# Area Computation of Internet Traffic Share Problem with Special Reference to Cyber Crime Environment

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*Abstract*— **Cybercrime is a fast growing area of research, it covers any illegal activity that uses a computer as its primary means of commission. More and more criminals are exploiting the speed, convenience and anonymity of the internet to commit a diverse range of criminal activities. In the same line Naldi (2002) proposed internet traffic share problem in a new look by using markov chain. This model was extended by Shukla, Thakur and Tiwari (2010) by introducing a new cyber crime state .The importance of this state is that user performs cyber crime after successful call connectivity. In this model they developed mathematical relationship between traffic share of cyber criminals and blocking probability of operators. This relationship produces a probability function which exist a definite bounded area. This bounded area contains a lot of network parameters and is required to be estimated. An attempt has been made to analyze such kind of area by using trapezoidal method usually applies in numerical analysis. It is found that this area is inversely proportional to the probability of attraction for cyber crime and other parameter. It supports to elaborate the relationship among traffic share of cyber crime and many network parameters.**

Keywords- ***Trapezoidal Rule (TR), Area Estimation (AE), Cyber Crime (CC), Blocking probability (BP).***

## I. INTRODUCTION

Today virtual world has established itself parallel to the reality. Almost everyone has created an identity on the internet in order to tap the unlimited potential of the internet for interacting, exploring, visualizing and evolving. Naturally there are illegal activities going on the internet that are constantly working towards jeopardizing businesses, stealing top secret data in high profile organizations, manipulating individual accounts, phishing, defacements and pharming in monetary transactions. In the same area Naldi(2002) has used markov chain model to develop a model based analysis for internet traffic share problem which is involve between two competitive operators(ISP's) whereas Shukla, Thakur and Tiwari (2010) extended this model by introducing one more cyber crime state. They have derived traffic share expression with the combination of network blocking probability. This expression contains a lot of network affected parameter which influence the traffic share. The graphical study of such kind of expression is very complex manner and it generates a probability based area curve, therefore it is required to estimate such kind of area. This bounded area provides a primary level knowledge about the traffic share of cyber criminals. The aims of this paper is to develop a technique for estimating the area of traffic share of cyber criminals by using trapezoidal rule generally applies in numerical analysis.

## II. A REVIEW

Many software developer and researcher utilize markov chain model as a tool for the purpose of networking. Deshpande and Karypis (2004) presented a Selective Markov Models for the prediction of web-page accesses. Yeian and Lygeres (2005) proposed Stabilization of a class throw stochastic differential equations with the help of markovian switching, System and Control Letters. Perzen(1992)explain the fundamental concept of Markov chain model whereas Medhi(1991) suggests the detail description of stochastic model through queuing theory.

Chen and Mark (1993) advocate fast packet switching phenomena with shared concentration with the help of queering theory. Hambali and Ramani (2002) performed a study for multicast switching in various different traffics networks. Naldi (2002) derived Internet traffic share expression in two operator environment and further extend it for multi operator case. Shukla, Gadewar and Pathak (2007) conducted a study for the purpose of stochastic model for space division switches for packet movement situation in the area of computer network.

Shukla, Tiwari, Thakur and Tiwari (2009) have given a view point approach on a comparative study for the variation of Call-by-Call and two –call bases internet traffic share problem in two operator environments.

Shukla, Tiwari, Thakur and Deshmukh (2010) proposed two call based study for the improvement of call-by-call approach of internet traffic. Shukla and Thakur (2010) focused on disconnectivity problem in internet access traffic sharing by using Iso-share Analysis.

Shukla *et al.*(2010) examine the traffic share management in case when two operator are in computation and develop a stochastic model through markov chain.

Shukla *et al.* (2011 a) utilized the knowledge of two-call based elasticity Analysis for Internet Traffic Sharing, in special case of cyber crime. Shukla and Singhai (2011 b) develop a browser share status of users when two browser installed in computer system. Shukla *et al.* (2011 c) proposed a model based analysis of reconnectivity of call connection through markov chain.

Shukla *et al.* (2012 a,b) attempt for least square based curve fitting application in multi operator environment. One more similar study is due to Shukla, Verm,Dubey and Gangele (2012 c) for cyber crime based modeling for the purpose of internet traffic problem through curve fitting technique.

Gangele,Verma and Shukla (2014) performed a study on area estimation of internet access traffic sharing phenomena and develop a methodology for it ,with the help of trapezoidal rule.

## III. TRAFFIC SHARES EXPRESSION FOR CYBER CRIME:

Shukla, Thakur and Tiwati (2010) derived the following expression for traffic share

$$\left[\overline{P}_1\right]_{CC} = \frac{(1-L_1)(1-C_1)}{1-L_1L_2(1-p_A)^2}\left[p+(1-p)L_2(1-p_A)\right] \quad ...(3.1)$$

If we plot the graph of above expression which is based on blocking probability ($L_1$ or $L_2$) and traffic sharing ($\overline{P}_1$) 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 trapezoidal method of numerical analysis.

## IV. CONCEPT OF TRAPEZOIDAL 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 $a = x_0 < x_1 < x_2 < x_3, ..... < x_n = b$ and differencing $h=(x_{i+1} - x_i)$ is like equal interval.

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

This 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 $\overline{P}_1 = f(L_j)$, j=1,2 and assume

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

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

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

$$I = \int_l^u f(L_1)dL_1 = \int_l^u \left[\frac{(1-L_1)(1-C_1)}{1-L_1L_2(1-p_A)^2}\left\{p+(1-p)L_2(1-p_A)\right\}\right]dL_1 \quad ...(5.1)$$

**Table 1-[ For Figure (1.1) Where ( p = 0.35 ,$C_1$ =0.25, $p_A$ =0.3 ,h=0.05 ) ]**

| $L_2$ | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 |
|---|---|---|---|---|---|---|---|---|---|
| $L_1$ | $\overline{P}_1$ | $\overline{P}_1$ | $\overline{P}_1$ | $\overline{P}_1$ | $\overline{P}_1$ | $\overline{P}_1$ | $\overline{P}_1$ | $\overline{P}_1$ | $\overline{P}_1$ |
| 0 | 0.297 | 0.331 | 0.365 | 0.399 | 0.433 | 0.467 | 0.501 | 0.536 | 0.570 |
| 0.05 | 0.282 | 0.316 | 0.349 | 0.383 | 0.417 | 0.450 | 0.484 | 0.519 | 0.553 |
| 0.1 | 0.268 | 0.301 | 0.333 | 0.366 | 0.400 | 0.433 | 0.467 | 0.502 | 0.536 |
| 0.15 | 0.254 | 0.285 | 0.317 | 0.349 | 0.382 | 0.415 | 0.449 | 0.484 | 0.518 |
| 0.2 | 0.240 | 0.270 | 0.301 | 0.332 | 0.364 | 0.397 | 0.430 | 0.465 | 0.500 |
| 0.25 | 0.225 | 0.254 | 0.284 | 0.315 | 0.346 | 0.378 | 0.411 | 0.445 | 0.480 |
| 0.3 | 0.211 | 0.239 | 0.267 | 0.297 | 0.327 | 0.358 | 0.391 | 0.425 | 0.460 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **0.35** | 0.196 | 0.223 | 0.250 | 0.278 | 0.308 | 0.338 | 0.370 | 0.403 | 0.438 |
| **0.4** | 0.182 | 0.207 | 0.233 | 0.260 | 0.288 | 0.317 | 0.348 | 0.381 | 0.415 |
| **0.45** | 0.167 | 0.190 | 0.215 | 0.241 | 0.268 | 0.296 | 0.326 | 0.358 | 0.391 |
| **0.5** | 0.152 | 0.174 | 0.197 | 0.221 | 0.247 | 0.273 | 0.302 | 0.333 | 0.365 |
| **0.55** | 0.137 | 0.157 | 0.179 | 0.201 | 0.225 | 0.250 | 0.278 | 0.307 | 0.338 |
| **0.6** | 0.122 | 0.141 | 0.160 | 0.181 | 0.203 | 0.226 | 0.252 | 0.280 | 0.310 |
| **0.65** | 0.107 | 0.124 | 0.141 | 0.160 | 0.180 | 0.202 | 0.225 | 0.252 | 0.279 |
| **0.7** | 0.092 | 0.107 | 0.122 | 0.139 | 0.157 | 0.176 | 0.197 | 0.221 | 0.247 |
| **0.75** | 0.077 | 0.089 | 0.103 | 0.117 | 0.133 | 0.149 | 0.168 | 0.190 | 0.213 |
| **0.8** | 0.062 | 0.072 | 0.083 | 0.095 | 0.108 | 0.122 | 0.138 | 0.156 | 0.176 |
| **0.85** | 0.046 | 0.054 | 0.063 | 0.072 | 0.082 | 0.093 | 0.106 | 0.120 | 0.137 |
| **0.9** | 0.031 | 0.036 | 0.042 | 0.048 | 0.056 | 0.063 | 0.072 | 0.083 | 0.094 |
| **0.95** | 0.016 | 0.018 | 0.021 | 0.025 | 0.028 | 0.032 | 0.037 | 0.043 | 0.049 |
| **Area=** | **0.150** | **0.170** | **0.192** | **0.213** | **0.236** | **0.259** | **0.284** | **0.311** | **0.338** |

In view of table 1 it is observe that at constant value of p=0.35, $C_1$=0.25 and $p_A$=0.3 Maximum area is A=0.338 for $L_2$=0.9 and Minimum area is A=0.150 for $L_2$=0.1 for the equal interval of h=0.05 for operator $O_1$.

**Table 2-[ For Figure (1.2) Where ( $L_2$ = 0.15 ,$C_1$ =0.2 , p=0.25 ,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** | 0.281 | 0.272 | 0.263 | 0.254 | 0.245 | 0.236 | 0.227 | 0.218 | 0.209 |
| **0.05** | 0.269 | 0.26 | 0.251 | 0.242 | 0.233 | 0.224 | 0.216 | 0.207 | 0.199 |
| **0.1** | 0.256 | 0.247 | 0.238 | 0.23 | 0.221 | 0.213 | 0.205 | 0.196 | 0.188 |
| **0.15** | 0.243 | 0.235 | 0.226 | 0.218 | 0.209 | 0.201 | 0.193 | 0.185 | 0.178 |
| **0.2** | 0.23 | 0.222 | 0.214 | 0.205 | 0.197 | 0.19 | 0.182 | 0.175 | 0.167 |
| **0.25** | 0.217 | 0.209 | 0.201 | 0.193 | 0.185 | 0.178 | 0.171 | 0.164 | 0.157 |
| **0.3** | 0.204 | 0.196 | 0.188 | 0.181 | 0.173 | 0.166 | 0.16 | 0.153 | 0.146 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **0.35** | 0.191 | 0.183 | 0.175 | 0.168 | 0.161 | 0.155 | 0.148 | 0.142 | 0.136 |
| **0.4** | 0.177 | 0.17 | 0.163 | 0.156 | 0.149 | 0.143 | 0.137 | 0.131 | 0.125 |
| **0.45** | 0.163 | 0.156 | 0.15 | 0.143 | 0.137 | 0.131 | 0.126 | 0.120 | 0.115 |
| **0.5** | 0.15 | 0.143 | 0.137 | 0.131 | 0.125 | 0.119 | 0.114 | 0.109 | 0.105 |
| **0.55** | 0.136 | 0.129 | 0.123 | 0.118 | 0.113 | 0.108 | 0.103 | 0.098 | 0.094 |
| **0.6** | 0.121 | 0.115 | 0.11 | 0.105 | 0.100 | 0.096 | 0.092 | 0.088 | 0.084 |
| **0.65** | 0.107 | 0.102 | 0.097 | 0.092 | 0.088 | 0.084 | 0.08 | 0.077 | 0.073 |
| **0.7** | 0.092 | 0.087 | 0.083 | 0.079 | 0.075 | 0.072 | 0.069 | 0.066 | 0.063 |
| **0.75** | 0.077 | 0.073 | 0.07 | 0.066 | 0.063 | 0.06 | 0.057 | 0.055 | 0.052 |
| **0.8** | 0.062 | 0.059 | 0.056 | 0.053 | 0.051 | 0.048 | 0.046 | 0.044 | 0.042 |
| **0.85** | 0.047 | 0.044 | 0.042 | 0.04 | 0.038 | 0.036 | 0.034 | 0.033 | 0.031 |
| **0.9** | 0.032 | 0.03 | 0.028 | 0.027 | 0.025 | 0.024 | 0.023 | 0.022 | 0.021 |
| **0.95** | 0.016 | 0.015 | 0.014 | 0.013 | 0.013 | 0.012 | 0.011 | 0.011 | 0.010 |
| **Area=** | **0.146** | **0.140** | **0.134** | **0.129** | **0.124** | **0.119** | **0.114** | **0.109** | **0.104** |

In light of table 2 for the varying values of $L_1$ area decrease subject to the condition for fixed value of $L_2$=0.15, $C_1$=0.2 and p=0.25.The lowest value of area is A =0.104 and highest value is A=0.146 for equal interval of h=0.05.

**Table 3-[ For Figure (1.3) Where ( $p_A$= 0.15 , p =0.2 , $L_2$=0.3 ,h=0.05 ) ]**

| **$C_1$** | **0.1** | **0.2** | **0.3** | **0.4** | **0.5** | **0.6** | **0.7** | **0.8** | **0.9** |
|---|---|---|---|---|---|---|---|---|---|
| **$L_1$** | $\overline{P}_1$ | $\overline{P}_1$ | $\overline{P}_1$ | $\overline{P}_1$ | $\overline{P}_1$ | $\overline{P}_1$ | $\overline{P}_1$ | $\overline{P}_1$ | $\overline{P}_1$ |
| **0** | **0.364** | **0.323** | **0.283** | **0.242** | **0.202** | **0.162** | **0.121** | **0.081** | **0.04** |
| **0.05** | 0.349 | 0.31 | 0.272 | 0.233 | 0.194 | 0.155 | 0.116 | 0.078 | 0.039 |
| **0.1** | 0.334 | 0.297 | 0.26 | 0.223 | 0.186 | 0.149 | 0.111 | 0.074 | 0.037 |
| **0.15** | 0.319 | 0.284 | 0.248 | 0.213 | 0.177 | 0.142 | 0.106 | 0.071 | 0.035 |
| **0.2** | 0.304 | 0.27 | 0.236 | 0.203 | 0.169 | 0.135 | 0.101 | 0.068 | 0.034 |
| **0.25** | 0.288 | 0.256 | 0.224 | 0.192 | 0.16 | 0.128 | 0.096 | 0.064 | 0.032 |
| **0.3** | 0.272 | 0.242 | 0.212 | 0.181 | 0.151 | 0.121 | 0.091 | 0.06 | 0.03 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **0.35** | 0.256 | 0.227 | 0.199 | 0.17 | 0.142 | 0.114 | 0.085 | 0.057 | 0.028 |
| **0.4** | 0.239 | 0.212 | 0.186 | 0.159 | 0.133 | 0.106 | 0.08 | 0.053 | 0.027 |
| **0.45** | 0.222 | 0.197 | 0.172 | 0.148 | 0.123 | 0.098 | 0.074 | 0.049 | 0.025 |
| **0.5** | 0.204 | 0.181 | 0.159 | 0.136 | 0.113 | 0.091 | 0.068 | 0.045 | 0.023 |
| **0.55** | 0.186 | 0.165 | 0.144 | 0.124 | 0.103 | 0.083 | 0.062 | 0.041 | 0.021 |
| **0.6** | 0.167 | 0.149 | 0.13 | 0.111 | 0.093 | 0.074 | 0.056 | 0.037 | 0.019 |
| **0.65** | 0.148 | 0.132 | 0.115 | 0.099 | 0.082 | 0.066 | 0.049 | 0.033 | 0.016 |
| **0.7** | 0.129 | 0.114 | 0.100 | 0.086 | 0.071 | 0.057 | 0.043 | 0.029 | 0.014 |
| **0.75** | 0.109 | 0.096 | 0.084 | 0.072 | 0.06 | 0.048 | 0.036 | 0.024 | 0.012 |
| **0.8** | 0.088 | 0.078 | 0.068 | 0.059 | 0.049 | 0.039 | 0.029 | 0.02 | 0.010 |
| **0.85** | 0.067 | 0.059 | 0.052 | 0.045 | 0.037 | 0.03 | 0.022 | 0.015 | 0.007 |
| **0.9** | 0.045 | 0.04 | 0.035 | 0.03 | 0.025 | 0.02 | 0.015 | 0.01 | 0.005 |
| **0.95** | 0.023 | 0.02 | 0.018 | 0.015 | 0.013 | 0.01 | 0.008 | 0.005 | 0.003 |
| **Area=** | **0.196** | **0.174** | **0.152** | **0.131** | **0.109** | **0.087** | **0.065** | **0.044** | **0.022** |

The generated data in the above table no. 3 for equal interval of $L_1$ (here bounded area is defined by A) it is clear that area A=0.022 is lowest for $C_1$ =0.9 and for fixed value of $p_A$= 0.15, p =0.2 and $L_{2=}0.3$

**Table 4-[ For Figure (1.4) Where ( $C_1$= 0.3 , $p_A$ =0.2 , $L_{2=}$0.25 ,h=0.05 ) ]**

| **P** | **0.1** | **0.2** | **0.3** | **0.4** | **0.5** | **0.6** | **0.7** | **0.8** | **0.9** |
|---|---|---|---|---|---|---|---|---|---|
| **$L_1$** | $\overline{P}_1$ | $\overline{P}_1$ | $\overline{P}_1$ | $\overline{P}_1$ | $\overline{P}_1$ | $\overline{P}_1$ | $\overline{P}_1$ | $\overline{P}_1$ | $\overline{P}_1$ |
| **0** | 0.196 | 0.252 | 0.308 | 0.364 | 0.42 | 0.476 | 0.532 | 0.588 | 0.644 |
| **0.05** | 0.188 | 0.241 | 0.295 | 0.349 | 0.402 | 0.456 | 0.509 | 0.563 | 0.617 |
| **0.1** | 0.179 | 0.23 | 0.282 | 0.333 | 0.384 | 0.435 | 0.487 | 0.538 | 0.589 |
| **0.15** | 0.171 | 0.219 | 0.268 | 0.317 | 0.366 | 0.415 | 0.463 | 0.512 | 0.561 |
| **0.2** | 0.162 | 0.208 | 0.255 | 0.301 | 0.347 | 0.393 | 0.44 | 0.486 | 0.532 |
| **0.25** | 0.153 | 0.197 | 0.241 | 0.284 | 0.328 | 0.372 | 0.416 | 0.459 | 0.503 |
| **0.3** | 0.144 | 0.185 | 0.226 | 0.268 | 0.309 | 0.35 | 0.391 | 0.432 | 0.474 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **0.35** | 0.135 | 0.174 | 0.212 | 0.251 | 0.289 | 0.328 | 0.366 | 0.405 | 0.443 |
| **0.4** | 0.126 | 0.162 | 0.197 | 0.233 | 0.269 | 0.305 | 0.341 | 0.377 | 0.413 |
| **0.45** | 0.116 | 0.149 | 0.183 | 0.216 | 0.249 | 0.282 | 0.315 | 0.348 | 0.382 |
| **0.5** | 0.107 | 0.137 | 0.167 | 0.198 | 0.228 | 0.259 | 0.289 | 0.320 | 0.350 |
| **0.55** | 0.097 | 0.124 | 0.152 | 0.18 | 0.207 | 0.235 | 0.263 | 0.290 | 0.318 |
| **0.6** | 0.087 | 0.112 | 0.136 | 0.161 | 0.186 | 0.211 | 0.235 | 0.260 | 0.285 |
| **0.65** | 0.077 | 0.098 | 0.12 | 0.142 | 0.164 | 0.186 | 0.208 | 0.230 | 0.252 |
| **0.7** | 0.066 | 0.085 | 0.104 | 0.123 | 0.142 | 0.161 | 0.18 | 0.199 | 0.218 |
| **0.75** | 0.056 | 0.072 | 0.088 | 0.103 | 0.119 | 0.135 | 0.151 | 0.167 | 0.183 |
| **0.8** | 0.045 | 0.058 | 0.071 | 0.083 | 0.096 | 0.109 | 0.122 | 0.135 | 0.148 |
| **0.85** | 0.034 | 0.044 | 0.053 | 0.063 | 0.073 | 0.083 | 0.092 | 0.102 | 0.112 |
| **0.9** | 0.023 | 0.029 | 0.036 | 0.043 | 0.049 | 0.056 | 0.062 | 0.069 | 0.075 |
| **0.95** | 0.012 | 0.015 | 0.018 | 0.021 | 0.025 | 0.028 | 0.031 | 0.035 | 0.038 |
| **Area=** | **0.103** | **0.133** | **0.162** | **0.192** | **0.222** | **0.251** | **0.281** | **0.310** | **0.340** |

The table 4 shows that $c_1$=0.3 area (A) increase subject to the condition when $p_A$ =0.2, $L_2$ and 0.25 with the little increment of p with interval 0.1.Higest value of area is A=0.340 at p=0.9 and lowest area is A=0.103 for p=0.1 for fixed value of h=0.05.

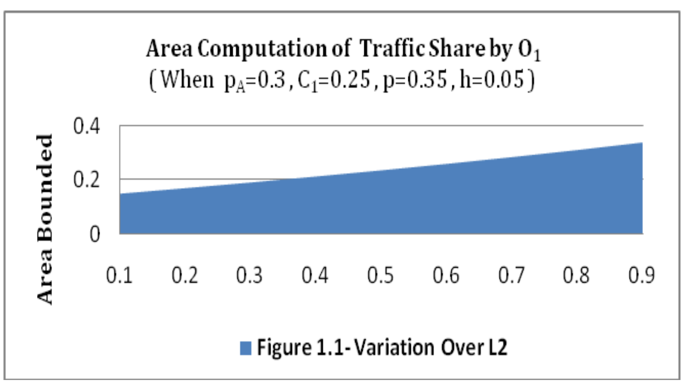



Figure 1.1- Variation Over L2

Figure 1.1 supports the fact observed in table 1 for variation of many network parameters related to the traffic share in cyber crime environment.

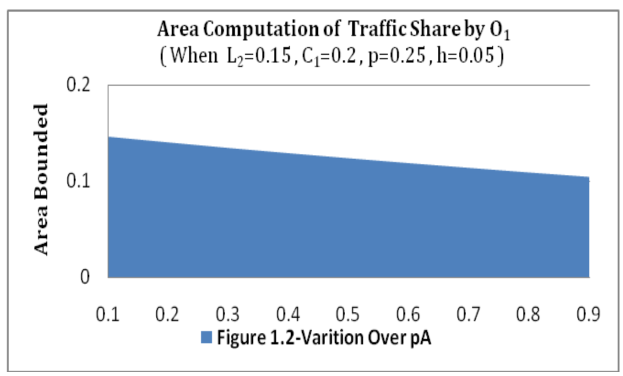



Figure 1.2-Varition Over pA

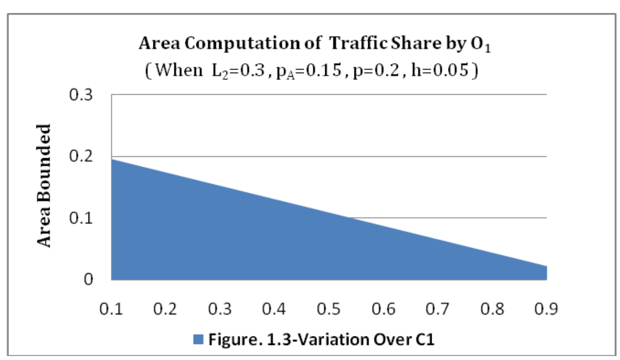



Figure. 1.3-Variation Over C1

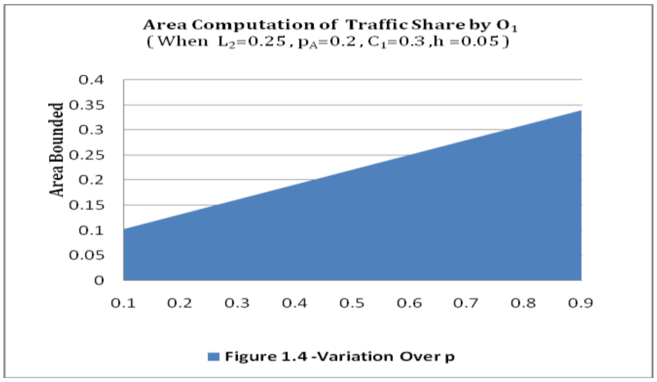



Figure 1.2, 1.3 and 1.4 supports the observation in table 2, 3 and 4 over the variation of prefixed input parameter of network to estimate the bounded area for first kind of operator $O_1$.

$$I=\int_l^u f(L_2)dL_2=\int_l^u\left[\frac{(1-L_2)(1-C_1)}{1-L_1L_2(1-p_A)^2}\{(1-p)+pL_1(1-p_A)\}\right]dL_2 \quad ...(5.2)$$

**Table 5-[ For Figure (1.5) Where ( p= 0.25 , $p_A$ =0.2 , $C_1$=0.35 ,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** | 0.501 | 0.514 | 0.527 | 0.54 | 0.552 | 0.566 | 0.579 | 0.592 | 0.605 |
| **0.05** | 0.477 | 0.491 | 0.505 | 0.519 | 0.533 | 0.548 | 0.562 | 0.577 | 0.591 |
| **0.1** | 0.453 | 0.468 | 0.483 | 0.498 | 0.513 | 0.529 | 0.545 | 0.561 | 0.577 |
| **0.15** | 0.43 | 0.445 | 0.461 | 0.477 | 0.493 | 0.51 | 0.527 | 0.545 | 0.562 |
| **0.2** | 0.406 | 0.422 | 0.438 | 0.455 | 0.472 | 0.49 | 0.508 | 0.527 | 0.547 |
| **0.25** | 0.381 | 0.398 | 0.415 | 0.432 | 0.450 | 0.469 | 0.489 | 0.509 | 0.53 |
| **0.3** | 0.357 | 0.374 | 0.391 | 0.409 | 0.427 | 0.447 | 0.468 | 0.489 | 0.512 |
| **0.35** | 0.333 | 0.349 | 0.367 | 0.385 | 0.404 | 0.425 | 0.446 | 0.468 | 0.492 |
| **0.4** | 0.308 | 0.325 | 0.342 | 0.361 | 0.380 | 0.401 | 0.423 | 0.446 | 0.471 |
| **0.45** | 0.283 | 0.3 | 0.317 | 0.335 | 0.355 | 0.376 | 0.399 | 0.423 | 0.449 |
| **0.5** | 0.259 | 0.274 | 0.291 | 0.309 | 0.328 | 0.35 | 0.373 | 0.398 | 0.425 |
| **0.55** | 0.233 | 0.249 | 0.265 | 0.283 | 0.301 | 0.323 | 0.345 | 0.371 | 0.398 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **0.6** | 0.208 | 0.222 | 0.238 | 0.255 | 0.273 | 0.294 | 0.316 | 0.342 | 0.369 |
| **0.65** | 0.183 | 0.196 | 0.211 | 0.227 | 0.244 | 0.264 | 0.286 | 0.31 | 0.338 |
| **0.7** | 0.157 | 0.169 | 0.182 | 0.197 | 0.213 | 0.232 | 0.253 | 0.277 | 0.304 |
| **0.75** | 0.131 | 0.142 | 0.154 | 0.167 | 0.181 | 0.199 | 0.218 | 0.24 | 0.266 |
| **0.8** | 0.106 | 0.114 | 0.124 | 0.136 | 0.148 | 0.163 | 0.18 | 0.2 | 0.224 |
| **0.85** | 0.079 | 0.086 | 0.094 | 0.103 | 0.113 | 0.126 | 0.14 | 0.157 | 0.178 |
| **0.9** | 0.053 | 0.058 | 0.064 | 0.07 | 0.077 | 0.086 | 0.097 | 0.11 | 0.126 |
| **0.95** | 0.027 | 0.029 | 0.032 | 0.036 | 0.039 | 0.045 | 0.05 | 0.058 | 0.067 |
| **Area=** | **0.255** | **0.268** | **0.281** | **0.295** | **0.311** | **0.327** | **0.344** | **0.364** | **0.385** |

The generated data in following table no. 5 depicts that estimated bounded area varying upward trend for some input fix value p= 0.25 , $p_A$ =0.2 and $C_{1=}$0.35 .In equal class interval=0.05 the minimum value of area is A=0.255 for $L_1$=0.1 and maximum value of area is A=0.385 for $L_1$=0.

**Table 6-[ For Figure (1.6) Where ( $p_A$= 0.25 , $C_1$=0.3 , $L_1$=0.15 ,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** | 0.638 | 0.576 | 0.514 | 0.452 | 0.389 | 0.327 | 0.265 | 0.203 | 0.141 |
| **0.05** | 0.609 | 0.549 | 0.49 | 0.431 | 0.371 | 0.312 | 0.253 | 0.194 | 0.134 |
| **0.1** | 0.579 | 0.523 | 0.466 | 0.41 | 0.353 | 0.297 | 0.241 | 0.184 | 0.128 |
| **0.15** | 0.549 | 0.496 | 0.442 | 0.389 | 0.335 | 0.282 | 0.228 | 0.175 | 0.121 |
| **0.2** | 0.519 | 0.469 | 0.418 | 0.367 | 0.316 | 0.266 | 0.216 | 0.165 | 0.115 |
| **0.25** | 0.489 | 0.441 | 0.394 | 0.346 | 0.298 | 0.251 | 0.203 | 0.156 | 0.108 |
| **0.3** | 0.458 | 0.413 | 0.369 | 0.324 | 0.279 | 0.235 | 0.19 | 0.146 | 0.101 |
| **0.35** | 0.427 | 0.386 | 0.344 | 0.302 | 0.260 | 0.219 | 0.178 | 0.136 | 0.094 |
| **0.4** | 0.396 | 0.358 | 0.319 | 0.28 | 0.241 | 0.203 | 0.165 | 0.126 | 0.087 |
| **0.45** | 0.365 | 0.329 | 0.294 | 0.258 | 0.222 | 0.187 | 0.152 | 0.116 | 0.081 |
| **0.5** | 0.333 | 0.301 | 0.268 | 0.236 | 0.203 | 0.171 | 0.138 | 0.106 | 0.074 |
| **0.55** | 0.301 | 0.272 | 0.242 | 0.213 | 0.183 | 0.154 | 0.125 | 0.096 | 0.066 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **0.6** | 0.269 | 0.243 | 0.216 | 0.19 | 0.164 | 0.138 | 0.112 | 0.086 | 0.059 |
| **0.65** | 0.236 | 0.213 | 0.19 | 0.167 | 0.144 | 0.121 | 0.098 | 0.075 | 0.052 |
| **0.7** | 0.203 | 0.184 | 0.164 | 0.144 | 0.124 | 0.104 | 0.085 | 0.065 | 0.045 |
| **0.75** | 0.17 | 0.154 | 0.137 | 0.121 | 0.103 | 0.087 | 0.071 | 0.054 | 0.038 |
| **0.8** | 0.137 | 0.123 | 0.11 | 0.097 | 0.083 | 0.07 | 0.057 | 0.044 | 0.03 |
| **0.85** | 0.103 | 0.093 | 0.083 | 0.073 | 0.062 | 0.053 | 0.043 | 0.033 | 0.023 |
| **0.9** | 0.069 | 0.062 | 0.056 | 0.049 | 0.042 | 0.035 | 0.029 | 0.022 | 0.015 |
| **0.95** | 0.035 | 0.031 | 0.028 | 0.025 | 0.021 | 0.018 | 0.014 | 0.011 | 0.008 |
| **Area=** | **0.327** | **0.296** | **0.264** | **0.232** | **0.199** | **0.168** | **0.136** | **0.104** | **0.072** |

Table 6 is made for varying values of $L_2$ for increasing p estimated area decreases subject to the condition when we fixed $C_1$=0.3, $L_1$=0.15 and $p_A$=0.25. The highest value of area A=0.327 for p=0.1 and lowest value of area is A=0.072 for p=0.9.

**Table 7-[ For Figure (1.7) Where ( p= 0.2 , $C_1$=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** | 0.703 | 0.700 | 0.698 | 0.695 | 0.692 | 0.69 | 0.688 | 0.685 | 0.683 |
| **0.05** | 0.672 | 0.669 | 0.665 | 0.662 | 0.659 | 0.656 | 0.654 | 0.651 | 0.648 |
| **0.1** | 0.640 | 0.636 | 0.633 | 0.629 | 0.625 | 0.623 | 0.620 | 0.617 | 0.614 |
| **0.15** | 0.609 | 0.604 | 0.600 | 0.596 | 0.592 | 0.589 | 0.586 | 0.583 | 0.580 |
| **0.2** | 0.576 | 0.571 | 0.567 | 0.562 | 0.558 | 0.555 | 0.552 | 0.549 | 0.546 |
| **0.25** | 0.544 | 0.538 | 0.533 | 0.529 | 0.524 | 0.521 | 0.517 | 0.515 | 0.512 |
| **0.3** | 0.511 | 0.505 | 0.500 | 0.495 | 0.490 | 0.487 | 0.483 | 0.48 | 0.478 |
| **0.35** | 0.477 | 0.471 | 0.466 | 0.461 | 0.456 | 0.452 | 0.449 | 0.446 | 0.444 |
| **0.4** | 0.443 | 0.437 | 0.431 | 0.426 | 0.422 | 0.418 | 0.415 | 0.412 | 0.410 |
| **0.45** | 0.409 | 0.403 | 0.397 | 0.392 | 0.387 | 0.384 | 0.381 | 0.378 | 0.376 |
| **0.5** | 0.374 | 0.368 | 0.362 | 0.357 | 0.353 | 0.349 | 0.346 | 0.344 | 0.342 |
| **0.55** | 0.339 | 0.333 | 0.327 | 0.322 | 0.318 | 0.315 | 0.312 | 0.309 | 0.307 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **0.6** | 0.303 | 0.297 | 0.292 | 0.287 | 0.283 | 0.28 | 0.277 | 0.275 | 0.273 |
| **0.65** | 0.267 | 0.261 | 0.257 | 0.252 | 0.248 | 0.245 | 0.243 | 0.241 | 0.239 |
| **0.7** | 0.23 | 0.225 | 0.221 | 0.217 | 0.213 | 0.211 | 0.208 | 0.206 | 0.205 |
| **0.75** | 0.193 | 0.189 | 0.185 | 0.181 | 0.178 | 0.176 | 0.174 | 0.172 | 0.171 |
| **0.8** | 0.156 | 0.152 | 0.148 | 0.145 | 0.142 | 0.141 | 0.139 | 0.138 | 0.137 |
| **0.85** | 0.118 | 0.114 | 0.112 | 0.109 | 0.107 | 0.106 | 0.104 | 0.103 | 0.103 |
| **0.9** | 0.079 | 0.077 | 0.075 | 0.073 | 0.071 | 0.071 | 0.07 | 0.069 | 0.068 |
| **0.95** | 0.040 | 0.039 | 0.038 | 0.037 | 0.035 | 0.035 | 0.035 | 0.034 | 0.034 |
| **Area=** | **0.366** | **0.361** | **0.357** | **0.353** | **0.349** | **0.347** | **0.345** | **0.342** | **0.341** |

In light of table 7 it is observe that for increasing value of $p_A$ area reduces subject to the condition when $L_2$ increases with 0.05 interval and for a fixed value of p= 0.2, $C_1$=0.15 and $L_1$=0.15 .Minimum value of area is A=0.341 for $p_A$=0.9 and maximum value is A=0.366 for $p_A$=0.1 .

**Table 8-[ For Figure (1.8) Where ( p= 0.15 , $p_A$=0.35 , $L_1$=0.15 ,h=0.05 ) ]**

| $C_1$ | 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** | 0.778 | 0.692 | 0.605 | 0.519 | 0.432 | 0.346 | 0.259 | 0.173 | 0.086 |
| **0.05** | 0.742 | 0.659 | 0.577 | 0.494 | 0.412 | 0.33 | 0.247 | 0.165 | 0.082 |
| **0.1** | 0.705 | 0.627 | 0.548 | 0.47 | 0.391 | 0.313 | 0.235 | 0.157 | 0.078 |
| **0.15** | 0.668 | 0.594 | 0.519 | 0.445 | 0.371 | 0.297 | 0.223 | 0.148 | 0.074 |
| **0.2** | 0.631 | 0.56 | 0.49 | 0.42 | 0.350 | 0.28 | 0.21 | 0.14 | 0.070 |
| **0.25** | 0.593 | 0.527 | 0.461 | 0.395 | 0.329 | 0.264 | 0.198 | 0.132 | 0.066 |
| **0.3** | 0.555 | 0.494 | 0.432 | 0.37 | 0.308 | 0.247 | 0.185 | 0.123 | 0.062 |
| **0.35** | 0.517 | 0.46 | 0.402 | 0.345 | 0.287 | 0.230 | 0.172 | 0.115 | 0.057 |
| **0.4** | 0.479 | 0.426 | 0.373 | 0.319 | 0.266 | 0.213 | 0.160 | 0.106 | 0.053 |
| **0.45** | 0.441 | 0.392 | 0.343 | 0.294 | 0.244 | 0.196 | 0.147 | 0.098 | 0.049 |
| **0.5** | 0.402 | 0.357 | 0.313 | 0.268 | 0.223 | 0.179 | 0.134 | 0.089 | 0.045 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **0.55** | 0.363 | 0.323 | 0.282 | 0.242 | 0.201 | 0.161 | 0.121 | 0.081 | 0.040 |
| **0.6** | 0.324 | 0.288 | 0.252 | 0.216 | 0.179 | 0.144 | 0.108 | 0.072 | 0.036 |
| **0.65** | 0.284 | 0.252 | 0.221 | 0.189 | 0.157 | 0.126 | 0.095 | 0.063 | 0.032 |
| **0.7** | 0.244 | 0.217 | 0.19 | 0.163 | 0.135 | 0.109 | 0.081 | 0.054 | 0.027 |
| **0.75** | 0.204 | 0.182 | 0.159 | 0.136 | 0.113 | 0.091 | 0.068 | 0.045 | 0.023 |
| **0.8** | 0.164 | 0.146 | 0.128 | 0.109 | 0.091 | 0.073 | 0.055 | 0.036 | 0.018 |
| **0.85** | 0.123 | 0.11 | 0.096 | 0.082 | 0.068 | 0.055 | 0.041 | 0.027 | 0.014 |
| **0.9** | 0.083 | 0.073 | 0.064 | 0.055 | 0.045 | 0.037 | 0.028 | 0.018 | 0.009 |
| **0.95** | 0.041 | 0.037 | 0.032 | 0.028 | 0.023 | 0.018 | 0.014 | 0.009 | 0.005 |
| **Area=** | **0.397** | **0.352** | **0.308** | **0.264** | **0.220** | **0.176** | **0.132** | **0.088** | **0.044** |

Table 8 shows that for constant increment of $c_1$ by 0.1 area reduces when $L_2$increases by 0.05 subject to the condition for the constant value of p= 0.15, $p_A$=0.35 & $L_1$=0.15 .highest value of estimated bounded area is A=0.397 for $C_1$=0.1 and lowest value is A=0.044 for $C_1$ =0.9 .

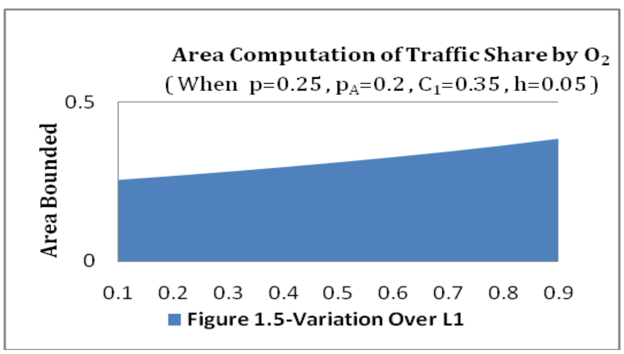
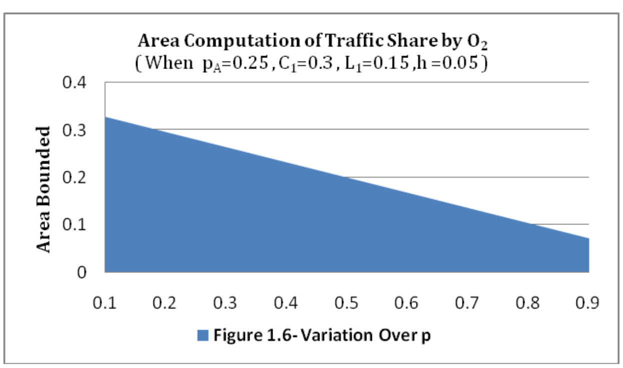
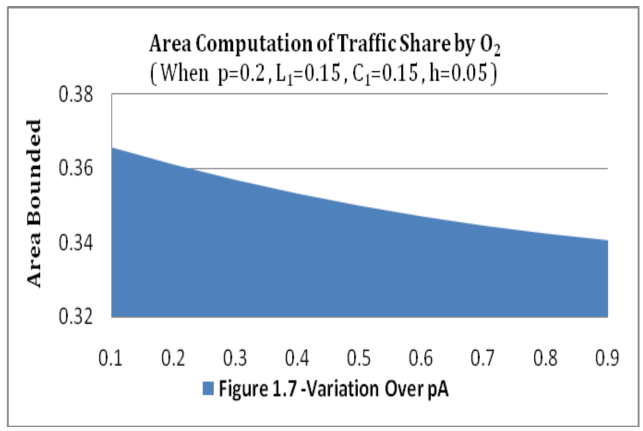
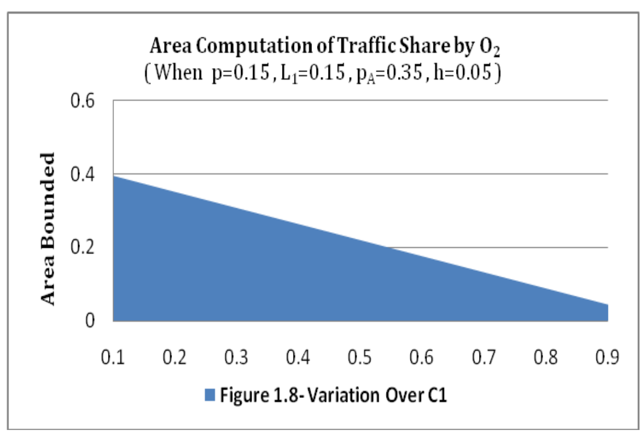



Figure 1.5 support the facts of table 5 for variation of blocking probability $L_1$ and many more network parameter to estimate bounded area (A).




In light of figure 1.6, 1.7 and 1.8 supports the observation given in table no. 6, 7 and 8 to find out bounded area of second kind of operator $O_2$.

## VI. CONCLUSION:

It is observe that estimated area provide variety of information about the traffic share for both kinds of operators in cyber crime prospect. Such kind of study helps in decision making to find out operator share status that is in comparative mode. Area is inversely proportional to $C_1$ (($1-C_1$) is defined as probability of attraction for cyber crime).Area is also inversely propositional to p and $p_A$ for second kind of operator subject to the condition of prefixed input network parameter of operators owner. It provides firsthand knowledge about the relationship between cybercrime based user behaviour traffic share and network blocking parameters of operators.

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