An Approach for Area Estimation towards Conjunction Control of Internet Traffic Sharing by Using Simpson 1/3^{ed} Rule

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Abstract— **In present scenario of research, network congestion is one of the most interesting area. Congestion in internet is a long-standing problem and in modern days internet service providers use congestion control and congestion avoidance techniques to avoid congestion collapse. Internet congestion appears when a large volume of data is being routed on low bandwidth lines or across networks that have high latency and cannot handle large volumes. Due to such heavy load on network, disconnectivity appears and internet traffic share of operators fluctuate. Naldi (2002) explored a model based on Internet Traffic Share problem between comparative operators mode. The basic idea of Naldi (2002) was extended by Thakur and Shukla (2010) in which disconnectivity factor was introduced and mathematical relationship of traffic share and network blocking probability with special reference for disconnectivity factor was examined. This relationship originates probability based quadratic function which has a definite bounded area. This area contains many network parameters and to assess various properties of internet traffic it is necessary to estimate. The aim of this paper is to develop an appropriate approach for estimation of such kind of bounded area by using Simpson 1/3 rule usually applied in numerical quadrature. It is found that probability of disconnectivity (i.e. S_1 and S_2) is directly proportional to bounded area. This study is an attempt to establish the relationship among internet traffic share status and network disconnectivity parameters. Graphical study is also performed to support for numerical facts.**

Keywords— **Area Estimation, Simpson 1/3 Rule, Disconnectivity, Blocking Probability.**

I. INTRODUCTION

Now a day in the primary business model for the consumer, internet is a required tool for their communication. Today, much of their download information is stored on servers, and within ISP network infrastructure. This has successfully driven by widespread internet adoption and it makes profitable to the owners of service providers (ISP). Naldi(2002) initiated model based on internet traffic sharing which is restricted between two operators where as Thakur and Shukla(2010) reconstructed this model with a disconnectivity factor and derived the expressions of traffic sharing. These expressions are function of many network parameters ($L_1, L_2, S_1, S_2, p, P_A$).The graphical analysis of traffic sharing and network parameter (like blocking probability ,disconnectivity probability, probability of abandon, initial choice of users) are in complex form and generate a probability based area curve. This area generates numerous information about the traffic share phenomena and is necessary to be computed. This computed area indicate status of traffic sharing for conjunction controlling in case when disconnectivity is a factor for the measurement of internet traffic share. This paper presents an approach for estimating the bounded area of traffic share phenomena in competitive operators environment with the help of Simpson's 1/3 rule which is one of numerical analysis method.

II. LITERATURE SURVEY

Naldi (1999) proposed measurement based modelling of internet dial-up access connections with the help of Markov chain. Shukla, Gadewar and Pathak (2007) presented a stochastic model for space division switches for the judgement of packet movement in computer network. Dorea, Cruz and Rojas (2004) discussed on an approximation results for non-homogeneous Markov chains and develop some applications. Agarwal and Lakhwinder (2008) advocate reliability analysis of fault-tolerant multistage interconnection networks and discuss various aspects for it. Tiwari, Thakur and Shukla (2010) focused on cyber crime based analysis for multi-dimensional effect when two service providers are in comparative mode. Internet traffic sharing problem in a multi-operator environment case was examined by Naldi (2002) by using markov chain model. Medhi (1991) discussed fundamental concept of markov chain and gives some application for a random movement for different situation. Shukla and Thakur (2009) suggested a model based state probability analysis of users in case when two operators are in competitive situation. Shukla and Gadewar (2007) attempt for stochastic modeling for cell movement in a knockout switch in computer networks and consequently utilized by Shukla, Gadewar and Pathak (2007) for the modelling of space-division Switching in a new look. Shukla, Tiwari, Thakur and Tiwari (2009) explored rest state based analysis for internet traffic distribution in multi-operator environment situation. Shukla, Tiwari, Kareem and Thakur (2010) conducted a study for the effects of disconnectivity analysis for congestion control in internet traffic sharing in multi operator environment case while one more similar contribution is given by Thakur and Shukla (2010) for Iso-share analysis of internet traffic sharing in presence of favoured dis-connectivity and derived some new results. Shukla and Singhai (2011) have given a view point approach on analysis of user web behaviour behaviour with the help of markov chain model. Shukla,Gangele, Singhai and Verma(2011) have given a useful contribution for users web-browsing behaviour through elasticity analysis. Shukla, Gangele,Verma and Singh (2011) have described concept of elasticity and Indexing for usual Internet traffic share problem and find some new result. Shukla, Verma and Gangele (2012a,b,c) have given a mathematical approach for developing some properties of internet traffic sharing by using least square based curve fitting technique in different heterogeneous computer networks.Gangele, Verma and Shukla (2014a) have given a methodology for bounded area estimation of internet traffic sharing phenomena with the help of Trapezoidal method. Gangele and Shukla (2014b) develop a technique for area computation of internet traffic share problem with special reference to cyber crime environment. One more similar study is due to Gangele, Dongre (2014c,d) for area estimation in different internet traffic situation in comparative operators environment.

III. INTERNET TRAFFIC SHARE EXPRESSION FOR DISCONNECTIVITY ANALYSIS

Thakur and Shukla (2010) derived the following expression for traffic sharing

$$\bar{P}_1 = \frac{(1-L_1)\begin{bmatrix} p+(1-p)L_2(1-p_A)+(1-L_1) \\ S_1\{p+(1-p)L_2(1-p_A)\} \end{bmatrix}}{1-L_1L_2(1-p_A)^2} \quad ...(3.1)$$

If we plot the graph of above expression which is based on blocking probability (L_1 or L_2) and traffic sharing ($\bar{P}_1$) of first kind of operator O_1.It provides a bounded area A within curve between X and Y axes. If the bounded area A is high then different conclusions could be drawn. Now the problem is how to estimate this bounded area. In this paper, we have tried to estimate the bounded area A using Simsion 1/3[ed] method of numerical analysis.

IV. SIMPSION 1/3 METHOD

Let y = f(x) be a function to be integrated in the range a to b (a < b). Using functional relationship, we can write n different discrete values of x in range a - b, and can write different y using y=f (x) as below:

x: $x_0, x_1, x_2 ... x_n$

y: y_0, y_1,y_2...y_n ; (i=1,2,3...n) ;
Where a = $x_0 < x_1 < x_2 < x_3 \dots < x_n$ = b and differencing h=(x_{i+1} - x_i) is like equal interval.

$$I = \int_b^a f(x)dx = \int_b^a y\,dx = \frac{h}{3}\left[\begin{array}{l}(y_0+y_n)+\\ 4(y_1+y_3+\dots+y_{n-1})+\\ 2(y_2+y_4+\dots+y_{n-2})\end{array}\right] \quad \dots(4.1)$$

This is known as Simpson 1/3 ed rule of Integration used in numerical analysis.

V. UTILITY OF SIMPSION 1/3ed METHOD

We take the followings for (3.1), and consider $\bar{P}_1$ = f(L_j), j=1,2 and assume

X = Blocking probability of network (L_1) or (L_2)

Y = Traffic sharing is equal to $\bar{P}_1$

And want to evaluate the following integral (as proposed by Thakur and Shukla (2010)) in the limit 0 to l where l=0 and u=1 are the constraints:

$$I = \int_l^u f(L_1)dL_1 = \int_l^u \left[\frac{(1-L_1)\left[\begin{array}{l}p+(1-p)L_2(1-p_A)\\ +(1-L_1)S_1\left\{\begin{array}{l}p+(1-p)\\ L_2(1-p_A)\end{array}\right\}\end{array}\right]}{1-L_1L_2(1-p_A)^2}\right]dL_1 \quad \dots(5.1)$$

TABLE-1 [For Figure (1.1) Where (S_1=0.15 , p_A=0.35 , p=0.25 ,h=0.05)]

L_2	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
L_1	$\bar{P}_1$	$\bar{P}_1$	$\bar{P}_1$	$\bar{P}_1$	$\bar{P}_1$	$\bar{P}_1$	$\bar{P}_1$	$\bar{P}_1$	$\bar{P}_1$
0	0.3436	0.3996	0.4557	0.5118	0.4557	0.5678	0.6239	0.6799	0.736
0.05	0.3243	0.3774	0.4304	0.4835	0.4304	0.5366	0.5898	0.6429	0.6961
0.1	0.3053	0.3553	0.4054	0.4555	0.4054	0.5057	0.5559	0.6062	0.6565
0.15	0.2865	0.3335	0.3806	0.4277	0.3806	0.4749	0.5222	0.5696	0.6171
0.2	0.2679	0.3119	0.356	0.4002	0.356	0.4445	0.4889	0.5333	0.5779
0.25	0.2495	0.2906	0.3317	0.373	0.3317	0.4143	0.4557	0.4973	0.539
0.3	0.2314	0.2695	0.3077	0.346	0.3077	0.3844	0.4229	0.4616	0.5003
0.35	0.2134	0.2486	0.2838	0.3192	0.2838	0.3547	0.3904	0.4261	0.4620
0.4	0.1957	0.2279	0.2603	0.2928	0.2603	0.3254	0.3581	0.391	0.4240
0.45	0.1781	0.2075	0.237	0.2666	0.237	0.2963	0.3262	0.3561	0.3862
0.5	0.1608	0.1874	0.214	0.2407	0.214	0.2676	0.2945	0.3216	0.3489
0.55	0.1437	0.1674	0.1913	0.2152	0.1913	0.2392	0.2633	0.2875	0.3119
0.6	0.1269	0.1478	0.1688	0.1899	0.1688	0.2111	0.2324	0.2538	0.2753
0.65	0.1102	0.1284	0.1466	0.1649	0.1466	0.1833	0.2018	0.2204	0.2391
0.7	0.0938	0.1092	0.1247	0.1403	0.1247	0.1559	0.1717	0.1874	0.2033
0.75	0.0776	0.0904	0.1032	0.116	0.1032	0.1289	0.1419	0.1549	0.168
0.8	0.0616	0.0717	0.0819	0.0921	0.0819	0.1023	0.1126	0.1229	0.1333
0.85	0.0459	0.0534	0.0609	0.0685	0.0609	0.0761	0.0837	0.0914	0.099
0.9	0.0303	0.0353	0.0403	0.0453	0.0403	0.0503	0.0553	0.0603	0.0654
0.95	0.0151	0.0175	0.02	0.0224	0.02	0.0249	0.0274	0.0299	0.0324
AREA(A)=	**0.1637**	**0.1906**	**0.2176**	**0.2446**	**0.2717**	**0.2989**	**0.3262**	**0.3535**	**0.381**

In light of table 1 it is observe that the maximum value of bounded area is 0.381 at L_2=0.9 and for some constant value of network parameter S_1=0.15, p_A=0.35, p=0.25 and h=0.05,minimum value is 0.1637 at L_2=0.1.

TABLE-2 [For Figure (1.2) Where (S_1=0.35 , p=0.15 , L_2=0.2 ,h=0.05)]

p_A	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
L_1	$\bar{P}_1$	$\bar{P}_1$	$\bar{P}_1$	$\bar{P}_1$	$\bar{P}_1$	$\bar{P}_1$	$\bar{P}_1$	$\bar{P}_1$	$\bar{P}_1$
0	0.4091	0.3861	0.3632	0.3402	0.3173	0.2943	0.2714	0.2484	0.2255
0.05	0.3843	0.3626	0.3409	0.3193	0.2977	0.2761	0.2545	0.2329	0.2114
0.1	0.3600	0.3395	0.3191	0.2988	0.2785	0.2582	0.238	0.2178	0.1977
0.15	0.3361	0.3168	0.2977	0.2786	0.2596	0.2407	0.2218	0.203	0.1842
0.2	0.3125	0.2945	0.2767	0.2589	0.2412	0.2235	0.206	0.1885	0.171
0.25	0.2894	0.2727	0.256	0.2395	0.2231	0.2068	0.1905	0.1743	0.1581
0.3	0.2667	0.2512	0.2358	0.2206	0.2054	0.1903	0.1754	0.1604	0.1456
0.35	0.2444	0.2302	0.216	0.202	0.1881	0.1743	0.1606	0.1469	0.1333
0.4	0.2226	0.2096	0.1967	0.1839	0.1712	0.1586	0.1461	0.1337	0.1213
0.45	0.2013	0.1894	0.1777	0.1662	0.1547	0.1433	0.132	0.1208	0.1095
0.5	0.1803	0.1697	0.1593	0.1489	0.1386	0.1284	0.1182	0.1082	0.0981
0.55	0.1599	0.1505	0.1412	0.132	0.1229	0.1138	0.1048	0.0959	0.087
0.6	0.1400	0.1317	0.1236	0.1155	0.1076	0.0996	0.0918	0.084	0.0762
0.65	0.1206	0.1135	0.1065	0.0995	0.0927	0.0858	0.0791	0.0723	0.0656
0.7	0.1017	0.0957	0.0898	0.084	0.0782	0.0724	0.0667	0.0610	0.0554
0.75	0.0833	0.0784	0.0736	0.0688	0.0641	0.0594	0.0547	0.0500	0.0454
0.8	0.0655	0.0617	0.0579	0.0541	0.0504	0.0467	0.0431	0.0394	0.0357
0.85	0.0482	0.0454	0.0427	0.0399	0.0372	0.0345	0.0318	0.0291	0.0264
0.9	0.0315	0.0297	0.0279	0.0261	0.0244	0.0226	0.0208	0.0190	0.0173
0.95	0.0155	0.0146	0.0137	0.0128	0.012	0.0111	0.0102	0.0094	0.0085
AREA(A)=	**0.1876**	**0.1768**	**0.166**	**0.1553**	**0.1447**	**0.1341**	**0.1235**	**0.113**	**0.1026**

It is seen from table 2 that lowest value is 0.1026 at p_A = 0.9 for fixed value of S_1=0.35, p=0.15, L_2=0.2 and highest value is 0.1876 at p_A = 0.1 with some little increment of p_A by 0.1.

TABLE-3 [For Figure (1.3) Where (L_2=0.15 , p_A=0.25 , p=0.35 ,h=0.05)]

S_1	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
L_1	$\bar{P}_1$	$\bar{P}_1$	$\bar{P}_1$	$\bar{P}_1$	$\bar{P}_1$	$\bar{P}_1$	$\bar{P}_1$	$\bar{P}_1$	$\bar{P}_1$
0	0.4654	0.5078	0.5501	0.5924	0.6347	0.677	0.7193	0.7616	0.8039
0.05	0.4403	0.4787	0.517	0.5554	0.5937	0.6321	0.6704	0.7088	0.7471
0.1	0.4154	0.4499	0.4845	0.5191	0.5536	0.5882	0.6228	0.6573	0.6919

0.15	0.3906	0.4216	0.4525	0.4835	0.5145	0.5454	0.5764	0.6074	0.6383
0.2	0.366	0.3936	0.4211	0.4487	0.4762	0.5038	0.5313	0.5589	0.5864
0.25	0.3417	0.366	0.3903	0.4146	0.4389	0.4632	0.4875	0.5119	0.5362
0.3	0.3175	0.3387	0.36	0.3813	0.4025	0.4238	0.4451	0.4664	0.4876
0.35	0.2935	0.3119	0.3303	0.3487	0.3671	0.3856	0.404	0.4224	0.4408
0.4	0.2696	0.2854	0.3012	0.3169	0.3327	0.3485	0.3642	0.38	0.3958
0.45	0.246	0.2593	0.2726	0.2859	0.2992	0.3125	0.3259	0.3392	0.3525
0.5	0.2226	0.2337	0.2447	0.2557	0.2668	0.2778	0.2889	0.2999	0.311
0.55	0.1994	0.2084	0.2174	0.2263	0.2353	0.2443	0.2533	0.2623	0.2713
0.6	0.1764	0.1835	0.1906	0.1978	0.2049	0.212	0.2192	0.2263	0.2334
0.65	0.1536	0.1591	0.1645	0.17	0.1755	0.181	0.1865	0.192	0.1975
0.7	0.131	0.135	0.1391	0.1431	0.1472	0.1512	0.1553	0.1593	0.1634
0.75	0.1086	0.1114	0.1143	0.1171	0.1199	0.1227	0.1255	0.1284	0.1312
0.8	0.0864	0.0883	0.0901	0.0919	0.0937	0.0955	0.0973	0.0991	0.101
0.85	0.0645	0.0655	0.0665	0.0676	0.0686	0.0696	0.0706	0.0717	0.0727
0.9	0.0428	0.0432	0.0437	0.0441	0.0446	0.0451	0.0455	0.046	0.0464
0.95	0.0213	0.0214	0.0215	0.0216	0.0217	0.0218	0.022	0.0221	0.0222
AREA(A)=	**0.2249**	**0.2393**	**0.2537**	**0.2681**	**0.2825**	**0.2969**	**0.3113**	**0.3258**	**0.3402**

It is observe from table 3 with some little increment of disconnectivity probability s_1 by 0.1 highest value of estimated bounded area at S_1=0.9 is 0.3402 for L_2=0.15, p_A=0.25, p=0.35 and h=0.05 and it is also seen that minimum value of area is 0.2249 subject to the condition for pre fixed input parameters.

TABLE-4 [For Figure (1.4) Where (S_1=0.15, L_2=0.3 ,p_A=0.2 ,h=0.05)]

P	**0.1**	**0.2**	**0.3**	**0.4**	**0.5**	**0.6**	**0.7**	**0.8**	**0.9**
L_1	$\bar{P}_1$	$\bar{P}_1$	$\bar{P}_1$	$\bar{P}_1$	$\bar{P}_1$	$\bar{P}_1$	$\bar{P}_1$	$\bar{P}_1$	$\bar{P}_1$
0	0.3634	0.4508	0.5382	0.6256	0.713	0.8004	0.8878	0.9752	0.9826
0.05	0.3434	0.426	0.5086	0.5912	0.6737	0.7563	0.8389	0.9215	0.9341
0.1	0.3235	0.4014	0.4792	0.557	0.6348	0.7126	0.7904	0.8682	0.9461
0.15	0.3039	0.3769	0.45	0.5231	0.5962	0.6693	0.7423	0.8154	0.8885
0.2	0.2843	0.3527	0.4211	0.4895	0.5579	0.6263	0.6947	0.7631	0.8314
0.25	0.265	0.3287	0.3925	0.4562	0.52	0.5837	0.6474	0.7112	0.7749
0.3	0.2458	0.305	0.3641	0.4232	0.4824	0.5415	0.6006	0.6597	0.7189
0.35	0.2269	0.2814	0.336	0.3906	0.4451	0.4997	0.5543	0.6088	0.6634
0.4	0.2081	0.2581	0.3082	0.3582	0.4083	0.4583	0.5084	0.5584	0.6084
0.45	0.1895	0.2351	0.2806	0.3262	0.3718	0.4174	0.4629	0.5085	0.5541
0.5	0.1711	0.2123	0.2534	0.2946	0.3357	0.3769	0.418	0.4592	0.5003
0.55	0.1529	0.1897	0.2265	0.2633	0.3001	0.3368	0.3736	0.4104	0.4472
0.6	0.135	0.1674	0.1999	0.2324	0.2648	0.2973	0.3297	0.3622	0.3947
0.65	0.1172	0.1454	0.1736	0.2018	0.23	0.2582	0.2864	0.3146	0.3428

0.7	0.0997	0.1237	0.1477	0.1717	0.1957	0.2197	0.2436	0.2676	0.2916
0.75	0.0825	0.1023	0.1221	0.142	0.1618	0.1816	0.2015	0.2213	0.2411
0.8	0.0654	0.0812	0.0969	0.1127	0.1284	0.1441	0.1599	0.1756	0.1914
0.85	0.0487	0.0604	0.0721	0.0838	0.0955	0.1072	0.1189	0.1306	0.1423
0.9	0.0322	0.0399	0.0476	0.0554	0.0631	0.0709	0.0786	0.0863	0.0941
0.95	0.0159	0.0198	0.0236	0.0274	0.0313	0.0351	0.039	0.0428	0.0466
AREA(A)=	**0.1738**	**0.2156**	**0.2574**	**0.2992**	**0.3411**	**0.3829**	**0.4247**	**0.4665**	**0.5083**

The table no. 4 shows that for increasing value of p area (A) increases subject to the condition when S_1=0.15, L_2=0.3,p_A=0.2 and h=0.05 ,highest value of area is 0.5083 for p= 0.9 and lowest value is 0.1738 for p=0.1 for same prefixed network parameter.

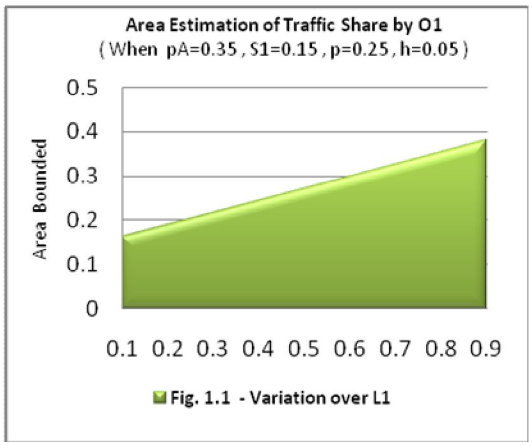


Figure 1.1 supports the fact that is observed in table 1 for the variation of different network parameter to estimate bounded area (A).

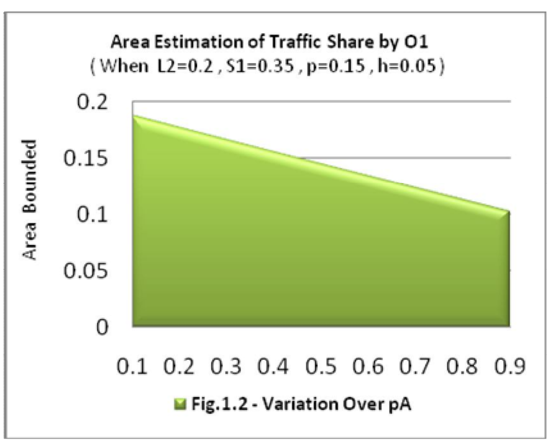
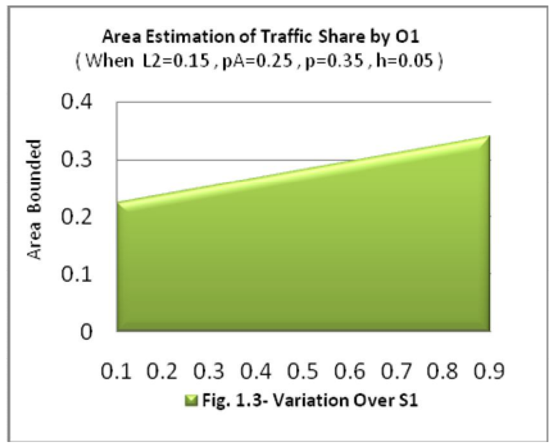


Figure 1.2 support the facts of table 2 that is for increasing p_A bounded area reduces for some fixed network parameter .



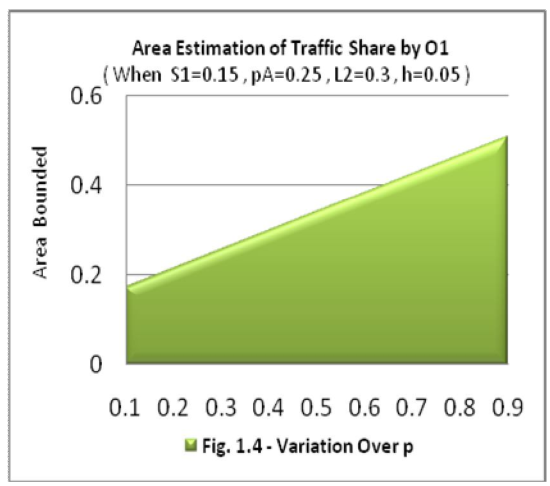


Figure 1.3, 1.4 support the facts of table 3 & 4 respectively for the variation of different parameter in case of operator O_1.

Let us consider one more form of integration as below

$$I=\int_l^u f(L_2)dL_2=\int_l^u\left[\frac{(1-L_2)\left[\begin{array}{l}\{(1-p)+pL_1(1-p_A)\}+\\(1-L_2)S_2\left\{\begin{array}{l}(1-p)\\+pL_1(1-p_A)\end{array}\right\}\end{array}\right]}{1-L_1L_2(1-p_A)^2}\right]dL_2 \quad ...(5.2)$$

TABLE-5 [For Figure (1.5) Where (S_2=0.2, p=0.35 ,p_A=0.25 ,h=0.05)]

L_1	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
L_2	$\overline{P}_2$	$\overline{P}_2$	$\overline{P}_2$	$\overline{P}_2$	$\overline{P}_2$	$\overline{P}_2$	$\overline{P}_2$	$\overline{P}_2$	$\overline{P}_2$
0	0.6938	0.7208	0.7477	0.7746	0.8016	0.8285	0.8554	0.8824	0.9093
0.05	0.6584	0.684	0.7096	0.7352	0.7608	0.7864	0.812	0.8376	0.8633
0.1	0.6229	0.6472	0.6715	0.6958	0.7201	0.7443	0.7687	0.793	0.8173
0.15	0.5876	0.6105	0.6335	0.6564	0.6794	0.7024	0.7253	0.7483	0.7713
0.2	0.5524	0.574	0.5955	0.6172	0.6388	0.6604	0.6821	0.7037	0.7254
0.25	0.5172	0.5374	0.5577	0.578	0.5982	0.6185	0.6388	0.6592	0.6795
0.3	0.4821	0.501	0.5199	0.5388	0.5577	0.5767	0.5957	0.6147	0.6337
0.35	0.4471	0.4647	0.4822	0.4998	0.5173	0.5349	0.5526	0.5702	0.5879
0.4	0.4122	0.4284	0.4446	0.4608	0.477	0.4932	0.5095	0.5258	0.5422
0.45	0.3774	0.3922	0.407	0.4219	0.4367	0.4516	0.4665	0.4815	0.4965
0.5	0.3426	0.3561	0.3695	0.383	0.3965	0.4101	0.4236	0.4372	0.4508
0.55	0.308	0.3201	0.3322	0.3443	0.3564	0.3686	0.3808	0.393	0.4053
0.6	0.2734	0.2841	0.2949	0.3056	0.3164	0.3272	0.338	0.3489	0.3598
0.65	0.2389	0.2483	0.2577	0.2671	0.2765	0.2859	0.2954	0.3049	0.3144
0.7	0.2045	0.2125	0.2206	0.2286	0.2367	0.2447	0.2528	0.2609	0.2691
0.75	0.1702	0.1769	0.1835	0.1902	0.1969	0.2036	0.2104	0.2171	0.2239
0.8	0.136	0.1413	0.1466	0.152	0.1573	0.1627	0.168	0.1734	0.1788
0.85	0.1019	0.1058	0.1098	0.1138	0.1178	0.1218	0.1258	0.1298	0.1338
0.9	0.0678	0.0705	0.0731	0.0757	0.0784	0.0811	0.0837	0.0864	0.089
0.95	0.0339	0.0352	0.0365	0.0378	0.0391	0.0405	0.0418	0.0431	0.0444
AREA(A)=	**0.3424**	**0.3558**	**0.3692**	**0.3826**	**0.396**	**0.4094**	**0.4229**	**0.4363**	**0.4498**

The data in the following table no. 5 depicts that for fixed increasing value of L_1 bounded area increases. Maximum area value 0.4498 at L_1 =0.9 and for constant parameter S_2=0.2, p=0.35,p_A=0.25 and equal interval of h=0.05 whereas minimum value is 0.3424 at L_1 =0.1 .

TABLE-6 [For Figure (1.6) Where (L_1=0.15, p=0.4 ,p_A=0.15 ,h=0.05)]

S_2	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
L_2	$\overline{P}_2$	$\overline{P}_2$	$\overline{P}_2$	$\overline{P}_2$	$\overline{P}_2$	$\overline{P}_2$	$\overline{P}_2$	$\overline{P}_2$	$\overline{P}_2$
0	0.6549	0.6666	0.6862	0.7135	0.7487	0.7916	0.8424	0.901	0.9674
0.05	0.622	0.6326	0.6503	0.6752	0.7071	0.746	0.7921	0.8453	0.9055
0.1	0.5891	0.5987	0.6147	0.6371	0.6659	0.701	0.7426	0.7906	0.845
0.15	0.5562	0.5648	0.5792	0.5992	0.6251	0.6566	0.6939	0.7369	0.7857
0.2	0.5234	0.531	0.5438	0.5617	0.5847	0.6128	0.646	0.6843	0.7278
0.25	0.4905	0.4973	0.5086	0.5244	0.5447	0.5695	0.5989	0.6328	0.6712
0.3	0.4577	0.4636	0.4735	0.4874	0.5052	0.5269	0.5526	0.5823	0.6159
0.35	0.4249	0.43	0.4386	0.4506	0.466	0.4849	0.5072	0.5329	0.5621
0.4	0.3921	0.3965	0.4038	0.4141	0.4273	0.4435	0.4626	0.4847	0.5097
0.45	0.3593	0.363	0.3692	0.3779	0.3891	0.4028	0.4189	0.4375	0.4587
0.5	0.3265	0.3296	0.3348	0.342	0.3513	0.3627	0.3761	0.3916	0.4091
0.55	0.2938	0.2963	0.3005	0.3064	0.314	0.3232	0.3342	0.3468	0.3611
0.6	0.2611	0.2631	0.2664	0.2711	0.2771	0.2845	0.2932	0.3032	0.3145
0.65	0.2284	0.2299	0.2325	0.2361	0.2407	0.2464	0.2531	0.2608	0.2695
0.7	0.1957	0.1968	0.1987	0.2014	0.2048	0.209	0.2139	0.2196	0.2261
0.75	0.163	0.1638	0.1651	0.167	0.1694	0.1723	0.1758	0.1798	0.1843
0.8	0.1304	0.1309	0.1317	0.1329	0.1345	0.1364	0.1386	0.1411	0.1441
0.85	0.0977	0.098	0.0985	0.0992	0.1001	0.1011	0.1024	0.1038	0.1055
0.9	0.0651	0.0653	0.0655	0.0658	0.0662	0.0667	0.0672	0.0679	0.0686
0.95	0.0326	0.0326	0.0326	0.0327	0.0328	0.0329	0.0331	0.0332	0.0334
AREA(A)=	**0.3252**	**0.3292**	**0.3359**	**0.3453**	**0.3573**	**0.3721**	**0.3895**	**0.4095**	**0.4323**

The generated data in table no. 6 shows that for constant value of network parameter L_1=0.15, p=0.4, p_A=0.15 for operator O_1 maximum value of bounded area is 0.4323 at S_2=0.9 and minimum value is 0.3252 for S_2=0.1 and it shows increasing pattern as S_2 increases constantly by 0.1 and h=.05.

TABLE-7 [For Figure (1.7) Where (S_2=0.3, p_A=0.3 ,L_1=0.1 ,h=0.05)]									
p	**0.1**	**0.2**	**0.3**	**0.4**	**0.5**	**0.6**	**0.7**	**0.8**	**0.9**
L_2	$\overline{P}_2$	$\overline{P}_2$	$\overline{P}_2$	$\overline{P}_2$	$\overline{P}_2$	$\overline{P}_2$	$\overline{P}_2$	$\overline{P}_2$	$\overline{P}_2$
0	0.9805	0.8726	0.7664	0.6619	0.5591	0.4579	0.3584	0.2606	0.1645
0.05	0.9281	0.8263	0.726	0.6273	0.53	0.4343	0.3401	0.2474	0.1562
0.1	0.8761	0.7803	0.6859	0.5928	0.5011	0.4108	0.3218	0.2342	0.1479
0.15	0.8244	0.7346	0.6459	0.5585	0.4723	0.3873	0.3035	0.221	0.1396
0.2	0.7731	0.6891	0.6062	0.5243	0.4436	0.3639	0.2853	0.2078	0.1313
0.25	0.7221	0.6439	0.5666	0.4903	0.415	0.3406	0.2671	0.1946	0.1231
0.3	0.6714	0.5989	0.5273	0.4565	0.3865	0.3173	0.249	0.1815	0.1148
0.35	0.6211	0.5543	0.4882	0.4228	0.3581	0.2941	0.2309	0.1684	0.1066
0.4	0.5712	0.5099	0.4493	0.3893	0.3298	0.271	0.2129	0.1553	0.0983
0.45	0.5216	0.4658	0.4106	0.3559	0.3017	0.248	0.1949	0.1422	0.0901
0.5	0.4723	0.422	0.3721	0.3227	0.2737	0.2251	0.1769	0.1292	0.0819
0.55	0.4234	0.3785	0.3339	0.2897	0.2458	0.2022	0.159	0.1162	0.0737
0.6	0.3749	0.3353	0.2959	0.2568	0.218	0.1794	0.1412	0.1032	0.0654
0.65	0.3267	0.2923	0.2581	0.2241	0.1903	0.1567	0.1233	0.0902	0.0572
0.7	0.2789	0.2497	0.2205	0.1916	0.1627	0.1341	0.1056	0.0772	0.049
0.75	0.2315	0.2073	0.1832	0.1592	0.1353	0.1115	0.0879	0.0643	0.0408
0.8	0.1845	0.1652	0.1461	0.127	0.108	0.0891	0.0702	0.0514	0.0327
0.85	0.1378	0.1235	0.1092	0.095	0.0808	0.0667	0.0526	0.0385	0.0245
0.9	0.0915	0.082	0.0726	0.0632	0.0538	0.0444	0.035	0.0256	0.0163
0.95	0.0455	0.0409	0.0362	0.0315	0.0268	0.0221	0.0175	0.0128	0.0082
AREA(A)=	**0.4760**	**0.4247**	**0.3740**	**0.3239**	**0.2743**	**0.2253**	**0.1768**	**0.1289**	**0.0816**

Tables 7 shows decreasing pattern in area when we constantly increase p for equal interval 0.1 .Highest value is 0.4760 at p=0.1 for fixed parameter S_2=0.3, p_A=0.3, L_1=0.1 and lowest value is 0 .0816 for p=0.9.

TABLE-8 [For Figure (1.8) Where (S_2=0.35, p=0.15 ,L_1=0.15 ,h=0.05)]									
p_A	**0.1**	**0.2**	**0.3**	**0.4**	**0.5**	**0.6**	**0.7**	**0.8**	**0.9**
L_2	$\overline{P}_2$	$\overline{P}_2$	$\overline{P}_2$	$\overline{P}_2$	$\overline{P}_2$	$\overline{P}_2$	$\overline{P}_2$	$\overline{P}_2$	$\overline{P}_2$
0	0.9609	0.9584	0.9559	0.9534	0.9509	0.9484	0.946	0.9435	0.941
0.05	0.909	0.9066	0.9041	0.9017	0.8993	0.8969	0.8945	0.8921	0.8897
0.1	0.8575	0.8551	0.8527	0.8504	0.848	0.8457	0.8434	0.8412	0.8389
0.15	0.8064	0.8041	0.8017	0.7995	0.7972	0.795	0.7928	0.7907	0.7885
0.2	0.7556	0.7534	0.7512	0.749	0.7468	0.7447	0.7426	0.7406	0.7386
0.25	0.7053	0.7031	0.701	0.6989	0.6969	0.6949	0.6929	0.691	0.6891
0.3	0.6553	0.6532	0.6512	0.6492	0.6473	0.6454	0.6436	0.6418	0.6401
0.35	0.6056	0.6037	0.6018	0.6000	0.5982	0.5965	0.5948	0.5931	0.5915
0.4	0.5564	0.5546	0.5529	0.5512	0.5495	0.5479	0.5463	0.5448	0.5433
0.45	0.5076	0.506	0.5044	0.5028	0.5013	0.4998	0.4984	0.497	0.4956
0.5	0.4592	0.4577	0.4563	0.4549	0.4535	0.4521	0.4508	0.4496	0.4483
0.55	0.4113	0.4099	0.4086	0.4073	0.4061	0.4049	0.4037	0.4026	0.4015
0.6	0.3637	0.3625	0.3614	0.3603	0.3592	0.3581	0.3571	0.3561	0.3551
0.65	0.3166	0.3156	0.3146	0.3136	0.3127	0.3118	0.3109	0.31	0.3092
0.7	0.27	0.2691	0.2683	0.2675	0.2667	0.2659	0.2651	0.2644	0.2637
0.75	0.2238	0.2231	0.2224	0.2217	0.2211	0.2204	0.2198	0.2192	0.2186
0.8	0.1781	0.1775	0.177	0.1765	0.1759	0.1754	0.175	0.1745	0.174
0.85	0.1328	0.1324	0.132	0.1316	0.1313	0.1309	0.1305	0.1302	0.1298
0.9	0.088	0.0878	0.0875	0.0873	0.0871	0.0868	0.0866	0.0863	0.0861
0.95	0.0438	0.0436	0.0435	0.0434	0.0433	0.0432	0.0431	0.0429	0.0428
AREA(A)=	**0.4641**	**0.4627**	**0.4613**	**0.4600**	**0.4586**	**0.4573**	**0.4561**	**0.4548**	**0.4536**

It is observe from table 8 that for constant values of parameter S_2=0.35, p=0.15 ,L_1=0.15 for operator O_2 highest value is 0.4641 at p_A=0.1 and lowest value is 0.4536 at p_A= 0.9 and for some constant increment of p_A by 0.1 bounded area decreases.

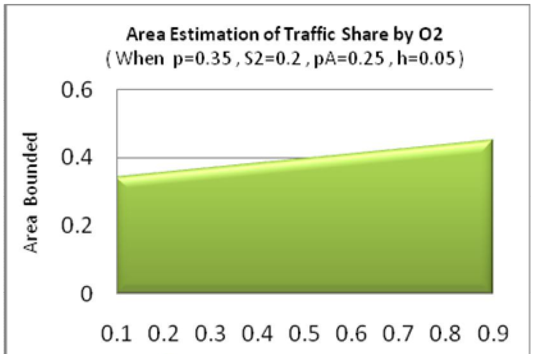


Fig. 1.5-Variation Over L2

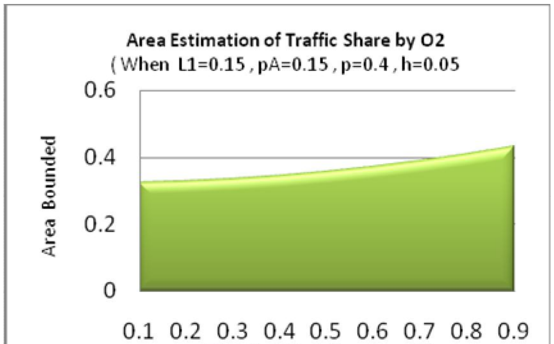


Fig.1.6-Variation Over S2

Fig. 1.5 indicates that for increasing value of L_2 bounded area increases subject to the condition for prefixed input parameter. It also supports to table no 5.

Figure 1.6 supports the facts for table 6 and it also dipcts that for constant value of P_A,p,L_1 bounded area increase for the littel increament of S_2 by 0.1.

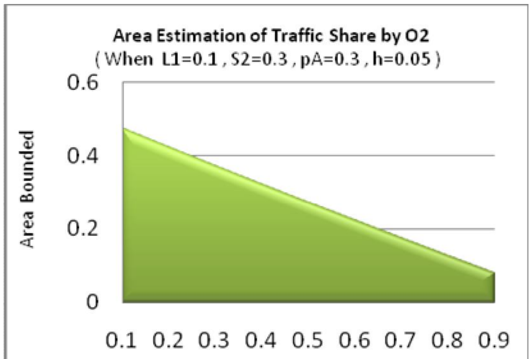


Fig.1.7-Variation Over p

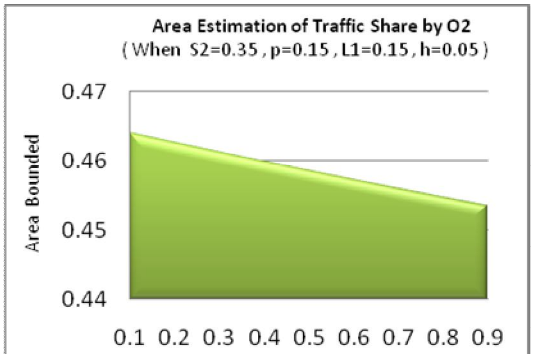


Fig.1.8-Variation Over pA

Figure 1.7 and 1.8 shows that bounded area reduce for some fixed network parameter it is also supported by table 7, 8 respectively.

VI. CONCLUSION

This is an attempt to study mathematical relationship of traffic share and network blocking probability to deal with the problem of internet congestion more precisely. Study and analysis of estimated bounded area and its network parameters using Simpson's 1/3 rule of numerical analysis; unlock a wider approach towards the problem of network congestion and internet traffic sharing. Further, this will prove to be quite accommodating to the internet service providers to use it as a tool in combination with congestion avoidance techniques for better congestion control. It is also evident from the study that the probability of dis-connectivity (S_1 and S_2) and bounded area are directly related.

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