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Probability Density Estimation Function of Browser Share Curve for Users Web Browsing Behaviour

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Abstract:- In present scenario many browsers are available for internet surfing but only a few are liked and utilized for a variety of purposes. The primary purpose of a web browser is to bring information resources to the users, allowing them to view and provide access to other information. The problem of browser sharing between two browsers was suggested by Shukla and Singhai (2011) and they have developed mathematical relationship between browser shares and browse failure probability. This relationship generates probability based quadratic function which has a definite bounded area. This area is a function of many parameters and is required to be estimated. But, by direct integration methods, it is cumbersome to solve. An attempt has been made to analyze an approximate methodology to estimate the bounded area using Trapezoidal method of numerical analysis. It is found that bounded area is directly proportional to users' choice and browser failure phenomena. It provides insights and explains the relationship among browser share and users web browsing behaviour phenomena.

Keywords:- *Area estimation (AE), Trapezoidal rule (TR), Browser failure probability (BFP), web browser (WB).*

I. INTRODUCTION

Majority of web browsers allow the users to open multiple information resources at the same time, either in different browser windows or in different tabs of the same window. Every browser bears a failure rate related to connectivity. It is termed as browser failure and has some probability of occurrence every moment. This browser failure occurs because of command execution pattern, internal coding structure of browser and speed of search engine etc. An application of Makov Chain Model has been proposed by Naldi (2002). He suggested traffic share management between two operators in a new look whereas Shukla and Singhai (2011) derived browser share expression in case when two browsers are installed in computer system. These expressions are functions of many other input parameters like browser failure probability, quality of services, quitting probability etc. The mathematical relationship between browser share and browser failure probability is a complex relationship and generates a curve. Therefore, it is necessary to estimate the area bounded by these curves at x-axis. If the area is high, browser can have more browser share. The estimated bounded area provides primary information for the decision about the browser share status. This paper proposed an approximate methodology for area estimation of browser share with the help of Trapezoidal rule used in numerical analysis.

II. LITERATURE SURVEY

Now a days many software developer and researcher use stochastic modeling for the purpose of realistic situation. A new look of traffic share problem was given by Naldi (2002).Agrawal (2009) presented a system level modeling on chip for the purpose of networking. Babikar and Nor(2009) proposed a flow based internet traffic classification for the cause of bandwidth optimization problem. Agrawal and Kaur(2008) advocate reliability analysis for fault tolerance in multistage interconnection network. Newby and Dag (2002) suggested average cost criteria for optical inspection and maintenance for stochastically deteriorating systems. Deshpande and Karypis (2004) examine web page access prediction by using markov chain modeling and find ACM transaction on internet technology. Medhi (1991) focus on a detail description of stochastic models in field of queuing theory. Catledge and Pitko (1995) presented new strategies of browser in the World-Wide Web for computer networks and ISDN Systems. Perzen(1992) given a fundamental concept of stochastic process and explain various examples of markov chain model. Yeian and Lygeres (2005) conducted a study on Stabilization of a class of stochastic differential equations by using markovian switching, System and Control Letters and develop some new expression. Shukla,Gangele,Singhai and Verma (2011a) presented a web browser behavior of user through elasticity analysis. Shukla *et al.*(2011b) derived browser sharing problem in case when two browser installed in a computer system. Shukla *et al.*(2011c) proposed a location based internet traffic share phenomena in two market environment. Shukla *et al.*(2011d) advocate the problem of internet traffic share by using elasticity and index based technique. Shukla, Gangele,Verma and Thakur (2011e) suggested indexed based concept for the purpose of cyber criminals behaviors for traffic share problem. Shukla, Thakur and Deshmukh (2009a) focus on traffic share problem by introducing rest state and calculate traffic management between two operator environments. Shukla *et al.* (2009b) gives a useful contribution on traffic share in multidimensional effect in multi operator environment and develops traffic share loss expression. A comparative study of traffic share problem was given by Shukla *et al.* (2009c) for comparison of different methods in computer networking. Least square based curve fitting application was introduced by Shukla, Verma and Gangele (2012a,b,c) and proposed different aspect of traffic in two operator environment. Area estimation of traffic share problem was suggested by Gangele, Verma and Shukla (2014) through trapezoidal rule used in numerical analysis.

III. BROWSER SHARE EXPRESSION:

Shukla and Singhai (2011) discussed the following expression for browser share

$$\overline{B}_1 = (1-b_1)(1-P_C)\left[\frac{P+(1-P)(1-P_q)b_2}{1-b_1b_2(1-P_q)^2}\right] \quad ...(3.1)$$

The graph of above expression is based on browser failure probability ($b_1$or b_2) and browser sharing ($\overline{B}_1$) of browser B_1. It provides a bounded area A within curve between X and Y axes. If the bounded area A is high then various conclusions could be drawn. Now the problem is how to estimate this bounded area. An attempt has been made to estimate the bounded area A using trapezoidal method of numerical analysis.

IV. TRAPEZOIDAL METHOD:

Suppose 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: $x_0, x_1, x_2 \ldots x_n$

y: $y_0, y_1, y_2 \ldots y_n$, ; (i=1,2,3,…n) ;

Where $a = x_0 < x_1 < x_2 < x_3 \ldots < x_n = b$ and differencing $h = (x_{i+1} - x_i)$ is like equal interval.

$$I = \int_a^b f(x)dx = \int_a^b ydx = \frac{h}{2}\left[(y_0+y_n)+2(y_1+y_2+y_3+.......+y_{n-1})\right] \quad ..(4.1)$$

Which is known as Trapezoidal rule of Integration used in numerical analysis.

V. APPLICATION OF TRAPEZOIDAL METHOD

We take the followings for (3.1), and consider $\overline{B}_1$ = f (b_j), j=1,2 and assume

X = Browser failure probability (b_1) or (b_2)

Y = Browser sharing is equal to $\overline{B}_1$ and wants to evaluate the following integral (as defined due to Shukla and Singhai (2011)) in the limit l to u where l=0 and u=1 are the constraints:

$$I = \int_l^u f(b_1)db_1$$

$$= \int_l^u \left[(1-b_1)(1-P_C)\left\{\frac{P+(1-P)(1-P_q)b_2}{1-b_1b_2(1-P_q)^2}\right\}\right]db_1 \quad ...(5.1)$$

TABLE 1-[For Figure (1) Where (p =0.15, p_q = 0.25, p_c = 0.35, h=0.05)]

b_2	**0.1**	**0.2**	**0.3**	**0.4**	**0.5**	**0.6**	**0.7**	**0.8**	**0.9**
b_1	$\overline{B}_1$	$\overline{B}_1$	$\overline{B}_1$	$\overline{B}_1$	$\overline{B}_1$	$\overline{B}_1$	$\overline{B}_1$	$\overline{B}_1$	$\overline{B}_1$
0	0.1389	0.1804	0.2218	0.2633	0.3047	0.3461	0.3876	0.429	0.4704
0.05	0.1324	0.1723	0.2125	0.2529	0.2936	0.3345	0.3756	0.4169	0.4585
0.1	0.1258	0.1642	0.2031	0.2424	0.2822	0.3224	0.3631	0.4043	0.4460
0.15	0.1191	0.156	0.1934	0.2316	0.2704	0.3099	0.3501	0.3910	0.4327
0.2	0.1124	0.1476	0.1836	0.2205	0.2583	0.2969	0.3366	0.3771	0.4187
0.25	0.1057	0.1392	0.1737	0.2092	0.2458	0.2835	0.3224	0.3625	0.4040

0.3	0.0989	0.1307	0.1635	0.1976	0.2329	0.2696	0.3076	0.3472	0.3883
0.35	0.0921	0.122	0.1532	0.1857	0.2197	0.2551	0.2922	0.331	0.3716
0.4	0.0853	0.1133	0.1427	0.1736	0.206	0.2401	0.276	0.3139	0.3539
0.45	0.0784	0.1045	0.1320	0.1611	0.1919	0.2245	0.2591	0.2959	0.3351
0.5	0.0715	0.0956	0.1211	0.1483	0.1773	0.2082	0.2413	0.2768	0.3149
0.55	0.0645	0.0865	0.1100	0.1352	0.1622	0.1913	0.2226	0.2565	0.2934
0.6	0.0575	0.0774	0.0987	0.1217	0.1466	0.1736	0.203	0.2351	0.2703
0.65	0.0505	0.0681	0.0872	0.1079	0.1305	0.1552	0.1823	0.2122	0.2454
0.7	0.0434	0.0587	0.0755	0.0937	0.1138	0.136	0.1605	0.1879	0.2186
0.75	0.0363	0.0492	0.0635	0.0792	0.0965	0.1159	0.1375	0.1619	0.1896
0.8	0.0291	0.0396	0.0513	0.0642	0.0786	0.0948	0.1132	0.1341	0.1581
0.85	0.0219	0.0299	0.0388	0.0488	0.0601	0.0728	0.0874	0.1042	0.1239
0.9	0.0146	0.0201	0.0262	0.0330	0.0408	0.0497	0.0600	0.0721	0.0864
0.95	0.0073	0.0101	0.0132	0.0167	0.0208	0.0255	0.0310	0.0375	0.0453
AREA(A)=	**0.0706**	**0.0935**	**0.1173**	**0.1423**	**0.1684**	**0.1959**	**0.2250**	**0.2557**	**0.2884**

The generated data in above table for equal interval of b_1 (here bounded area is defined by (A)): In view of table 1 it is observe that at the fixed value of p =0.15 area (A) increase subject to the condition if we fixed $p_q = 0.25$, $p_c = 0.35$ and b_2 increase with 0.1 interval .The minimum value of estimated area is 0.070 at b_2 =0.1.

TABLE 2-[For Figure (2) Where (p_q =0.35, b_2= 0.25, p_c = 0.45, h=0.05)]

P	**0.1**	**0.2**	**0.3**	**0.4**	**0.5**	**0.6**	**0.7**	**0.8**	**0.9**
b_1	$\overline{B}_1$	$\overline{B}_1$	$\overline{B}_1$	$\overline{B}_1$	$\overline{B}_1$	$\overline{B}_1$	$\overline{B}_1$	$\overline{B}_1$	$\overline{B}_1$
0	0.1354	0.1815	0.2276	0.2736	0.3197	0.3658	0.4118	0.4579	0.5039
0.05	0.1293	0.1733	0.2173	0.2613	0.3053	0.3493	0.3933	0.4373	0.4813
0.1	0.1232	0.1650	0.2070	0.2489	0.2908	0.3327	0.3746	0.4165	0.4584
0.15	0.117	0.1567	0.1965	0.2363	0.2761	0.3159	0.3557	0.3955	0.4352
0.2	0.1107	0.1483	0.1860	0.2236	0.2613	0.2989	0.3366	0.3742	0.4119
0.25	0.1043	0.1398	0.1753	0.2108	0.2463	0.2818	0.3172	0.3527	0.3882
0.3	0.0979	0.1312	0.1645	0.1978	0.2311	0.2644	0.2977	0.3310	0.3643
0.35	0.0914	0.1225	0.1536	0.1847	0.2158	0.2469	0.2780	0.3090	0.3401
0.4	0.0848	0.1137	0.1426	0.1714	0.2003	0.2291	0.2580	0.2868	0.3157
0.45	0.0782	0.1048	0.1314	0.158	0.1846	0.2112	0.2378	0.2644	0.2910
0.5	0.0715	0.0958	0.1201	0.1444	0.1688	0.1931	0.2174	0.2417	0.2660
0.55	0.0647	0.0867	0.1087	0.1307	0.1527	0.1747	0.1967	0.2188	0.2408
0.6	0.0578	0.0775	0.0972	0.1169	0.1365	0.1562	0.1759	0.1955	0.2152
0.65	0.0509	0.0682	0.0855	0.1028	0.1201	0.1374	0.1548	0.1721	0.1894
0.7	0.0439	0.0588	0.0737	0.0886	0.1036	0.1185	0.1334	0.1483	0.1633
0.75	0.0368	0.0492	0.0618	0.0743	0.0868	0.0993	0.1118	0.1243	0.1368
0.8	0.0296	0.0396	0.0497	0.0598	0.0698	0.0799	0.0900	0.1000	0.1101
0.85	0.0223	0.0299	0.0375	0.0451	0.0527	0.0603	0.0679	0.0755	0.0830
0.9	0.0150	0.0200	0.0251	0.0302	0.0353	0.0404	0.0455	0.0506	0.0557
0.95	0.0075	0.0100	0.0126	0.0152	0.0178	0.0203	0.0229	0.0254	0.0280
AREA(A)=	**0.0700**	**0.0939**	**0.1177**	**0.1415**	**0.1653**	**0.1896**	**0.2130**	**0.2368**	**0.2606**

In light of table 2 it is observe that maximum value of area is 0.2606 and minimum value is 0.0700 at fixed value of p_q =0.35, b_2= 0.25, p_c = 0.45 and with little increment of interval 0.1of P.

TABLE 3-[For Figure (3) Where (p =0.45, b_2= 0.15, p_c = 0.25, h=0.05)]

p_q	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
b_1	$\overline{B}_1$	$\overline{B}_1$	$\overline{B}_1$	$\overline{B}_1$	$\overline{B}_1$	$\overline{B}_1$	$\overline{B}_1$	$\overline{B}_1$	$\overline{B}_1$
0	0.3932	0.387	0.3808	0.3746	0.3684	0.3623	0.3561	0.3499	0.3437
0.05	0.3758	0.3694	0.3631	0.3569	0.3507	0.3446	0.3385	0.3325	0.3265
0.1	0.3582	0.3517	0.3453	0.339	0.3328	0.3268	0.3209	0.3151	0.3094
0.15	0.3404	0.3338	0.3273	0.321	0.3149	0.309	0.3033	0.2977	0.2922
0.2	0.3224	0.3157	0.3092	0.303	0.297	0.2912	0.2856	0.2802	0.275
0.25	0.3041	0.2974	0.291	0.2848	0.2789	0.2733	0.268	0.2628	0.2579
0.3	0.2856	0.2789	0.2726	0.2666	0.2608	0.2554	0.2503	0.2454	0.2407
0.35	0.2669	0.2603	0.2541	0.2482	0.2427	0.2375	0.2325	0.2279	0.2235
0.4	0.248	0.2415	0.2354	0.2297	0.2244	0.2195	0.2148	0.2104	0.2063
0.45	0.2288	0.2225	0.2166	0.2112	0.2061	0.2014	0.197	0.193	0.1892
0.5	0.2093	0.2033	0.1977	0.1925	0.1877	0.1833	0.1792	0.1755	0.172
0.55	0.1896	0.1839	0.1786	0.1737	0.1693	0.1652	0.1614	0.158	0.1548
0.6	0.1696	0.1643	0.1594	0.1549	0.1508	0.147	0.1436	0.1405	0.1376
0.65	0.1494	0.1445	0.14	0.1359	0.1322	0.1288	0.1257	0.1229	0.1204
0.7	0.1289	0.1245	0.1204	0.1168	0.1135	0.1105	0.1078	0.1054	0.1032
0.75	0.1082	0.1043	0.1008	0.0976	0.0948	0.0922	0.0899	0.0879	0.0860
0.8	0.0871	0.0838	0.0809	0.0783	0.076	0.0739	0.072	0.0703	0.0688
0.85	0.0658	0.0632	0.0609	0.0589	0.0571	0.0555	0.054	0.0528	0.0516
0.9	0.0441	0.0424	0.0408	0.0394	0.0381	0.037	0.036	0.0352	0.0344
0.95	0.0222	0.0213	0.0205	0.0197	0.0191	0.0185	0.018	0.0176	0.0172
AREA(A)=	**0.2045**	**0.1994**	**0.1947**	**0.1902**	**0.1861**	**0.1821**	**0.1784**	**0.1748**	**0.1715**

The table 3 shows that for p= 0.45 area (A) decreases subject to condition when b_2= 0.15, p_c = 0.25 and with the little increment of of p_q with interval 0.1.Minmum value is A 0.2045 for $p_{q=}$0.1 and maximum value of A is 0.1715 for p_q =0.9.

TABLE 4-[For Figure (4) Where (p =0.15, b_2= 0.25, p_q = 0.35, h=0.05)]

P_c	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
b_1	$\overline{B}_1$	$\overline{B}_1$	$\overline{B}_1$	$\overline{B}_1$	$\overline{B}_1$	$\overline{B}_1$	$\overline{B}_1$	$\overline{B}_1$	$\overline{B}_1$
0	0.2593	0.2305	0.2017	0.1729	0.1441	0.1153	0.0864	0.0576	0.0288
0.05	0.2477	0.2201	0.1926	0.1651	0.1376	0.1101	0.0826	0.055	0.0275
0.1	0.2359	0.2097	0.1835	0.1572	0.131	0.1048	0.0786	0.0524	0.0262
0.15	0.224	0.1991	0.1742	0.1493	0.1244	0.0995	0.0747	0.0498	0.0249
0.2	0.2119	0.1884	0.1648	0.1413	0.1177	0.0942	0.0706	0.0471	0.0235
0.25	0.1998	0.1776	0.1554	0.1332	0.111	0.0888	0.0666	0.0444	0.0222
0.3	0.1875	0.1666	0.1458	0.125	0.1041	0.0833	0.0625	0.0417	0.0208
0.35	0.175	0.1556	0.1361	0.1167	0.0972	0.0778	0.0583	0.0389	0.0194
0.4	0.1625	0.1444	0.1264	0.1083	0.0903	0.0722	0.0542	0.0361	0.0181
0.45	0.1497	0.1331	0.1165	0.0998	0.0832	0.0666	0.0499	0.0333	0.0166
0.5	0.1369	0.1217	0.1065	0.0913	0.076	0.0608	0.0456	0.0304	0.0152
0.55	0.1239	0.1101	0.0964	0.0826	0.0688	0.0551	0.0413	0.0275	0.0138
0.6	0.1107	0.0984	0.0861	0.0738	0.0615	0.0492	0.0369	0.0246	0.0123
0.65	0.0974	0.0866	0.0758	0.065	0.0541	0.0433	0.0325	0.0217	0.0108
0.7	0.084	0.0747	0.0653	0.056	0.0467	0.0373	0.028	0.0187	0.0093
0.75	0.0704	0.0626	0.0548	0.0469	0.0391	0.0313	0.0235	0.0156	0.0078
0.8	0.0566	0.0504	0.0441	0.0378	0.0315	0.0252	0.0189	0.0126	0.0063

0.85	0.0427	0.038	0.0332	0.0285	0.0237	0.019	0.0142	0.0095	0.0047
0.9	0.0287	0.0255	0.0223	0.0191	0.0159	0.0127	0.0096	0.0064	0.0032
0.95	0.0144	0.0128	0.0112	0.0096	0.008	0.0064	0.0048	0.0032	0.0016
AREA(A)=	**0.1341**	**0.1192**	**0.1043**	**0.0894**	**0.0745**	**0.0596**	**0.0447**	**0.0298**	**0.0149**

In table 4 at the varying value of p_c area (A) reduce for the constant value of p =0.15, b_2= 0.25, p_q = 0.35 .At p_c =0.9 highest value of area is 0.0149 and lowest value is 0.1341 for p_c=0.1

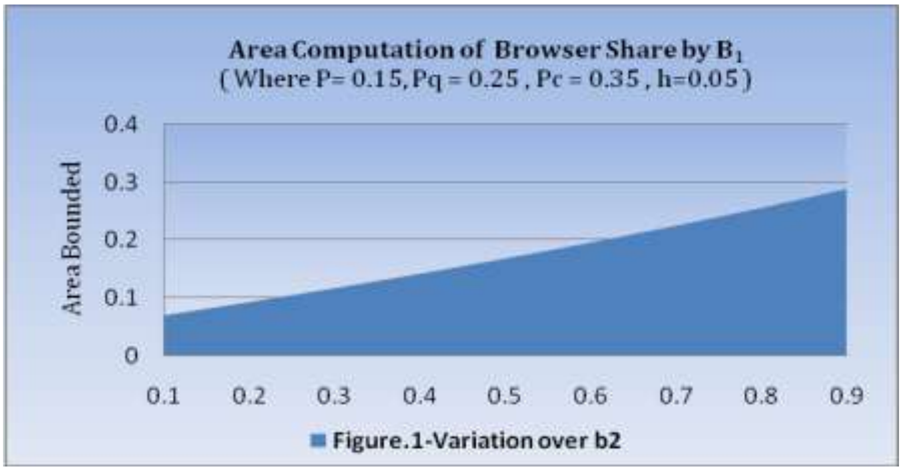
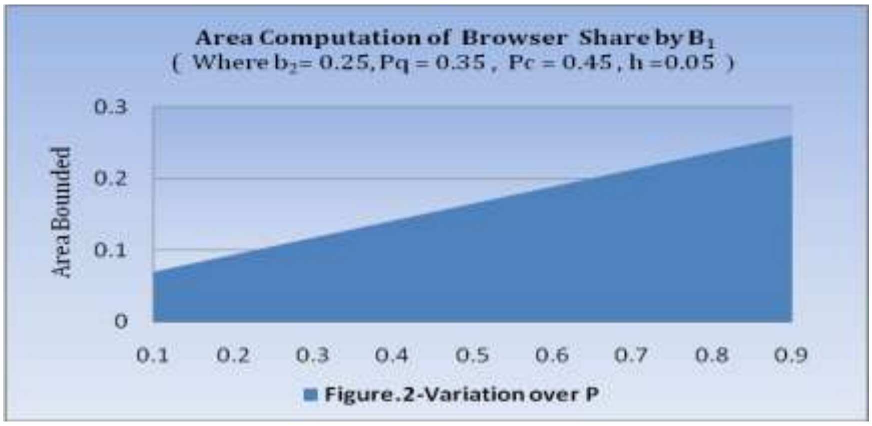
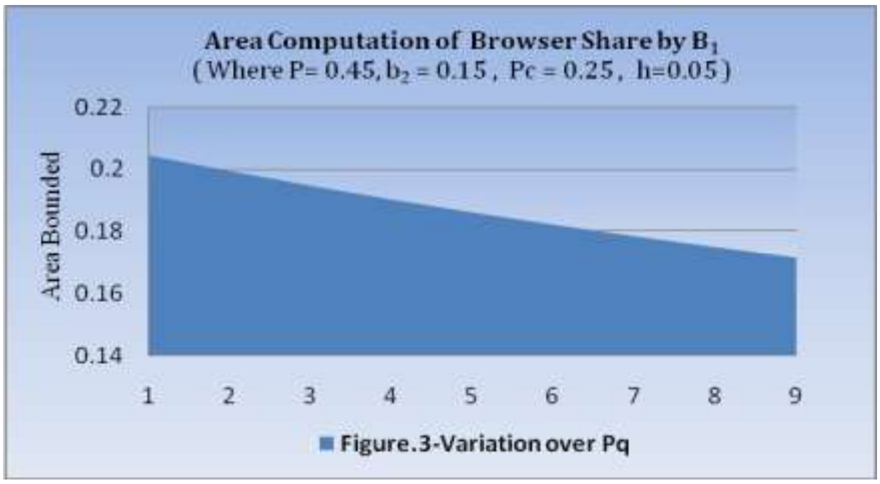
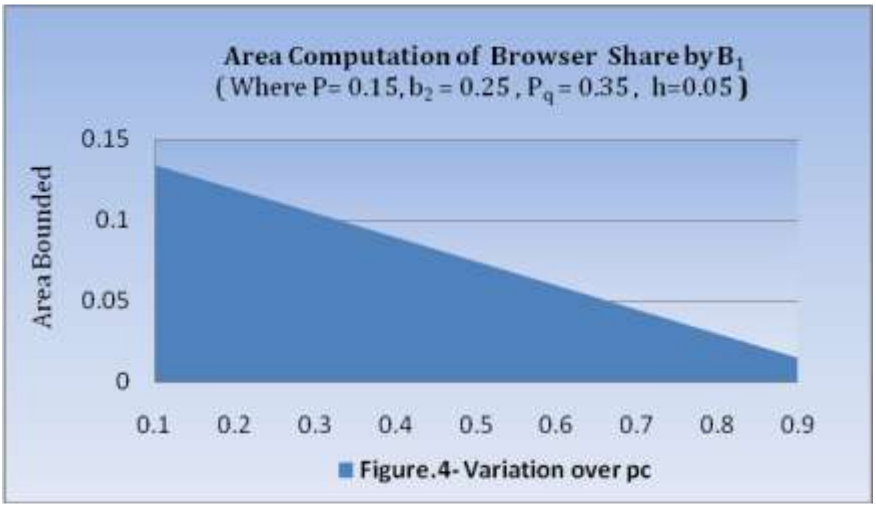


Figure 1.shows that bounded area increases at constant values of many parameter of web browser graph support the fact of table 1.





In view of figure 2 It is clear that estimated bounded area upward trend at variation over p and some fixed value b_2= 0.25,Pq = 0.35 , Pc = 0.45 , h =0.05 where as figure3. Indicate downward trend of estimated bounded area at variation over quieting probability p_q and constant values Where P= 0.45,b_2 = 0.15 , Pc = 0.25,which support table 3, 4 respectively.



In light of figure 4 It is observed that bounded area which estimated for variation over p_c is downward trend for some input fix values P= 0.15, b_2 = 0.25, P_q = 0.35 which is supported by table 4.
Let us consider another form of integration for browser B_2 defined as

$$I = \int_l^u f\left(b_2\right) db_2$$

$$= \int_l^u \left[\left(1-b_2\right)\left(1-P_C\right) \left\{ \frac{(1-P)+P(1-P_q)b_1}{1-b_1 b_2 (1-P_q)^2} \right\} \right] db_2 ...(5.2)$$

The generated data in following table of equal interval of b_2 are (A indicates estimated bounded area):

TABLE 5-[For Figure (5) Where (p =0.45, p_c= 0.05, p_q = 0.15, h=0.05)]

b_1	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
b_2	$\overline{B}_2$	$\overline{B}_2$	$\overline{B}_2$	$\overline{B}_2$	$\overline{B}_2$	$\overline{B}_2$	$\overline{B}_2$	$\overline{B}_2$	$\overline{B}_2$
0	0.5588	0.5952	0.6315	0.6679	0.7042	0.7405	0.7769	0.8132	0.8495
0.05	0.5328	0.5695	0.6065	0.6438	0.6813	0.7191	0.7572	0.7955	0.8342
0.1	0.5066	0.5435	0.581	0.619	0.6575	0.6967	0.7364	0.7768	0.8178
0.15	0.4802	0.5171	0.5548	0.5934	0.6329	0.6732	0.7145	0.7568	0.8002
0.2	0.4536	0.4903	0.5281	0.5671	0.6072	0.6487	0.6914	0.7356	0.7812
0.25	0.4268	0.4631	0.5008	0.5399	0.5806	0.6229	0.667	0.7129	0.7608
0.3	0.3999	0.4355	0.4728	0.5119	0.5528	0.5959	0.6411	0.6887	0.7388
0.35	0.3727	0.4075	0.4442	0.483	0.524	0.5674	0.6136	0.6626	0.7149
0.4	0.3453	0.379	0.4149	0.4531	0.4939	0.5375	0.5843	0.6347	0.6889
0.45	0.3177	0.3501	0.3849	0.4222	0.4625	0.506	0.5532	0.6045	0.6605
0.5	0.2899	0.3208	0.3541	0.3903	0.4297	0.4727	0.5199	0.5719	0.6294
0.55	0.2619	0.291	0.3226	0.3573	0.3955	0.4376	0.4843	0.5365	0.5951
0.6	0.2337	0.2607	0.2904	0.3232	0.3596	0.4003	0.4461	0.498	0.5572
0.65	0.2052	0.2299	0.2573	0.2878	0.3221	0.3609	0.4051	0.4559	0.515
0.7	0.1766	0.1986	0.2233	0.2512	0.2828	0.3189	0.3608	0.4097	0.4678
0.75	0.1477	0.1669	0.1885	0.2132	0.2415	0.2743	0.3129	0.3589	0.4146
0.8	0.1186	0.1346	0.1528	0.1737	0.1981	0.2267	0.261	0.3025	0.3541

0.85	0.0893	0.1018	0.1161	0.1328	0.1524	0.1759	0.2044	0.2398	0.2849
0.9	0.0598	0.0684	0.0785	0.0903	0.1043	0.1214	0.1426	0.1695	0.2048
0.95	0.03	0.0345	0.0398	0.046	0.0536	0.063	0.0748	0.0902	0.1111
AREA(A)=	**0.2856**	**0.3122**	**0.3404**	**0.3705**	**0.4029**	**0.4379**	**0.4761**	**0.5181**	**0.5650**

Table 5 Shows that of variation over b_2 in equal interval highest value of estimated bounded area (A) is 0.5650 for fixed value of p =0.45, p_c= 0.05, p_q = 0.15 and lowest value is 0.2856.

TABLE 6-[For Figure (6) Where (b_1 =0.15, p_c= 0.35, p_q = 0.05, h=0.05)]

P	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
b_2	$\overline{B}_2$	$\overline{B}_2$	$\overline{B}_2$	$\overline{B}_2$	$\overline{B}_2$	$\overline{B}_2$	$\overline{B}_2$	$\overline{B}_2$	$\overline{B}_2$
0	0.5943	0.5385	0.4828	0.4271	0.3713	0.3156	0.2598	0.2041	0.1484
0.05	0.5684	0.5151	0.4618	0.4085	0.3552	0.3018	0.2485	0.1952	0.1419
0.1	0.5422	0.4913	0.4405	0.3896	0.3388	0.2879	0.2371	0.1862	0.1354
0.15	0.5156	0.4672	0.4189	0.3705	0.3222	0.2738	0.2254	0.1771	0.1287
0.2	0.4886	0.4428	0.397	0.3511	0.3053	0.2595	0.2137	0.1678	0.122
0.25	0.4613	0.418	0.3748	0.3315	0.2882	0.245	0.2017	0.1584	0.1152
0.3	0.4336	0.3929	0.3523	0.3116	0.2709	0.2303	0.1896	0.1489	0.1083
0.35	0.4055	0.3675	0.3294	0.2914	0.2534	0.2153	0.1773	0.1393	0.1012
0.4	0.377	0.3416	0.3063	0.2709	0.2355	0.2002	0.1648	0.1295	0.0941
0.45	0.348	0.3154	0.2828	0.2501	0.2175	0.1848	0.1522	0.1195	0.0869
0.5	0.3187	0.2888	0.2589	0.229	0.1991	0.1692	0.1394	0.1095	0.0796
0.55	0.2889	0.2618	0.2347	0.2076	0.1805	0.1534	0.1263	0.0992	0.0721
0.6	0.2587	0.2345	0.2102	0.1859	0.1617	0.1374	0.1131	0.0889	0.0646
0.65	0.2281	0.2067	0.1853	0.1639	0.1425	0.1211	0.0997	0.0783	0.0569
0.7	0.1969	0.1785	0.16	0.1415	0.1231	0.1046	0.0861	0.0676	0.0492
0.75	0.1654	0.1498	0.1343	0.1188	0.1033	0.0878	0.0723	0.0568	0.0413
0.8	0.1333	0.1208	0.1083	0.0958	0.0833	0.0708	0.0583	0.0458	0.0333
0.85	0.1007	0.0913	0.0818	0.0724	0.0629	0.0535	0.044	0.0346	0.0251
0.9	0.0677	0.0613	0.055	0.0486	0.0423	0.0359	0.0296	0.0232	0.0169
0.95	0.0341	0.0309	0.0277	0.0245	0.0213	0.0181	0.0149	0.0117	0.0085
AREA(A)=	**0.3106**	**0.2815**	**0.2524**	**0.2232**	**0.1941**	**0.165**	**0.1358**	**0.1067**	**0.0776**

In view of table 6 for constant value of b_1 =0.15, p_c= 0.35 and p_q = 0.05 bounded area increase with fixed equal interval of b_2 and upper value of A is 0.3106 at p=0.1 and lowest value is 0.0776 for p=0.9.

TABLE 7-[For Figure (7) Where (b_1 =0.05, p= 0.25, p_c= 0.45, h=0.05)]

p_q	**0.1**	**0.2**	**0.3**	**0.4**	**0.5**	**0.6**	**0.7**	**0.8**	**0.9**
b_2	$\overline{B}_2$	$\overline{B}_2$	$\overline{B}_2$	$\overline{B}_2$	$\overline{B}_2$	$\overline{B}_2$	$\overline{B}_2$	$\overline{B}_2$	$\overline{B}_2$
0	0.4187	0.418	0.4173	0.4166	0.4159	0.4153	0.4146	0.4139	0.4132
0.05	0.3986	0.3977	0.3969	0.3962	0.3954	0.3946	0.3939	0.3932	0.3925
0.1	0.3784	0.3774	0.3765	0.3756	0.3748	0.374	0.3733	0.3726	0.3719
0.15	0.3581	0.357	0.356	0.3551	0.3542	0.3534	0.3526	0.3519	0.3512
0.2	0.3377	0.3366	0.3355	0.3345	0.3336	0.3327	0.3319	0.3312	0.3306
0.25	0.3172	0.316	0.3149	0.3139	0.3129	0.3121	0.3113	0.3106	0.3099
0.3	0.2967	0.2954	0.2943	0.2932	0.2923	0.2914	0.2906	0.2899	0.2893
0.35	0.2761	0.2748	0.2736	0.2725	0.2715	0.2707	0.2699	0.2692	0.2686
0.4	0.2553	0.2541	0.2529	0.2518	0.2508	0.2499	0.2492	0.2485	0.248

0.45	0.2346	0.2333	0.2321	0.231	0.2301	0.2292	0.2285	0.2278	0.2273
0.5	0.2137	0.2124	0.2112	0.2102	0.2093	0.2085	0.2077	0.2071	0.2066
0.55	0.1927	0.1915	0.1904	0.1894	0.1885	0.1877	0.187	0.1864	0.186
0.6	0.1716	0.1705	0.1694	0.1685	0.1676	0.1669	0.1663	0.1657	0.1653
0.65	0.1505	0.1494	0.1484	0.1475	0.1468	0.1461	0.1455	0.145	0.1447
0.7	0.1293	0.1283	0.1274	0.1266	0.1259	0.1253	0.1248	0.1243	0.124
0.75	0.108	0.1071	0.1063	0.1056	0.105	0.1044	0.104	0.1036	0.1033
0.8	0.0865	0.0858	0.0851	0.0845	0.084	0.0836	0.0832	0.0829	0.0827
0.85	0.065	0.0645	0.0639	0.0635	0.0631	0.0627	0.0624	0.0622	0.062
0.9	0.0435	0.043	0.0427	0.0423	0.0421	0.0418	0.0416	0.0415	0.0413
0.95	0.0218	0.0216	0.0214	0.0212	0.021	0.0209	0.0208	0.0207	0.0207
AREA(A)=	**0.2117**	**0.2107**	**0.2098**	**0.2090**	**0.2083**	**0.2077**	**0.2071**	**0.2066**	**0.2061**

The table 7 shows that for increasing p_q, the area A decreases subject to condition many other parameters b_1, p, p_c are fixed. The highest value of area is as A=0.2117 at p_q =0.1 whereas lowest value is A= 0.2061 on p_q= 0.9.

TABLE 8-[For Figure (8) Where (b_1 =0.35, p= 0.15, p_q= 0.05, h=0.05)]

P_c	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
b_2	$\overline{B}_2$	$\overline{B}_2$	$\overline{B}_2$	$\overline{B}_2$	$\overline{B}_2$	$\overline{B}_2$	$\overline{B}_2$	$\overline{B}_2$	$\overline{B}_2$
0	0.8099	0.7199	0.6299	0.5399	0.4499	0.36	0.27	0.18	0.09
0.05	0.7817	0.6949	0.608	0.5212	0.4343	0.3474	0.2606	0.1737	0.0869
0.1	0.7527	0.669	0.5854	0.5018	0.4182	0.3345	0.2509	0.1673	0.0836
0.15	0.7226	0.6424	0.5621	0.4818	0.4015	0.3212	0.2409	0.1606	0.0803
0.2	0.6916	0.6148	0.5379	0.4611	0.3842	0.3074	0.2305	0.1537	0.0768
0.25	0.6595	0.5862	0.5129	0.4397	0.3664	0.2931	0.2198	0.1466	0.0733
0.3	0.6263	0.5567	0.4871	0.4175	0.3479	0.2783	0.2088	0.1392	0.0696
0.35	0.5919	0.5261	0.4603	0.3946	0.3288	0.263	0.1973	0.1315	0.0658
0.4	0.5562	0.4944	0.4326	0.3708	0.309	0.2472	0.1854	0.1236	0.0618
0.45	0.5192	0.4616	0.4039	0.3462	0.2885	0.2308	0.1731	0.1154	0.0577
0.5	0.4809	0.4275	0.374	0.3206	0.2672	0.2137	0.1603	0.1069	0.0534
0.55	0.4411	0.3921	0.3431	0.2941	0.245	0.196	0.147	0.098	0.049
0.6	0.3997	0.3553	0.3109	0.2665	0.2221	0.1776	0.1332	0.0888	0.0444
0.65	0.3567	0.3171	0.2774	0.2378	0.1982	0.1585	0.1189	0.0793	0.0396
0.7	0.3119	0.2773	0.2426	0.208	0.1733	0.1386	0.104	0.0693	0.0347
0.75	0.2653	0.2358	0.2064	0.1769	0.1474	0.1179	0.0884	0.059	0.0295
0.8	0.2168	0.1927	0.1686	0.1445	0.1204	0.0963	0.0723	0.0482	0.0241
0.85	0.1661	0.1476	0.1292	0.1107	0.0923	0.0738	0.0554	0.0369	0.0185
0.9	0.1132	0.1006	0.088	0.0754	0.0629	0.0503	0.0377	0.0251	0.0126
0.95	0.0579	0.0514	0.045	0.0386	0.0321	0.0257	0.0193	0.0129	0.0064
AREA(A)=	**0.4544**	**0.4039**	**0.3534**	**0.3029**	**0.2524**	**0.2019**	**0.1515**	**0.1010**	**0.0505**

The table 8 made on varying values of p_c when many parameters are constant. Table 8 shows that for increasing p_c, the area A decreases subject to condition other parameters b_1 =0.35, p= 0.15, p_q= 0.05 are fixed. The highest value of area is A=0.4544 at p_c=0.1 whereas lowest value is A=0.0505 on p_c=0.9.

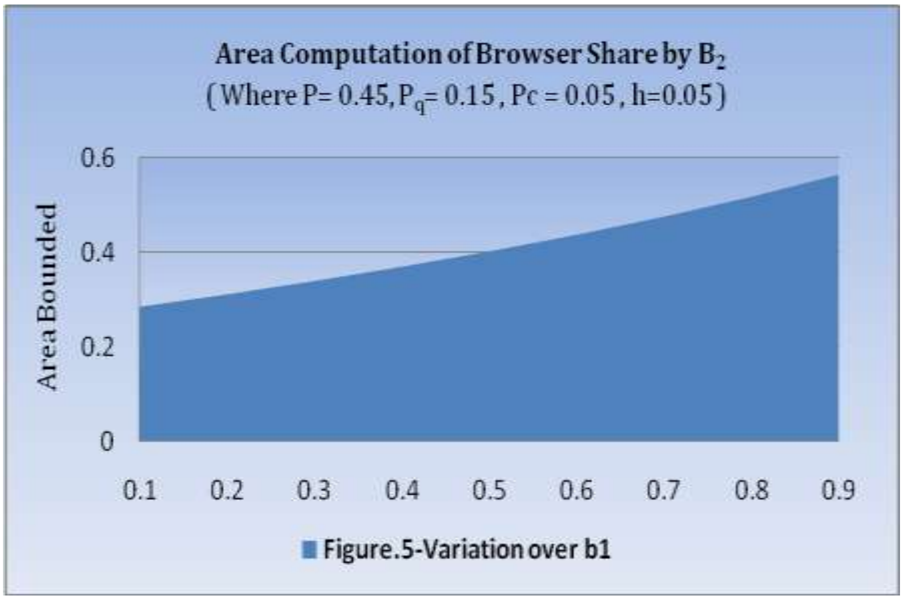
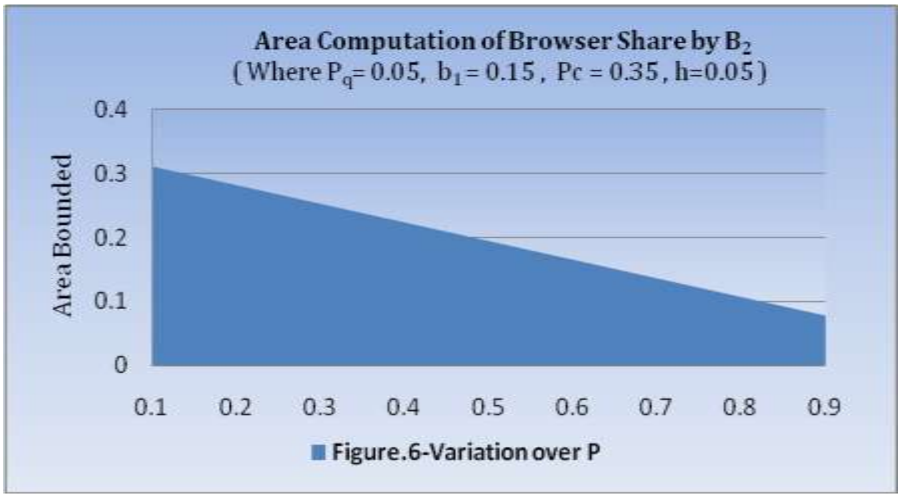
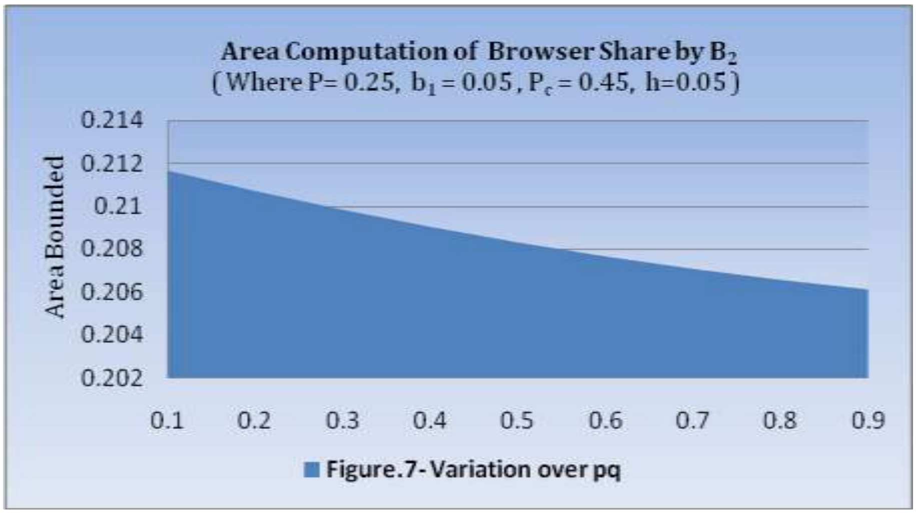


Fig 5 supports the facts observed in table 5 over variation of estimated bounded area A.





The figure 6 and 7 supports the observations in table 6 & 7 for fixed parameter of estimated bounded area A.

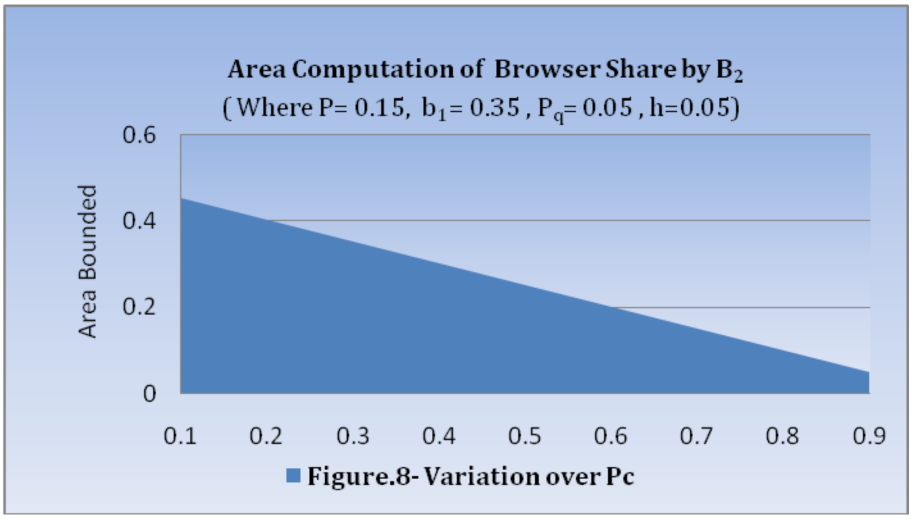


Figure.8- Variation over Pc

In light of figure 8 one can observe that estimated bounded area reduce for variation over quitting probability p_c for some constant parameter. And it supported with the help of table 8.

VI. CONCLUSIONS

One can conclude that estimated bounded area (A) contains multitude of information about the browser sharing phenomenon. The area (A) is directly proportional to the browser selection probability (P) of users. Moreover, the bounded area is directly proportional to the browser failure probability. When browser failure probability of competitor browser increases, bounded area reduced. It provides the knowledge of relationship between browser selection probability (P) and browser failure probabilities b_1 and b_2 respectively.

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