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# Reasons for Adolescent's Social Network addiction and its impact on Academics -An Analysis using Induced Linked Fuzzy Relational Mapping Using Hexagonal Fuzzy number

Nivetha Martin[1] and P.Pandiammal[2]

[1]Department of Mathematics, Arul Anandar College (Autonomous),Karumathur.

[2]Department of Mathematics, GTN Arts College,Dindigul.

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**ABSTRACT**

Educational Institution is a home away from home and it is a place of knowledge acquisition. It aims in developing the adolescents to fulfill the requirements of the needs of the society. It strives hard in implementing new tactics to enhance the academics, but it still fails in achieving it due to many reasons one among is, addiction to social networks. As we are living in techno world, we are bound to be a member of social networks (SN) and the adolescents are not an exception to it. In this present scenario we are highly dominated by our inventions and the best example is social networks. Though it is featured with many beneficial attributes its impact on adolescent's academics is worse which indeed troubles the parents and bring them to a conclusion that social networks has connection with adolescent's academic performance which is considered significant by the educational institution. To find the attribute which cause a strong impact on adolescent's academic performance, induced linked fuzzy relational mapping using hexagonal fuzzy number approach is used which is a novel method.



## Introduction

A Social network is defined to be a social structure consisting of many elements such as individual or an organization as a whole embedded with mutual interactions and relations. To mention a few SN in trend is Facebook, Twitter, Spring.me, Identi.ca and so on. The integration of SN in our daily lives has brought culture, social and behavioural effects especially among the adolescents. It has now been emerged as a serious discussion amidst the educational experts about the ways of handling the profound influence of SN which engender new patterns of expression, communication and motivation. On an argument in favour of SN everyone will state that it is an innovative and manipulative force, but this force decelerates and scatters the concentration of the adolescents who accounts to 82% of the users of SN. This indeed picturizes the extent of their dependency on SN and it has now finally ended up in addiction.

Presently in this Net-generation charging only the adolescent is unfair and unjust. The parents aim and feel pride of their children being in media rich environment and gets enthralled by their mastery over SN. This can't be termed as the sole reason but it also adds to their addiction. Academic Performance is very important for an adolescent as it decides his future and scope. Many factors contribute to the adolescent's deviation but SN ranks first. To analyze the reasons for it, induced linked Fuzzy Relation Mapping is used with hexagonal fuzzy number.

The concept of Fuzzy Relational Maps was first introduced by Vasanth.W.B and Yasmin.S to study employer and employee relation. It was extended to Linked Fuzzy Relational Maps by Vasanth.W.B and Pathinathan.T to analyze the causes of school dropouts due to migration of parents.

Tele:
E-mail address: nivetha.martin710@gmail.com



This was again extended further to Induced Linked Fuzzy Relational maps by Pathinathan. T . In all these works the weightage of one factor over the other is represented by either 0 or 1. But in this paper the weightage is assigned by linguistic variable and it is quantified by hexagonal fuzzy number. This new approach is made to be more precise than just assigning 1 or 0.

This paper aims in formulating solutions for the problems of SN addiction of adolescents so as to pave way for their enhancement of academic standards. The paper is organized as follows: Section 2 consists of basic definitions; section 3 describes the methodology; section 4 analyzes the reasons for SN addiction and section 5 concludes the work

## 2. Basic Definitions

### 2.1 Fuzzy Relational Maps (FRM)

A FRM is a map like structure enclosing the causal relationships between the real vector space elements of domain of dimension n and range of dimension m. The nodes of the domain space is denoted by D1,D2,…Dn where Di = {(x1,x2,…xn) / xi = 0 or 1, i = 1,..n}.If xi =1 or 0 then it implies Di is in ON or OFF state respectively.The nodes of the range space is denoted by R1,R2,….Rm where Rj = {(x1,x2,…xm) / xj = 0 or 1, i = 1,..m}. If xj =1 or 0 then it implies Rj is in ON or OFF state respectively.

### 2.2 Relational Matrix of FRM

The matrix M = (mij) is called as the relational matrix of the FRM,where mij is the weight associated with the directed edge DiRj or RjDi.

### 2.3 Hidden Pattern

Let D, ,D2,….Dn (R1,R2,….Rm) be a cycle when is switched on Di (Rj) and if the causality flows through the edges of a cycle and if it again causes Di (Rj), We say that the dynamical system goes round and round.

This is true for any node Di (Rj) for $i = 1, 2, \dots, n$. The equilibrium state for this dynamical system is called the hidden pattern.

**2.4 A Fixed Point attractor of FCM**

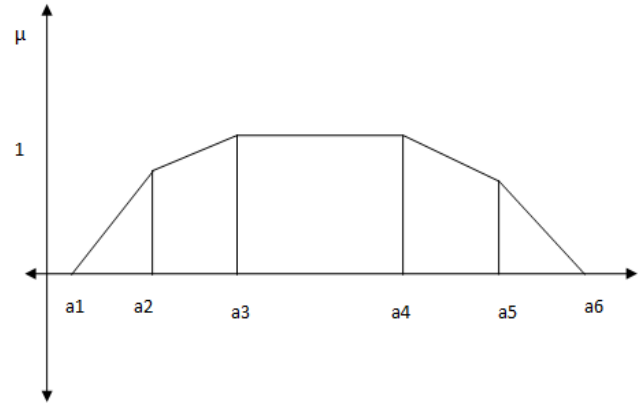
If the equilibrium state of a dynamical system is a unique state vector, then it is called a fixed point. Consider a FRM with D, ,D2,….Dn (R1,R2,….Rm)as nodes. For example, let us start the dynamical system by switching on Di (Rj). Let us assume that the FRM settles down with D1(R1) and Dn (Rm) on, i.e. the state vector remains as (1, 0, 0, . . ., 0, 1). This state vector (1, 0, 0, …, 0, 1) is called the fixed point.

**2.5 Limit Cycle**

If the equilibrium state of the dynamical system is a unique state vector, then it is called a fixed point

**2.6 Hexagonal fuzzy number**

A hexagonal fuzzy number is specified by 6 – tuples, AH = ( a1,a2,a3,a4,a5,a6) such that all ai's are real numbers and a1≤a2≤a3≤a4≤a5≤a6 where the membership function is [1]




$$\mu(\tilde{A}x) = \begin{cases} \frac{1}{2}\frac{x-a1}{a2-a1} \ for\ a1 \le x \le a2 \\ \frac{1}{2} + \frac{1}{2}\frac{x-a2}{a3-a2} \ for\ a2 \le x \le a3 \\ 1 \ for\ a3 \le x \le a4 \\ 1 - \frac{1}{2}\frac{x-a4}{a5-a4} \ for\ a4 \le x \le a5 \\ \frac{1}{2}\frac{a5-x}{a6-a5} \ for\ a5 \le x \le a6 \\ 0 \quad otherwise \end{cases}$$

**3. Method of finding the hidden pattern in Induced Linked Fuzzy Relational Maps using Hexagonal fuzzy number**

The steps followed in this method are same as that of the Induced linked Relational Maps. The difference lies in step 6

1. Consider D1,D2,…Dn and R1,R2…Rm, the concepts be the nodes of FCM with the responses of the experts
2. Form the relational matrix M with linguistic variables.
3. Keep D1 in ON state and all other components in OFF state.
4. Pass C1 through M and find C1`,
5. Convert into Signal Function by choosing the first two highest value to ON state and other values to OFF state with 1 and 0 respectively
6. Pass each component of C1` through M repeatedly and choose the first vector as C2 containing maximum number of 1's after applying threshold function that is assign 1 for the values greater than 1 and 0 for others.
7. Repeat the same procedure for C2 until we get a fixed point or a limit cycle
8. Find the hidden pattern in the similar way by keeping the second component in ON state.

**4. Analysis using Induced Linked Fuzzy Relation Map Model**

The following attributes of the SN are represented as nodes are as follows:

HSN1: Highly interesting and fascinating
HSN2: Enhances the social status
HSN3: Rapid acquisition and Transform of information
HSN4: Enable to live a virtual life by creating groups
HSN5: Boosts the rate of communication and interactiveness

The following attributes of parents are represented as nodes are as follows:

HP1: inability to control their children's usage of SN
HP2: feeling proud of their excellence in SN usage
HP3: Encouraging the replacement of playing games by SN
HP4: Relaxes by making their children to be busy with their works which make them to engage in SN
HP5: Rendering excess of freedom and joining hands with them

The following attributes of Adolescents are represented as nodes are as follows:

HA1: They wish to raise themselves high among their peer group
HA2: They want their views to be expressed to others
HA3: They are crazy about delightful things
HA4: They desired to do adventurous acts
HA5: They are interested to act independently

The linguistic values of the Hexagonal Fuzzy number are

| | |
|---|---|
| Very Low | (0,0.5,0.1,0.15,0.2,0.25) |
| Low | (0.15,0.2,0.25,0.3,0.35,0.4) |
| Medium | (0.3,0.35,0.4,0.45,0.5,0.55) |
| High | (0.45,0.5,0.55,0.6,0.65,0.7) |
| Very High | (0.65,0.7,0.75,0.8,0.9,1) |

The relational matrix between the domain (Media) attributes and the range ( Parents) attributes are represented as

SNP =

| | HP1 | HP2 | HP3 | HP4 | HP5 |
|---|---|---|---|---|---|
| HSN1 | VL | L | VL | L | M |
| HSN2 | VL | H | H | VL | H |
| HSN3 | VL | L | VL | L | VL |
| HSN4 | L | VH | M | M | M |
| HSN5 | VL | VL | L | H | H |

Hsum (SNP)=

| | HP1 | HP2 | HP3 | HP4 | HP5 |
|---|---|---|---|---|---|
| HSN1 | 0.2 | 0.275 | 0.2 | 0.275 | 0.425 |
| HSN2 | 0.2 | 0.575 | 0.575 | 0.2 | 0.575 |
| HSN3 | 0.2 | 0.275 | 0.2 | 0.275 | 0.2 |
| HSN4 | 0.275 | 0.8 | 0.425 | 0.425 | 0.425 |
| HSN5 | 0.2 | 0.2 | 0.275 | 0.575 | 0.575 |

The relational matrix between the domain (Parents) attributes and the range (Adolescents) attributes are represented as

PA =

| | HA1 | HA2 | HA3 | HA4 | HA5 |
|---|---|---|---|---|---|
| HP1 | L | L | M | M | H |
| HP2 | H | H | H | H | VH |
| HP3 | H | H | H | H | H |
| HP4 | H | M | H | VH | M |
| HP5 | H | H | VH | VH | VH |

Hsum ( PA) =

| | HA1 | HA2 | HA3 | HA4 | HA5 |
|---|---|---|---|---|---|
| HP1 | 0.275 | 0.275 | 0.425 | 0.425 | 0.575 |
| HP2 | 0.575 | 0.575 | 0.575 | 0.575 | 0.8 |
| HP3 | 0.575 | 0.575 | 0.575 | 0.575 | 0.575 |
| HP4 | 0.575 | 0.425 | 0.575 | 0.8 | 0.425 |
| HP5 | 0.575 | 0.575 | 0.8 | 0.8 | 0.8 |

The connection matrix relating media and adolescent is represented as M as follows

SNP oPA = M=

| | | | | |
|---|---|---|---|---|
| 0.73 | 0.69 | 0.86 | 0.92 | 0.91 |
| 1.16 | 1.13 | 1.32 | 1.37 | 1.45 |
| 0.6 | 0.56 | 0.68 | 0.74 | 0.73 |
| 1.27 | 1.21 | 1.41 | 1.5 | 1.56 |
| 0.99 | 0.90 | 1.15 | 1.28 | 1.13 |

Step 1 Let C1 = (10000)

C1M = ( 0.73 0.69 0.86 0.92 0.91)

( 0.73 0.69 0.86 0.92 0.91)$M^T$ = ( 3.42 5.34 2.75 5.77 4.53) ≈ (1 1 1 1 1) = C1'

C1'M = (10000)M = ( 0.73 0.69 0.86 0.92 0.91)

( 0.73 0.69 0.86 0.92 0.91)$M^T$ = ( 3.42 5.34 2.75 5.77 4.53 ) ≈ (1 1 1 1 1) = C2

C1'M = (01000)M = (1.16 1.13 1.32 1.37 1.45 )

(1.16 1.13 1.32 1.37 1.45 )$M^T$ = ( 5.34 8.34 4.29 9.01 7.07) ≈ (1 1 1 1 1)

C1'M = (00100)M = (0.6 0.56 0.68 0.74 0.73)

(0.6 0.56 0.68 0.74 0.73) $M^T$ =( 2.75 4.29 2.21 4.64 3.65) ≈ (1 1 1 1 1)

C1'M = (00010)M = (1.27 1.21 1.41 1.5 1.56)

(1.27 1.21 1.41 1.5 1.56) $M^T$ = ( 5.7 9.01 4.64 9.74 7.65) ≈ (1 1 1 1 1)

C1'M= (00001)M = (0.99 0.9 1.15 1.28 1.13)

(0.99 0.9 1.15 1.28 1.13) $M^T$ = ( 4.53 7.07 3.65 7.65 6.02) ≈ (1 1 1 1 1)

C2M=(11111)M = (4.75 4.49 5.42 5.82 5.78)

(4.75 4.49 5.42 5.82 5.78) $M^T$ ≈ (1 1 1 1 1) = C2'

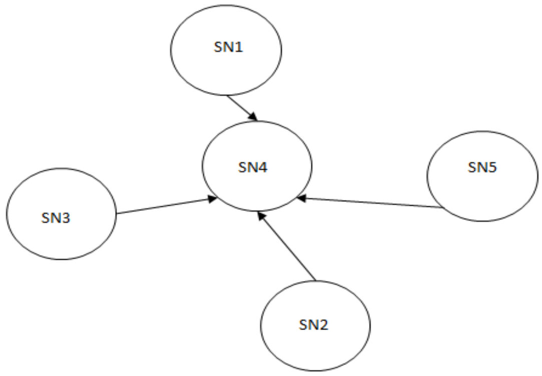
Proceeding in the similar manner we get C3 = (11111)

( 0.73 0.69 0.86 0.92 0.91) , (11111) is the fixed point.

By keeping other states in ON position we get the following results

| On position of Attribute | Triggering pattern |
|---|---|
| SN1 | SN1→ SN4 |
| SN2 | SN2→SN4 |
| SN3 | SN3→ SN4 |
| SN4 | SN4→ SN4 |
| SN5 | SN5→ SN4 |

The graphical representation of the attributes is as follows




The interrelationship between the attributes of the social networks reveals that HSN4 (enabling to live a virtual life by creating groups) is the terminal node. The limit point corresponding to HSN4(0.73 0.69 0.86 0.92 0.91) , (11111) highlights the attributes HSN1, HSN2, HSN3, HSN4, HSN5 and HA1, HA2, HA3, HA4,HA5 which together affects the adolescent's academic performance.

**Conclusion**

It is very vivid that the academic performance of the adolescent's is highly influenced by the social networks. To put it under control the parents must play an active role. We suggest the following remedial actions to be followed at homes which are as follows

- Spending time with them, sharing the day today happenings
- Explicating the limit and the need of SN
- Permitting them to play with their peer group
- Building up of friendly relationships

By practicing such things the adolescent will create a gap between them and SN.

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