Integrated Intelligent Research (IIR)
International Journal of Computing Algorithm
Volume: 04 Issue: 02 December 2015 Pages:68-71
ISSN: 2278-2397

A Study on the Exposures of Rag- Pickers using Induced Neutrosophic Cognitive Relational Maps

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Abstract-In this paper, using a new Fuzzy bimodal called Induced NeutrosophicCognitive Relational Maps (INCRM) we analyse the Socio-Economic problem faced by Rag-Pickers. Based on the study, conclusions and some remedial measures are stated.

Keywords-NCM, NRM, NCRM, INCRM, fixed point, limit cycle, hidden pattern.

I. INTRODUCTION

L.A. Zadeh(1965) introduced the fuzzy model. one in the. Fuzzy model is a mathematical which deals with neural networks and fuzzy logics. Generally fuzzy model helps to deal the uncertainties which are associated with human cognitive thinking.Among many fuzzy models, in this paper we are interested inFuzzy Cognitive Maps (FCM), Fuzzy Relational Maps (FRM).Praveenprakash (2010) has introduceda bimodal called Fuzzy Cognitive Relation Maps (FCRM)bimodal. In this paper, a new bimodal called Induced NCRM is introduced to analyse the Socio-Economic problem of Rag-Pickers.

II. PRELIMINARIES

A. Definition

Let S = $S_1 \cup S_2$, where $S_1$and S_2 are nonempty disjoint sets, then we call Sas a biset.

B. Definition

A matrix M = $M_1 \cup M_2$ where M_1 is anm × n matrix and M_2 is a p×s matrix, then M is called a bimatrix.

C. Definition

A Neutrosophic Cognitive Relation Maps (NCRM) is a directed fuzzy bigraphit has nodes which deals with concepts like policies and edges as causal relationships. In a NCRM the pair of associated nodes is called as binodes.

D. Definition

Consider the binodes, $\{C_1{}' C_2{}' \ldots.. C_n{}'\}$ of the FCM and $\{D_1 \ldots D_r\}$, $\{R_1 \ldots. R_s\}$ of the FRM for the NCRM bimodal.The directed fuzzy graph is drawn by using the edge biweighte$_{ij}^{t}$= {0, 1, -1, I}; 1≤ t ≤ 2.It is defined by $e_{ij}^1 \cup e_{ks}^2$in bimatrix where $e_{ij}^1$is the weight of the edge C_iC_j and $e_{ks}^2$is the directed edge of D_kR_s. Here M is the connection bimatrixof the new NCRM bimodal.

E. Definition

The new NCRMs with edge biweight{1, 0, -1, I} are called simple NCRMs. An NCRM which has a feedback is the representation of cyclesi.e., the casual relations between the nodes is in cyclic way, and thenNCRM is called a dynamicalbisystem.

F. Definition

The biedgese$_{ij}$ = (e_{ij}^1) ∪ (e_{ks}^2) take the values in fuzzy casual biinterval [-1,1] ∪ [-1,1].

i) e_{ij}= 0 indicates no causality between the binodes.

ii) e_{ij}>0 implies that both e_{ij}^1>0 and e_{ks}^2>0 ; indicates increase in the binodesimplies increase in the binodes.

iii) e_{ij}< 0 implies that both e_{ij}^1<0 and e_{ks}^2< 0 ; similarly decrease in the binodesimpliesdecrease in the binodes.

However unlike the FCM and FRM model we can have the following possibilities other than that of e_{ij} = 0, e_{ij}>0 and e_{ij}< 0.

i) e_{ij} = (e_{ij}^1) ∪ (e_{ks}^2) can be such that (e_{ij}^1) = 0 and (e_{ks}^2)>0. No relation.

ii) e_{ij}= (e_{ij}^1) ∪ (e_{ks}^2) also for (e_{ij}^1) = 0 and (e_{ks}^2) < 0.

iii) e_{ij} = (e_{ij}^1) ∪ (e_{ks}^2) we can have (e_{ij}^1) ≤ 0 and (e_{ks}^2) > 0

iv) Ine$_{ij}$ = (e_{ij}^1) ∪ (e_{ks}^2) we can have (e_{ij}^1) < 0 and (e_{ks}^2) =0

v) In e_{ij} = (e_{ij}^1) ∪ (e_{ks}^2) we can have (e_{ij}^1) > 0 and (e_{ks}^2) =0

vi)In e_{ij}= (e_{ij}^1) ∪ (e_{ks}^2) we can have (e_{ij}^1) > 0 and (e_{ks}^2) <0

Thus in the case of NCRM we can have 9 possibilitieswhich is useful for solving the problem in accurate way.

a) Application of this bimodal to the problem of rag pickers

Because of the changes in packaging and lifestyles, waste has definitely increased. Over a decade there was not much plastic packaging. So the scale of waste has changed which results to the fact of land contamination. Of course in India it is in common practice of not to separating the waste. Nowadays electronic waste such as batteries, gadgets waste containing mercury, broken glasses, medicine bottles, syringe, knives and vegetable peelersare thrown in same bins. Thus unsanitary working condition leads them to serious infections and wounds.

b) Adaptation of the problem to FCRM Bimodal

The linguistic questionnaire was transformed7 main attributes of problems faced by the rag pickers and 8 attributes as the cause of it which acts as catalyst.

The attributes are

C_1: Left orphans due to parents/family members death.

C_2: School dropouts/ no Money to pay school fees/ill-treatment bythe teachers.

C_3: Rag picking as a source of income and livelihood.

C_4: Bad Company and Bad habits.

C_5: Parents in jail.

C_6: Quarrel at home with parents or family members.

C_7: Poverty and unemployment's due to parents/family memberdeath.

D_1: Quarrel at home / ill treatment.

D_2: School dropout.

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Volume: 04 Issue: 02 December 2015 Pages: 68-71
ISSN: 2278-2397

D_3: Rag picking as an independent Profession.
D_4: Poverty and seeks self-respect.
D_5: Take up to all bad habits due to several reasons likebad company, for sleep, etc., so become drug addicts.
D_6: No hygiene/ no knowledge about hygiene / about thehazardous waste.
D_7: Run away from the family.
They deal with
R_1: Father a drunkard / No parents / parents in jail.
R_2: Enjoy independence /self-support.
R_3: No motivation by teacher in school.
R_4: No place to sleep in night.
R_5: Problem given by Police.
R_6: Malaria / typhoid.
R_7: Scabies / hepatics / skin ailment due to rag picking.
R_8: Government and public have taken no steps to manage waste.

We get the synaptic connecting bimatrixM as follows:

$$
\begin{array}{c} \\ C_1 \\ C_2 \\ C_3 \\ C_4 \\ C_5 \\ C_6 \\ C_7 \end{array}
\begin{array}{c}
\begin{array}{ccccccc} C_1 & C_2 & C_3 & C_4 & C_5 & C_6 & C_7 \end{array} \\
\begin{pmatrix}
0 & 1 & 0 & I & 0 & 0 & 1 \\
1 & 0 & 0 & 0 & 0 & I & 1 \\
0 & 0 & 0 & 0 & 0 & 1 & 0 \\
I & 0 & 1 & 0 & 0 & 1 & 1 \\
0 & 1 & 0 & I & 0 & 0 & 1 \\
1 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 1 & 0
\end{pmatrix}
\end{array}
\cup
$$

c) Analysis using FCRM Bimodal

First we work for the result for NCRM with initialvectorc$_1$ in NCM component of NCRM bimodal as ONstate saying that Left orphans due to parents/family members death as initializing attribute and the remaing in OFF state and the initial vector d$_1$ in NRM Component, ofNCRM bimodal as ON state saying that Quarrel at home is initializing attribute. The symbol $\hookrightarrow$ stands forthresholding and it means that values greater than or equal to1are replaced by 1.

Let I_1 = (1 0 0 0 0 0 0) U (1 0 0 0 0 0 0 0)
The effect of I_1 on the dynamical system M is

I_1M = (1 0 0 0 0 0 0)M_1 U (1 0 0 00 0 0 0)M_2
$\hookrightarrow$ (0 10 I 0 01) U (1 00 0 0000)
==> (0 1 0 I 0 0 1) U (1 0 0 0 0 0 0 0) M_2^T
$\hookrightarrow$ (01 0I 0 01) U(1 00 I1 00) = I_2

Now $I_1 \neq I_2$. Hence we precede further to get thelimit point as follows
I_2M = (1+I^2 0 I 0 0 2I+1 1+I)M_1 U (2+I^2 0 0 I 0 1 0 0)M_2
$\hookrightarrow$ (1 0 I 0 0 1 1)U (1 0 0 I 0 1 0 0)
==>(1 0 I 0 0 1 1) U (1 0 0 I 0 1 0 0) M_2^T
$\hookrightarrow$ (1 0 I 0 0 1 1) U (1 00 I 1 0 0) =I_3

Continuing this process and updating we get,
I_3M = (2+I^2 1 I I0 1+2I 2+I) U (1 0 0 I 0 1 0 0)
$\hookrightarrow$ (1 1 I I 0 0 0) U (1 0 0 I 1 0 0) =I_4

I_4M = (2+I^2 1 I I0 1+3I 2+I) U (2+I^2 0 0 I 0 1 0 0)
$\hookrightarrow$ (1 1 II 0 1 1) U (1 0 0 I 1 0 0) =I_5 =I_4

Table 1:Collection of Limit points for different input vectors.

No	Input Vector	Limit Points
1	(1 0 0 0 0 0 0)	(1 1 I I 0 1 1) U (1 0 0 I 1 0 0) (1 0 0 I 0 1 0 0)
2	(0 1 0 0 0 0 0)	(1 1 I I 0 1 1) U (0 1 1 0 0 1 1) (0 1 1 0 1 0 1 1)
3	(0 0 1 0 0 0 0)	(1 1 I I 0 1 1) U (0 1 1 0 0 1 1) (0 1 1 0 1 0 1 1)
4	(0 0 0 1 0 0 0)	(1 1 I I 0 1 1) U (I 0 0 1 I 0 0) (I 0 0 1 0 I 0 0)
5	(0 0 0 0 1 0 0)	(1 1 I I 0 1 1) U (1 0 0 I 1 0 0) (1 0 0 I 0 1 0 0)
6	(0 0 0 0 0 1 0)	1 1 I I 0 1 1) U (0 1 1 0 0 1 1) (0 1 1 0 1 0 1 1)
7	(0 0 0 0 0 0 1)	(1 1 I I 0 1 1) U (0 1 1 0 0 1 1) (0 1 1 0 1 0 1 1)

d) Induced NCRM Bimodal

$$
\begin{array}{c} \\ D_1 \\ D_2 \\ D_3 \\ D_4 \\ D_5 \\ D_6 \\ D_7 \end{array}
\begin{array}{c}
\begin{array}{cccccccc} R_1 & R_2 & R_3 & R_4 & R_5 & R_6 & R_7 & R_8 \end{array} \\
\begin{pmatrix}
1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 \\
0 & 1 & 0 & 0 & 1 & 0 & 0 & 1 \\
I & 0 & 0 & 1 & 0 & 0 & 0 & 0 \\
1 & 0 & 0 & 0 & 0 & 1 & 0 & 0 \\
0 & 0 & 0 & 0 & 1 & 0 & 1 & I \\
0 & 0 & 1 & 0 & 0 & 0 & 1 & 0
\end{pmatrix}
\end{array}
$$

It is found that in the analysis of NCRMbimodal, the expert have to initialize any vector in ON state i.e. with 1 and the remaining as 0 which will result to many 1's in the resultant vector. To avoid such situation and to show accuracy we are interested in induced NCRM bimodal.So here we adopt the method which will give importance to each vector by initializing them by keeping in ON state and we pass it over to dynamical system. Secondly the impact on all attributes i.e. using the induced path we will find the combined graph. Finally the idea for detecting the relations and influences between the nodes to find the equilibrium state, Let us take the connection bimatrix of NCRM bimodal which has both NCM and NRM components and let I_1 be the initial input bivector. In I_1 assign any component to ON state then pass the vector to adjacent matrix which is just multiplying the vector to the matrix M. Then the value for NCM, the components which is greater or equal to 1 is replaced with 1and all with 0. While in the case of NRM, components will be given ON state for two highest values and all in OFF state by giving values 1 and 0 respectively

The symbol $\hookrightarrow$ is the representation of tresholding vector. We will result to many new bivectors chose one from new bivector which has highest number of 1's and pass to the connection matrix. For each process we have resultant vectors, and I_2 is the vector which has maximum number of 1's just by choosing the first occurring vector. Repeating the same procedure until limit cycle is reached. Now we work for the result for INCRM bimodal with initial vector c$_1$ in NCM component of NCRM bimodal as ON state saying that Left

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Volume: 04 Issue: 02 December 2015 Pages: 68-71
ISSN: 2278-2397

orphans due to parents/family members death as initializing attribute and in NRM, component of NCRM bimodal as ON state saying that Quarrel at home / ill treatmentis initializing attribute. The symbol $\hookrightarrow$ stands for thresholding and it means that, values 1 and more than 1 are replaced by 1.

Let the initial state vector be I_1 = (1 0 0 0 0 0 0) U(1 0 0 0 0 0 0 0).
The effect of I_1 on the dynamical system M is
I_1M = (1 0 0 0 0 0 0)M_1 U (1 0 0 0 0 0 0 0)M_2
$\hookrightarrow$ (0 1 0 I 0 0 1) U (1 0 0 0 0 0 0 0)
==> (0 1 0 I 0 0 1) U (1 0 0 0 0 0 0 0) M_2^T
$\hookrightarrow$ (0 1 0 I 0 0 1) U (1 0 0 I 1 0 0) =I_1'

Let I_1' = IC_1' UIR_1'
From I_1' it is observed that the new bivectors are:
$I_1^{(1)}$ = (0 0 0 0 0 0 0) U(1 0 0 0 0 0 0)
$I_1^{(2)}$ = (0 1 0 0 0 0 0) U(0 0 0 0 0 0 0)
$I_1^{(3)}$ = (0 0 0 I 0 0 0) U(0 0 0 I 0 0 0)
$I_1^{(4)}$ = (0 0 0 0 0 0 0) U(0 0 0 0 1 0 0)
$I_1^{(5)}$ = (0 0 0 0 0 0 1) U(0 0 0 0 0 0 0)

Now let us find the new input vector I_2.
$I_1^{(1)}$ M= (0 0 0 0 0 0 0)M_1 U(1 0 0 0 0 0 0)M_2
==>(0 0 0 0 0 0 0) U(1 0 0 0 0 0 0 0) M_2^T
$\hookrightarrow$ (0 0 0 0 0 0 0)U (1 0 0 I 1 0 0)
Row sum is: (0, 2)

$I_1^{(2)}$ M = (0 1 0 0 0 0 0)M_1 U(0 0 0 0 0 0 0)M_2
$\hookrightarrow$ (1 0 0 0 0 I 1) U(0 0 0 0 0 0 0 0)
==> (1 0 0 0 0 I 1) U(0 0 0 0 0 0 0 0) M_2^T
$\hookrightarrow$ (1 0 0 0 0 I 1) U(0 0 0 0 0 0 0)

Row sum is: (2+I, 0)
$I_1^{(3)}$M = (0 0 0 I 0 0 0)M_1 U(0 0 0 I 0 0 0)M_2
$\hookrightarrow$ (I 0 I0 0 I I) U(I 0 0 I 0 0 0 0)
==>(I 0 I 0 0 I I) U(I 0 0 I 0 0 0 0)M_2^T
$\hookrightarrow$ (I 0 I 0 0 I I) U(I 0 0 I I 0 0)

Row sum is: (4I, 3I)
$I_1^{(4)}$M = (0 0 0 0 0 0 0)M_1 U(0 0 0 0 1 0 0)M_2
==> (0 0 0 0 0 0 0) U(1 0 0 0 0 1 0 0)M_2^T
$\hookrightarrow$ (0 0 0 0 0 0 0) U(1 0 0 I 1 0 0)
Row sum is: (0, 2+I)
$I_1^{(5)}$M = (0 0 0 0 0 0 1)M_1 U(0 0 0 0 0 0 0)M_2
$\hookrightarrow$ (0 0 0 0 0 1 0) U(0 0 0 0 0 0 0 0)
==> (0 0 0 0 0 1 0) U(0 0 0 0 0 0 0 0)M_2^T
$\hookrightarrow$ (0 0 0 0 0 1 0) U(0 0 0 0 0 0 0)
Row sum is: (1, 0)
Hence the new input vector I_2 i:
(1 0 0 0 0 I 1) U (1 0 0 I 1 0 0)

The effect of I_2 on M is
I_2M = (1 0 0 0 0 I 1)M_1 U (1 0 0 I 1 0 0)M_2
= (I 1 0 I 0 1 1) U (2+I^2 0 0 I 0 1 0 0)
$\hookrightarrow$ (I 1 0 I 0 1 1) U(1 0 0 I 0 1 0 0)
==> (I 1 0 I 0 1 1) U(1 0 0 I 0 1 0 0)M_2^T
$\hookrightarrow$ (I 1 0 I 01 1)U(1 0 0 I 1 0 0) = I_2'

Let I_2'= IC_2' IR_2'
The new bivectors are:
$I_2^{(1)}$ = (I 0 0 0 0 0 0) U IR_2'
$I_2^{(2)}$ = (0 1 0 0 0 0 0) U IR_2'
$I_2^{(3)}$ = (0 0 0 I 0 0 0) U IR_2'
$I_2^{(4)}$ = (0 0 0 0 0 0 0) U IR_2'
$I_1^{(5)}$ = (0 0 0 0 0 1 0) U IR_2'
$I_2^{(6)}$ = (0 0 0 0 0 0 1) U IR_2'

The effects of $I_2^{(1)}$, $I_2^{(2)}$, $I_2^{(3)}$, $I_2^{(4)}$, $I_1^{(5)}$, $I_2^{(6)}$ on M we gt the row sum as (3I, 2), (2+I, 0), (4I, 3I), (0, 2+I), (1, 0) and (1, 0) respectively.

Therefore the new input vector is:
I_3= (1 0 0 0 0 I 1) U (1 0 0 I 1 0 0)= I_2
Therefore the limit point is
(1 0 0 0 0 I 1) U (1 0 0 I 1 0 0)

*Table 2:*The set of limit points corresponding to different input bivectors

No	Input Bivector	Limit Points	Induced Path
1	(1 0 0 0 0 0 0) ∪ (1 0 0 0 0 0 0)	(1 0 0 0 0 I 1) ∪ (1 0 0 I 1 0 0) (1 0 0 I 0 1 0 0)	(C_1=>C_2=>C_2) ∪ (C_1=>C_1=>C_1)
2	(0 1 0 0 0 0 0) ∪ (0 1 0 0 0 0 0)	(0 1 0 I 0 0 1) ∪ (0 0 1 0 0 1 1) (0 1 1 0 1 0 1 1)	(C_2=>C_1=>C_1) ∪ (C_2=>C_7=>C_6=>C_6)
3	(0 0 1 0 0 0 0) ∪ (0 0 1 0 0 0 0)	(1 0 0 0 0 I 1) ∪ (0 0 1 0 0 0 0) (0 1 0 0 1 0 0 1)	(C_3=>C_6=>C_1=>C_2=>C_2) ∪ (C_3=>C_3=>C_3)
4	(0 0 0 1 0 0 0) ∪ (0 0 0 1 0 0 0)	(0 1 0 I 0 0 1) ∪ (1 0 0 I 0 0) (1 0 0 I 0 1 0 0)	(C_4=>C_3=>C_1=>C_1) ∪ (C_4=> =>C_1=>C_1))
5	(0 0 0 0 1 0 0) ∪ (0 0 0 0 1 0 0)	(1 0 0 0 0 I 1) ∪ (1 0 0 I 1 0 0) (1 0 0 0 0 1 0 0)	(C_5=>C_2=>C_2) ∪ (C_5=>C_1=>C_1)
6	(0 0 0 0 0 1 0) ∪ (0 0 0 0 0 1 0)	(0 1 0 I 0 0 1) ∪ (0 0 1 0 0 1 1) (0 0 0 0 1 0 1 I)	(C_6=>C_1=>C_2=>C_2) ∪ (C_6=>C_6=>C_6)
7	(0 0 0 0 0 0 1) ∪ (0 0 0 0 0 0 1)	(0 0 0 0 0 I 1) ∪ (0 0 1 0 0 1 1) (0 1 1 0 1 0 1 1)	(C_7=>C_6=>C_1=>C_2=>C_2) ∪ (C_7=>C_6=>C_6)

III. CONCLUSION

We analyzed the problems of rag pickers using the induced NCRM bimodal.For different inputs, by merging we get a combined graph which is shown in Figure given below.Weobserve that the nodes C_1 and $C_2$are reachable from all the nodes and there are many paths through the node C_6 and C_1 respectively. Similarly, the nodes D_1 and D_6hasmore paths. This reveals that C_1 and C_2 are the main cause and C_6 is the second prime cause for the mentioned problem. That is, Left orphans due to parents/family members death (C_1); School dropouts (C_2); Quarrel at home with parents or family members (C_6). Likewise no hygiene/ no knowledge about the hazardous waste (D_6); Problem given by Police (R_5); Malaria / typhoid (R_6); Scabies / hepatics / skin ailment due to rag picking (R_7); Government and public have taken no steps to manage waste(R_8). These are related to the reasons and for such cases they enter to the profession of Rag picking.

International Journal of Computing Algorithm
Volume: 04 Issue: 02 December 2015 Pages: 68-71
ISSN: 2278-2397

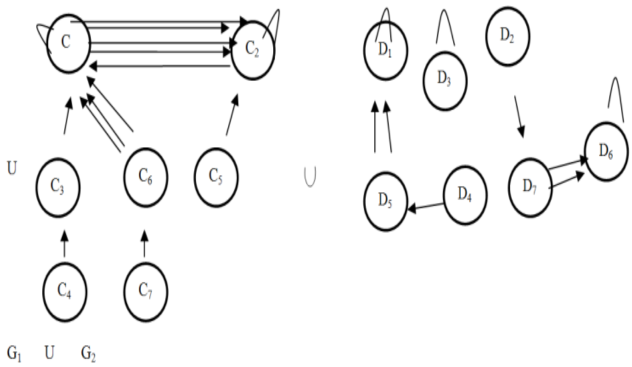

Figure:1

IV. REMEDIAL MEASURES

Steps must be taken to retain children in schools.Public must be provided with civic sense not to dump hazardous waste were rag pickers do the rag picking. As individuals, we have to control our wastes also it is advisable to use color bins for biodegradable and recyclable wastesGovernment/ NGO's should provide proper masks and gloves.Also, it is adequate to invest in new wastedisposing technologies so that this issue can deal effectively.Government should take strong step both to prevent the rag pickers around the hospital zone and also thehospital authorities not to dumb the dangerous and hazardous wastes which are reachable by the rag picker.

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