model of student-teacher relation. Likewise graph U_2 in the Figure 3.2 describes the COBFRMs model of students and parents. After filtering the link "students" between parents and teachers the directed linked graph U_3 of the SFLCOBFRMs model is described in the following figure:

Figure 3.1: Graph U_1



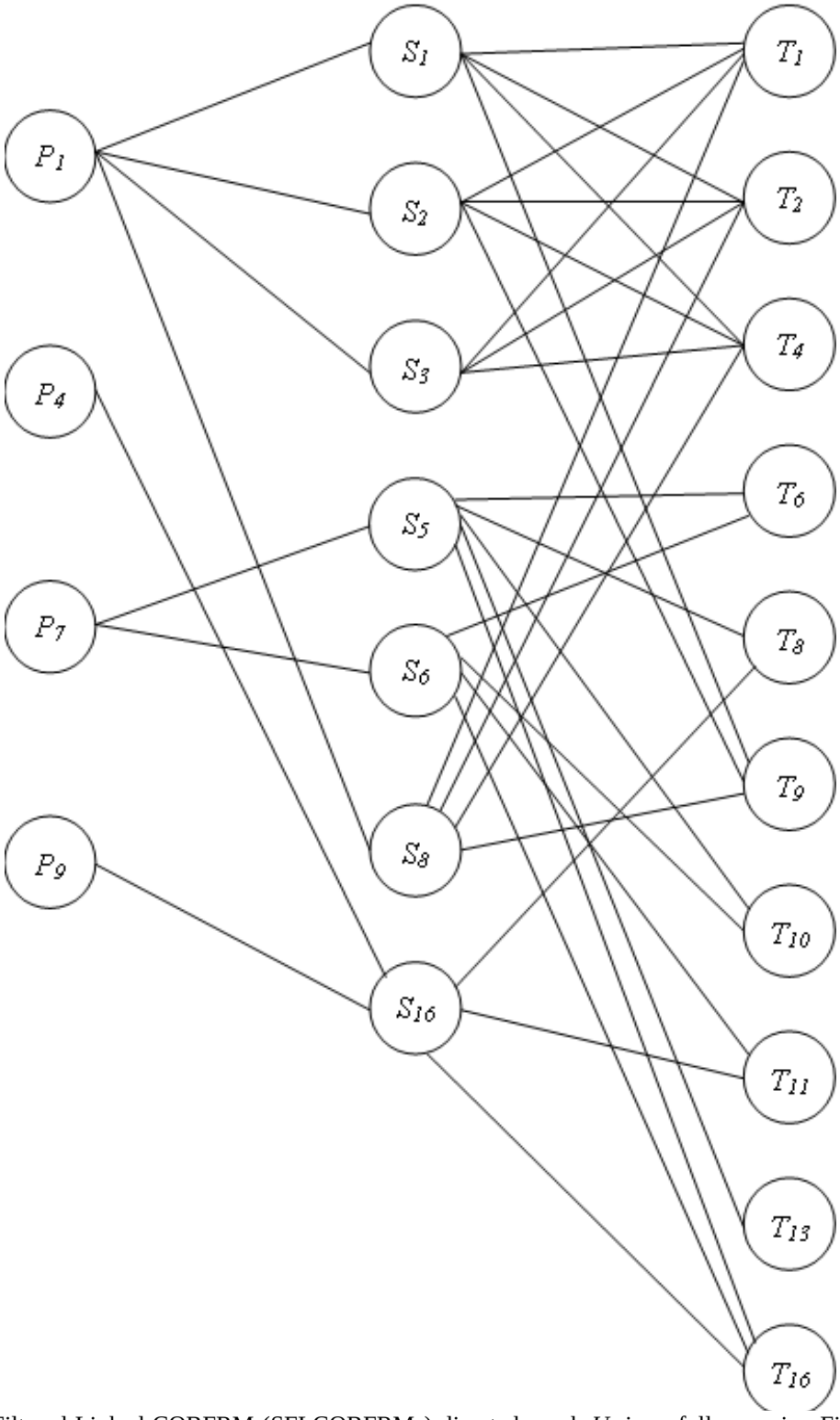
Next the directed graph U_2 of SFLCOBFRMs model is given in Figure 3.2.

Figure 3.2: Graph U_2



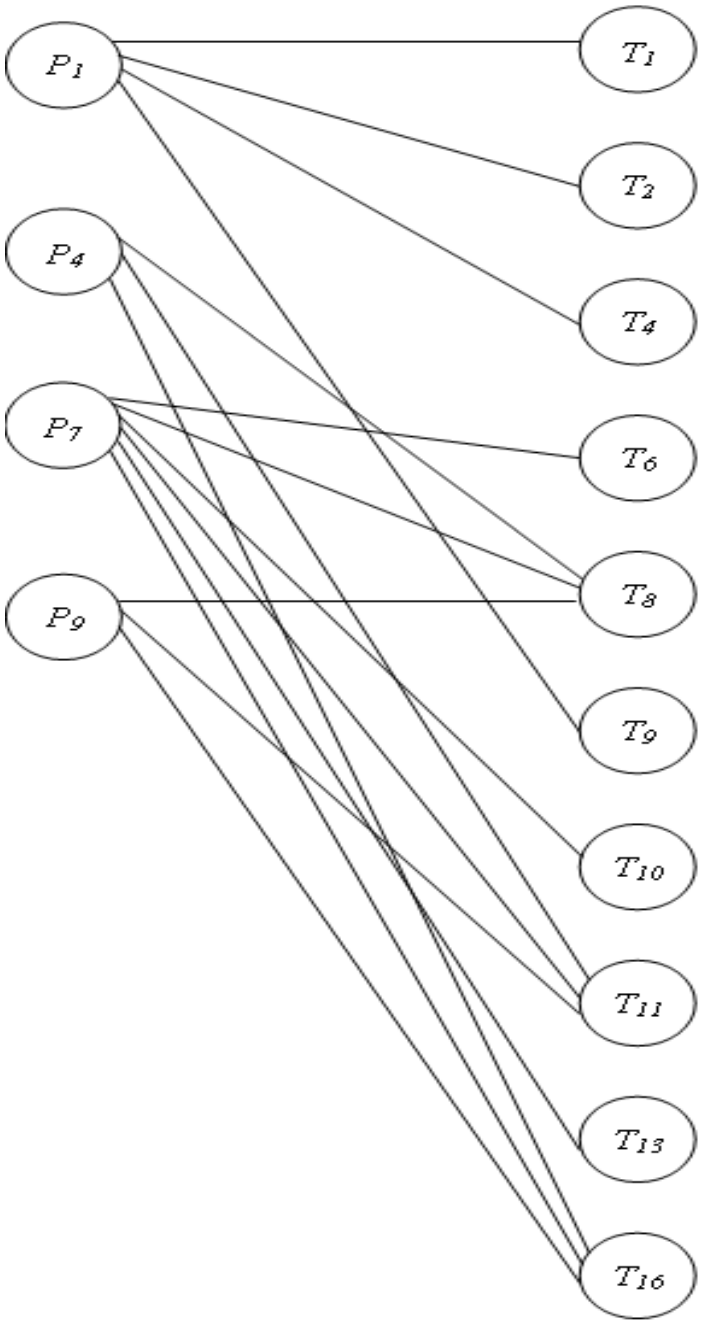
Now using the graphs U_1 and U_2 one gets the special linked filtered graph U_3 which is as follows:

Figure 3.3: Graph U_3



The Special Filtered Linked COBFRM (SFLCOBFRMs) directed graph U_4 is as follows using Figure 3.1, 3.2 and 3.3.

Figure 3.4: Graph U_4



The associated matrix of the SFLCOBFRMs bipartite graph is as follows:

$$H = \begin{array}{c} \\ P_1 \\ P_4 \\ P_7 \\ P_9 \end{array} \begin{array}{c} \begin{array}{cccccccccc} T_1 & T_2 & T_4 & T_6 & T_8 & T_9 & T_{10} & T_{11} & T_{13} & T_{16} \end{array} \\ \begin{bmatrix} 1 & 1 & 1 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 1 & 0 & 1 & 1 & 1 & 1 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 & 1 & 0 & 1 \end{bmatrix} \end{array}.$$

Using H as the dynamical system of SFLCOBFRMs the hidden pattern pair can be obtained as follows:
Let X = (1 0 0 0); that is only the node P_1 is in the on state, all nodes are in the off state.
To find the effect of X on H, we have

XH	$\rightarrow$	(1 1 1 0 0 1 0 0 0 0)	=	Y (say)
YH^T	$\rightarrow$	(1 0 0 0)	=	X_1 (= X).

Thus the hidden pattern pair is a fixed point.

Suppose the node T_8 alone from the range space is in the on state to find the effect of N = (0 0 0 0 1 0 0 0 0 0) on the dynamical system H of the SFLCOBFRMs model, we have

NH^T	$\rightarrow$	(0 1 1 1)	=	M (say)
MH	$\rightarrow$	(0 0 0 1 1 0 1 1 1 1)	=	N_1 (say)
N_1H^t	$\rightarrow$	(0 1 1 1)	=	M_1 (= M).

Thus the hidden pattern of N on the SFLCOBFRMs model H is a fixed point pair given by {(0 1 1 1), (0 0 0 1 1 0 1 1 1 1)}.

Negative attribute T_8 has made all the negative attributes on in both the domain and range spaces of the SFLCOBFRMs model. Thus the basic property of both the COBFRMs and linked FRMs is preserved by SFLCOBFRMs model also.

4. Conclusion:

This new model can be realized as the sharp or crisp results from the two models by which time and economy can be saved. This clearly emphasizes that if parents are taking care of their children's education, certainly that will result in general in the on state of good attributes of the teacher. However if parents do not take care of their education, all negative attributes of teachers come to on state there by implying that the perspective with which one approaches the problem can change or influence the existing perspective to a great extent though not completely.

In this paper multi-expert model viz. COBFRMs model is adopted to the study of teacher-student relationship and student-parent relation. This two COBFRMs are used to obtain the new multi expert model SFLCOBFRMs model to get the focused view of all the experts. Thus the two COBFRMs model are used to get the integrated view where as the SFLCOBFRMS model used to get the focused view of all the experts.

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