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Secret Conversation Image with Help of Fuzzy Cardinality

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Abstract

Facebook (fb) is a communication network connecting peoples in all over the world. They introduced fb messenger application for message with your fb friends. But the user has a trouble because of hackers. So, fb messenger add encryption to send safe chat. The purpose of this paper is to described sending images with help of end to end encryption by using fuzzy sets.

Keywords: facebook, fb security, end to end encryption, scalar cardinality.

1. INTRODUCTION

The contemporary care about wisdom representation and data systems has apply frontward useful expansions of elementary set theory such as fuzzy sets was developed by Lotfi. A. zadeh (1965). A fuzzy set allows only membership values [0, 1]. [4, 7, 11, 12, 13] Mark Zuckerberg invented "The Facebook" on 2004. It helps to communicate with other peoples all over the world. We can share photo, video, make profile, etc. These also we can set for us convince (who are all see your story update and profile like only friend / friends of friends / public). Also, we use fb in anywhere and anytime with help of internet connection. But after logout your fb the other persons can easily see the fb id and they have more change to use without your permission [8, 14, 15].

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The face book give a two-security option to save your account such as Two-step verification and Code generator. Support someone try to access your facebook. It cannot allow without security code. Then fb invented messenger for fb user to chat without main fb application. In messenger we can chat with friends, video and normal calls, update 360o stories, share photos, videos, files, live location, send variety of stickers, emoji, GIF, etc. On 2016, they add secret conversion (SC) for messenger user. It could safe and secure feel for fb customers because if someone hack your chat and it could be shown only a code. Then additional offers, we can set a SC chat from normal chat of friend profile and fix a time limit in different ways like seconds (5, 10, 30) or hours (1, 6, 12) or 1day. For every message the timer runs on left side and after end time end the chat or image will be blank. The normal chat messages are view in blue background and secret conversions are view in black background. SC is a root of cryptography. If A send a message to B without SC. Then the hacker can easily hack and read or took our details or data. But in SC the hacker can see a code of message. SC can provide two types of keys: [1, 3, 9].

• Public key

It could be helps to lock the chat and convert to cipher text is called encryption or encrypt.

• Private key

It will be used for unlock the code and view the normal chat is called decryption or decrypt.

Suppose the keys are not match then the message can't view.

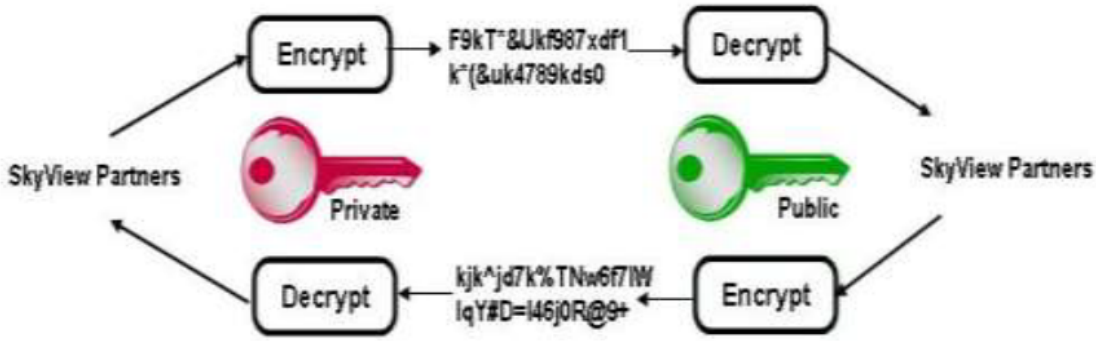


Figure 1: Secret conversation works

2. PRELIMINARIES

Definition 2.1. [10, 11] Any fuzzy set $\tilde{A}$, the linear membership function (LMF) is a membership function of the region in universe [0, 1].
(i.e.)

$$\mu_{\tilde{A}}(x) = \begin{cases} 0, & x < 0 \\ \frac{x}{(b-a)4}, & a \leq x \leq b \\ 1, & 1 > x \end{cases}$$

where $a = 1, b = 26$.

Definition 2.2. [4, 5, 12, 13] The pair of fuzzy sets $\tilde{A_1}$ and $\tilde{A_2}$. Then the union of fuzzy $\tilde{A} \cup \tilde{A}$ is defined by

$$\mu_{\tilde{A_1} \cup \tilde{A_2}}(x) = \max\left(\mu_{\tilde{A_1}}(x_i), \mu_{\tilde{A_2}}(x_i)\right),$$

for all $i = 1, 2, 3, ..., n$.

Definition 2.3. [4, 5, 12, 13] Any pair of fuzzy sets $\tilde{A_1}$ and $\tilde{A_2}$. Its intersection of fuzzy will be written as

$$\mu_{\tilde{A_1} \cup \tilde{A_2}}(x) = \min\left(\mu_{\tilde{A_1}}(x_i), \mu_{\tilde{A_2}}(x_i)\right),$$

for all $i = 1, 2, 3, ..., n$.

Definition 2.4. [2, 6, 7] Let $\tilde{A_i}$ and $\tilde{A_j}$ be any two fuzzy sets, where $i = 1, 2, 3, ..., n, j = 1, 2, 3, ..., m$.

$$\sum_{i,j=1}^{n} \tilde{A_i}\tilde{A_j} = \tilde{B} \; for \; all \; i = j \; and \; i \neq j,$$

where $\tilde{A_i}$ (or) $\tilde{A_j} = \{(\tilde{A_1} = A), (\tilde{A_2} = B), (\tilde{A_3} = C), ...\}$. This is known as scalar cardinality,

3. NUMERICAL EXAMPLE

First, we take capital alphabet letters and tag the natural numbers. These natural numbers are converted to fuzzy values by using Definition 2.1.

A	B	C	D	E	F	G	H	I	J	K
0.01	0.02	0.03	0.04	0.05	0.06	0.7	0.08	0.09	0.10	0.11

L	M	N	O	P	Q	R	S	T	U
0.12	0.13	0.14	0.15	0.16	0.17	0.18	0.19	0.20	0.21

V	W	X	Y	Z
0.22	0.23	0.24	0.25	0.26

Table 1: Capital letters and natural numbers

Then insert an image with a table. It has equal number of rows and columns based on image size.

Figure 2: Image for encryption

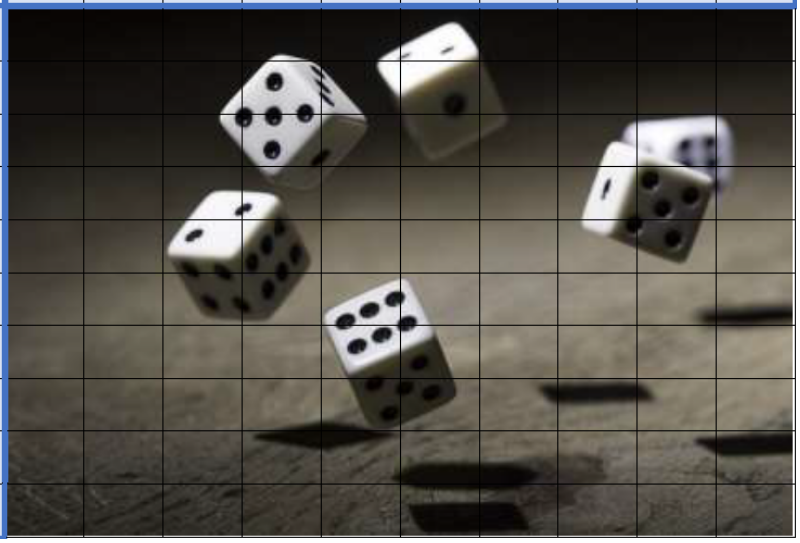
$\tilde{M} \cup \tilde{N}$	A	B	C	D	E	F	G	H	I	J
A										
B										
C										
D										
E										
F										
G										
H										
I										
J										

Figure 3: Insert image in a table

From Definition 2.2, we calculate the complete table for add each row, column and x-cross values. Definition 2.3 helps to identify an intersection value. $\alpha = 10$ (Number of rows or columns), where α is a key. $\phi = 0$.

$\tilde{M} \cup \tilde{N}$	A	B	C	D	E	F	G	H	I	J	0.80
A	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.10	0.55
B	0.02	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.10	0.56
C	0.03	0.03	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.10	0.58
D	0.04	0.04	0.04	0.04	0.05	0.06	0.07	0.08	0.09	0.10	0.61
E	0.05	0.05	0.05	0.05	0.05	0.06	0.07	0.08	0.09	0.10	0.65
F	0.06	0.06	0.06	0.06	0.06	0.06	0.07	0.08	0.09	0.10	0.70
G	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.08	0.09	0.10	0.76
H	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.09	0.10	0.83
I	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.10	0.91
J	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	1.00
0.55	0.55	0.56	0.58	0.61	0.65	0.70	0.76	0.83	0.91	1.00	0.55

Figure 4: Fuzzy matrix table

From the figure 4, the final table value is 0.55.

Final table value $\times$ number of rows or columns $\times$ 100 = 0.55 $\times$ 10 $\times$ 100 = 550.

From each value of 550 we compare with table 1 to convert letter = EE_{ϕ}.

Letters from last value	Before letters	After letters
E	D	F
E	D	F
ϕ	Z	A

Now, we mix the last value letters, above and below letters like first row (EDF), 2^{nd} row (EDF), etc.

Finally, every letter in one line for cipher text is $EDFEDF\phi ZA$.

Figure 5: Encrypted Image

Decryption

After reach the message the CT reverses the process to decrypt the code. We take the first-row code first letter then jump two steps forward for second letter and do this for all. Reject other row codes or rows. We get, EE_{ϕ}. Now substitute natural number for each letter. It becomes 550. Then divided by key $\times$ 100 = 0.55. Create a table and substitute this value on additional first row and column. For other cells we add 0.01 on same row and column.

	A	B	C	D	E	F	G	H	I	J	
A											0.55
B											0.56
C											0.58
D											0.61
E											0.65
F											0.70
G											0.76
H											0.83
I											0.91
J											1.00
	0.55	0.56	0.58	0.61	0.65	0.70	0.76	0.83	0.91	1.00	

Figure 6: Complete outer cells

Inside the image table first fill up the cross (up to down) by using natural number divided by 100.

	A	B	C	D	E	F	G	H	I	J	
A	0.01										0.55
B		0.02									0.56
C			0.03								0.58
D				0.04							0.61
E					0.05						0.65
F						0.06					0.70
G							0.07				0.76
H								0.08			0.83
I									0.09		0.91
J										0.10	1.00
	0.55	0.56	0.58	0.61	0.65	0.70	0.76	0.83	0.91	1.00	

Figure 7: Filled cross cells

Hereafter left side of cross cells have same values based on the row and right side add

0.01 with before value.

	A	B	C	D	E	F	G	H	I	J	
A	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.10	0.55
B	0.02	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.10	0.56
C	0.03	0.03	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.10	0.58
D	0.04	0.04	0.04	0.04	0.05	0.06	0.07	0.08	0.09	0.10	0.61
E	0.05	0.05	0.05	0.05	0.05	0.06	0.07	0.08	0.09	0.10	0.65
F	0.06	0.06	0.06	0.06	0.06	0.06	0.07	0.08	0.09	0.10	0.70
G	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.08	0.09	0.10	0.76
H	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.09	0.10	0.83
I	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.10	0.91
J	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	1.00
	0.55	0.56	0.58	0.61	0.65	0.70	0.76	0.83	0.91	1.00	

Figure 8: Image values

Every number matches then it shows the original image.

Figure 9: Decrypted Image

4. CONCLUSION

Day-day life the humans are using various mobile application for his / her entertainment and also fast way to reach image / chat / videos / inform to particular person. The secret conversion will be more helpful to safe and reach a right person. In this paper, we done image encryption by using max-min fuzzy set based on its width and breath of image. From this way we can do for other size of images.

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