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Journal of Computer Graphics and Multimedia Applications

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Global Journal of Computer Graphics & Techniques provides a medium to communicate information concerning interactive CG and CG applications. The journal focuses on interactive computer graphics, visualization and novel input modalities including virtual environments, and, within this scope, on graphical models, data structures, languages, picture manipulation algorithms and related software.

Journal of Computer Graphics and Multimedia Applications

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A Comparative Study of Normalized Cut Method and Random Walker Method

Monica Arora¹ & Santosh Kumar²

^{1,2}Department of Electronics & Communication Engineering
Invertis University, Bareilly, UP,
E-mail: monica20arora@gmail.com

ABSTRACT

Partitioning of image into different regions that are homogenous according to some pre-defined criterion is the chief characteristic of image segmentation. Segmentation is the first and most important step in numerous areas of image processing. In this paper, the comparative study of two image segmentation methods – normalized cut method and random walker method – is done. Normalized cut method is used to minimize the disassociation and maximize the association in the image pixels. It takes into account both similarity within groups as well as dissimilarity across groups. Random walker method is used to determine the labels (i.e. object or background) to associate with each pixel. Both the methods are used to minimize the graph cut.

Keywords: Graph Cut, Image Processing, Image Segmentation, Normalized Cut Method, Random Walker Method.

1. INTRODUCTION

Image processing is a blanket term that can be used to describe any operation that acts to improve, correct, analyze, manipulate or render an image. In example based image processing the mechanism by which an image is manipulated or analyzed is influenced directly by a set of example images. Image component recognition is the basic building block of most image processing based research that involves image understanding. Image processing is any form of signal processing for which the input is an image, such as a photograph or video frame; the output of image processing may be either an image or a set of characteristics or parameters related to the image.

Segmentation is a traditional image processing operation. Image Segmentation is the process of partitioning an image in a semantically meaningful way.

This vague definition implies the generality of the problem segmentation can be found in any image-driven process, e.g. fingerprint, face recognition, detection of anomalies in industrial pipelines, tracking of moving people, cars or airplanes etc. For many applications, segmentation reduces to finding an object in an image. This involves partitioning the image into two classes of regions - either object or background. Segmentation is taking place naturally in the human visual system. It is simply not feasible in practice to manually process all the images. Instead, segmentation algorithms are designed, which look for certain patterns and objects of interest and partition them. For example, a recent popular application is to search and match known faces in photo library which makes it possible to automatically generate photo collections with a certain person. An important part of this application is to segment the image into “face” and “background”. Image segmentation is one of the primary steps in image analysis for object identification. The main aim is to recognize homogeneous regions within an image as distinct and belonging to different objects. Segmentation stage does not worry about the identity of the objects. Image segmentation algorithms generally are based on one of two basic properties of intensity values: discontinuity and similarity. In the first category, the approach is to partition an image based on abrupt changes in intensity, such as isolated points, lines and edges in an image. The principal approaches in second category are based on partitioning an isolated points, lines and edges in an image. The principal approaches in second category are based on partitioning an image into regions that are similar according to a set of predefined criteria. Thresholding, region growing are examples of methods in this category. (Arora et al., 2013)

Graph Partitioning Method

Grouping can be formulated as a graph partitioning and optimization problem. The graph theoretic formulation of image segmentation is as follows:

The set of points in an arbitrary feature space are represented as a weighted undirected graph $G = (V, E)$, where the nodes of the graph are the points in the feature space

An edge is formed between every pair of nodes yielding a dense or complete graph. The weight on each edge, $w(i, j)$ is a function of the similarity between nodes i and j .

Partition the set of vertices into disjoint sets $V_1, V_2, \dots, V_k$ where by some measure the similarity among the vertices in a set V_i is high and, across different sets V_i, V_j is low.

To partition the graph in a meaningful manner, it is needed to:

Pick an appropriate criterion (which can be computed from the graph) to optimize which would result in a good segmentation.

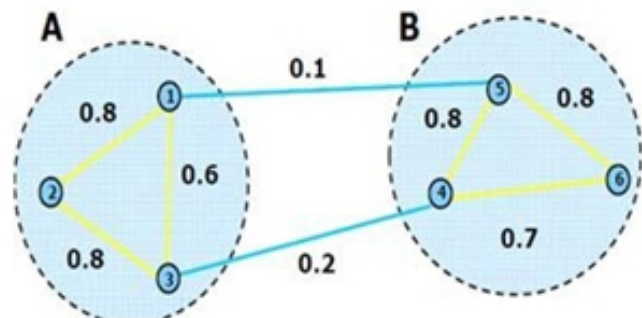
Finding an efficient way to achieve the optimization.

In the image segmentation and data clustering community, there has been much previous work using variations of the minimal spanning tree or limited neighborhood set approaches. Although those use efficient computational methods, the segmentation criteria used in most of them are based on local properties of the graph. Because perceptual grouping is about extracting the global impressions of a scene, this partitioning criterion often falls short of this main goal.

Graph partitioning is the grouping of all the nodes in a graph into two or more partitions based on certain criteria. The image is modeled as a weighted, undirected graph. The graph (image) is then partitioned according to a criterion designed to model "good" clusters. Graph cut methods have been successfully applied to image restoration, texture synthesis and image segmentation. (Pal & Pal, 1993)

Graph Cut

Consider a partition of the graph into two parts A and B.



Cut (A, B): sum of the weights of the set of edges that connect the two groups

$$\text{Cut (A, B)} = \sum_{i \in A, j \in B} w_{ij} \\ = 0.3$$

An intuitive goal is find the partition that minimizes the cut.

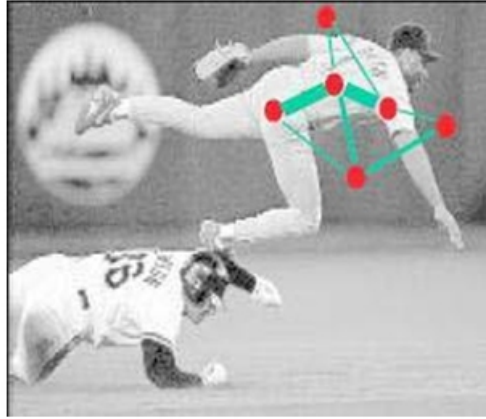


Fig: Schematic diagram showing graph weight edges for a gray scale image. Higher weights are shown as thicker edges.

Types of Graph Partitioning Methods

- a) Minimal Cut Method
- b) Isoperimetric Method
- c) Normalized Cut Method
- d) Random Walker Method

a) Minimal Cut Method: It is the simplest graph cut method. The min-cut of a graph is the cut that partitions G into disjoint segments such that the sum of the weights associated with edges between the different segments are minimized. The minimum cut criterion favors cutting small sets of isolated nodes in the graph.

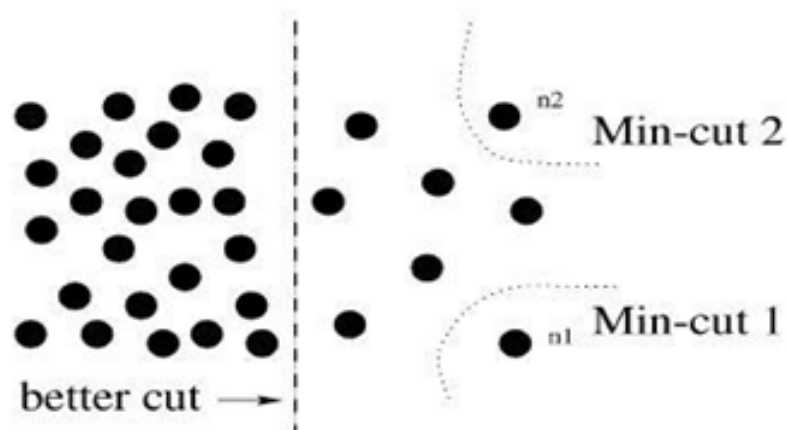


Fig: Minimum Cut favors cutting off singular, isolated nodes in order to reduce the cut value.

Assuming the edge weights are inversely proportional to the distance between the two nodes, the cut that partitions out node n_1 or n_2 will have a very small value. In fact, any cut that partitions out individual nodes on the right half will have smaller cut value than the cut that partitions the nodes into the left and right halves because the number of edges going across the cut reduces as the number of nodes in a set is reduced. (Eriksson et al., 1999)

b) Isoperimetric Method: It partitions the graph with a small isoperimetric constant, requiring solution to a linear system rather than an eigenvector problem. This approach produces the high quality segmentations of spectral methods, but with improved speed and stability. The isoperimetric algorithm to image segmentation may be described in the following steps:

Find weights for all edges using and build the L matrix.

Choose the node of largest degree as the ground node, v_g , and determine L_0 and d_0 by eliminating the row/column corresponding to v_g .

Solve for x_0 .

Threshold the potentials x at the value that gives partitions corresponding to the lowest isoperimetric ratio.

Continue recursion on each segment until the isoperimetric ratio of the subpartitions is larger than the stop parameter. (Grady & Schwartz, 2006)

c) Normalized Cut Method: To avoid unnatural bias in minimal cut method for partitioning out small sets of points, it is necessary to look at a different measure of disassociation. The problem with the cut criterion is that it does not consider association within a cluster. In order to circumvent this problem, it can be looked at the cut cost as a fraction of the total edge connections to all the nodes in the graph. Thus, the normalized cut is defined as

$$Ncut(A, B) = \frac{cut(A, B)}{cut(A)} + \frac{cut(A, B)}{cut(B)}$$

$W(u, v)$ is the total connection from nodes in A to all nodes in the graph. With this definition of the disassociation between the groups, the cut that partitions out small isolated points will no longer have small $Ncut$ value, since the cut value will almost certainly be a large percentage of the total connection from that small set to all other nodes.

To minimize dissimilarity across groups, it can be tried to minimize Ncut subject to the same constraints as those for minimum cut.

Alternatively, it is tried to look for clusters which have high within-group similarity. Thus, the normalized association is defined as:

$$\text{Nassoc}(A, B) = \frac{\text{assoc}(A, A)}{\text{assoc}(A, V)} + \frac{\text{assoc}(B, B)}{\text{assoc}(B, V)}$$

Where $\text{assoc}(A, A)$ and $\text{assoc}(B, B)$ are total weights of edges connecting nodes within A and B, respectively. This measure reflects how tightly nodes within the group are connected to each other as a fraction of the total connection from the group to all other nodes. (Shi & Malik, 2000)

A very important property that can be derived here is that Ncut and Nassoc are naturally related.

$$\begin{aligned} \text{Ncut}(A, B) &= \frac{\text{cut}(A, B)}{\text{assoc}(A, V)} + \frac{\text{cut}(A, B)}{\text{assoc}(B, V)} \\ &= \frac{\text{assoc}(A, V) - \text{assoc}(A, A)}{\text{assoc}(A, V)} + \frac{\text{assoc}(B, V) - \text{assoc}(B, B)}{\text{assoc}(B, V)} \\ &= 1 - \frac{\text{assoc}(A, A)}{\text{assoc}(A, V)} + 1 - \frac{\text{assoc}(B, B)}{\text{assoc}(B, V)} \\ &= 2 - \left(\frac{\text{assoc}(A, A)}{\text{assoc}(A, V)} + \frac{\text{assoc}(B, B)}{\text{assoc}(B, V)} \right) \\ &= 2 - \text{Nassoc}(A, B) \end{aligned}$$

Hence, the two partition criteria that is sought in grouping algorithm, minimizing the disassociation between the groups and maximizing the association within the groups are in fact, identical and can be satisfied simultaneously. Thus, the Ncut criterion takes care of both inter-set dissimilarity (by the minimization of Ncut) as well as intra-set similarity (by the simultaneous

Maximization of Nassoc). But there is a major stumbling block. An exact solution to minimizing normalized cut is an NP-complete problem. However, approximate discrete solutions can be found efficiently because the normalized cut criterion can be computed by solving a generalized eigenvalue problem.

Solving NCut

Let W be the similarity matrix, $W(i, j) = W_{ij}$

Let D be the diag. matrix, $D(i, i) = \sum_j W(i, j)$

Let x be a vector in $\{1, -1\}^N$, $x(i) = 1$ Then

the normalized cut can be written as

$$\frac{y^T (D - W) y}{y^T D y}$$

where $\mathbf{y}$ is an indicator vector whose value should be 1 in the i th position if the i th feature point belongs to A and a negative constant otherwise. (Obinata& Dutta)

Normalized cut algorithm

Represent the image as a weighted graph $G = (V, E)$, compute the weight of each edge, and summarize the information in D and W .

Solve $(D - W)y = \lambda Dy$ for the eigenvector with the second smallest eigenvalue.

Use the entries of the eigenvector to bipartition the graph.

Recursively partition the segmented parts, if necessary.

d) Random Walker Method: A random walker is a mathematical formalization of a path that consists of a succession of random steps. In image segmentation, random walks are used to determine the labels (i.e., "object" or "background") to associate with each pixel. This algorithm is typically referred to as the random walker segmentation algorithm. It is often substituted for Brownian motion. (Grady, 2006)

Algorithm summary

Generate weights based on image intensities. Build Laplacian matrix.

Solve system of linear equations for each label.

Assign pixel to label for which it has the highest probability.

Weight generation

The random walker is governed by edge weights (e.g., probabilities of reaching a pixel p_j from its neighboring pixel p_i).

$$W_{ij} = e^{-\beta |f(p_i) - f(p_j)|}$$

Where $f()$: intensity function

β : influences how quickly the probability decreases

The probability is higher the more likely the two pixels belong to the same region.

Laplacian matrix L

$$d_i, \quad \text{if } i = j$$

$$L_{ij} = -w_{ij}, \quad \text{if } p_i \text{ and } p_j \text{ are neighboring pixels}$$

$$0, \quad \text{otherwise}$$

Where d_i : degree of pixel p_i

It is shown that finding the probabilities for a walk starting at some pixel to arrive at some seed pixel is related to minimizing:

$$D(x) = \frac{1}{2} \sum_{e_{ij} \in E} W_{ij} (x_i - x_j)^2 = \frac{1}{2} x^T L x$$

Solution of system of linear equations

Partition the pixels into two sets, V_M (all marked/seed pixels, regardless of their label) and V_U (unseeded). The pixels in L and x are ordered such that seed pixels are first and unseeded pixels are second. Then, the optimization problem becomes:

$$D(x_u) = \frac{1}{2} x_m^T L_m x_m + x_m^T B x_u + \frac{1}{2} x_u^T L_u x_u$$

$$= \frac{1}{2} \left(x_m^T L_m x_m + 2 x_u^T B^T x_m + x_u^T L_u x_u \right)$$

Where L_M : edge weighted among the marked pixels

L_U : edge weighted among the unmarked pixels

To minimize it, the equation is differentiated with respect to unknown X_U :

$$\frac{\partial D(x_u)}{\partial x_u} = \frac{1}{2} (2 B^T x_m + 2 L_u x_u)$$

This is set to zero for finding the minimum of $D(X_U)$, resulting a system of $|V_U|$ linear equations: $\frac{y^T (D - W) y}{y^T D y}$

$$2 B^T x_m + 2 L_u x_u = 0 \Rightarrow L_u x_u = -B^T x_m$$

Where x_M : 1 for the label under consideration, and 0 for all other labels

Experimental Result

Both the methods have been implemented in MATLAB and it is observed that the results for normalized cut are quite good although high computational complexity is a drawback. Normalized cut produces better results in practice because it takes into account both similarity within groups as well as dissimilarity across groups.

Conclusion

Image segmentation is a preliminary step towards image analysis, recognition and understanding. Image segmentation needs perceptual and cognitive knowledge. It has a large number of techniques and a wide range of applications. There are many approaches and techniques. Each method tries to solve a different case. A graph theoretic framework using graph partition method as a criterion is considered here and the comparative study of its two methods – normalized cut method and random walker method – is done. Normalized cut method takes into account both similarity within groups as well as dissimilarity across groups. Both the methods are used to minimize the graph cut but normalized cut method is more better and efficient.

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A Comparative Study of Quantum Cryptography over Traditional Key Exchange Methods

Dr Jitender Rai

Associate Professor, Department of Computer Science,
Tecnia Institute of Advanced Studies, GGSIPU, University
E mail: jitender12rai@gmail.com,

ABSTRACT

This research paper focused on the comparative study of quantum cryptography is an effort to allow two users of a common communication channel to create a body of shared and secret information. This information, which generally takes the form of a random string of bits, can then be used as a conventional secret key for secure communication. It is useful to assume that the communicating parties initially share a small amount of secret information, which is used up and then renewed in the exchange process, but even without this assumption exchanges are possible. The main comparison of quantum cryptography over traditional key exchange methods is that the exchange of information can be shown to be secure in a very strong sense, without making assumptions about the intractability of certain mathematical problems. Existing cryptographic techniques are usually identified as "traditional" or "modern." Traditional techniques were designed to be Simple, and if they were to be used with great secrecy extremely long keys would be needed. The main practical problem with secret-key encryption is determining a secret key. So in this study we mention the various Comparative key features related to our security key as per using traditional keys.

Keywords: Security keys, cryptography techniques, traditional key, conventional secret key.

1.1 INTRODUCTION

The Cryptology, the mathematical science of secret communications, has a long and distinguished history of military and diplomatic uses dating back to the ancient Greeks. Today, the ability to ensure the secrecy of military or diplomatic communications is as vital as ever, but cryptography is also becoming more and more important in everyday life. With the growth of computer networks for business transactions and communication of confidential information there is an ever increasing need for encryption to ensure that this information cannot be acquired by third parties[1]. Remarkably, the seemingly unrelated philosophical foundations of quantum mechanics are now being brought to bear directly on the problem of communications security in the potentially practical emerging technology of quantum cryptography. In this paper we shall review study of quantum cryptography.

1.2 HISTORY OF RESEARCH WORK

The Quantum cryptography was first recommended by Stephen Wiesner in the early 1970s. The plan was issued in 1983 in Sigact News, and at the same time two scientists Bennet and Brassard, familiar with the idea of Wiesner, were ready to issue their own ideas. Then In 1984, they delivered the first quantum cryptography protocol called the "BB84.[4]" The protocol is provably secure, depending on the quantum property that information gain is only possible at the expense of disturbing the signal if the two states we are trying to distinguish are not orthogonal. The first experimental prototype based on this was made in 1991. It functioned over a distance of 32 centimeters. Over time, the technology has been improved and the distance extended to kilometers.

Heisenberg's uncertainty principle ensures that the eavesdropper's activities must produce an irreversible change in the quantum states ("collapse of the wave function") before they are retransmitted to the intended recipient. These changes will introduce an anomalously high error rate in the transmissions between the sender and intended recipient, allowing them to detect the attempted eavesdropping. Thus, the two important security features of QKD are that eavesdroppers cannot reliably acquire key material, and any attempt to do so will be detectable. The origins of quantum cryptography can be traced to the work of Wiesner, who proposed that if single-quantum states could be stored for long periods of time they could be used as counterfeit-proof money. Wiesner eventually published his ideas in 1983, but they were of largely academic interest owing to the impracticality of isolating a quantum state from the environment for long time periods. However, Bennett and Brassard realised that instead of using single quanta for information storage they could be used for information transmission. In 1984 they published the first quantum cryptography protocol BB84A further advance in theoretical quantum cryptography took place in 1991 when Ekert proposed that Einstein-Podolsky-Rosen (EPR) entangled two-particle states could be used to implement a quantum cryptography protocol whose security was based on Bell's inequalities. Also in 1991, Bennett and collaborators demonstrated that QKD was potentially practical by constructing a working prototype system for the BB84 protocol, using polarized photons. In 1992 Bennett published a "minimal QKD scheme ("B92") and proposed that it could be implemented using single-photon interference with photons propagating for long distances over optical fibers[7].

1.3 PROCESS OF QUANTUM CRYPTOGRAPHY

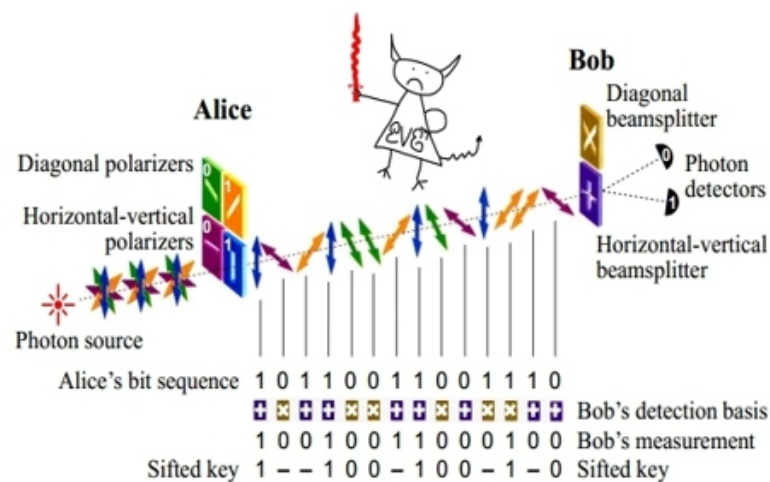


Figure 1.1 Working Architecture of Quantum Cryptography

In the figure 1.1 you may have heard the term BB84 Protocol and wondered how it worked. For example Alice uses a light source to create a photon. The photon is sent through a polarizer and randomly given one of four possible polarization and bit designations Vertical (One bit), Horizontal (Zero bit), 45 degree right (One bit), or 45 degree left (Zero bit). The photon travels to Bob's location. Bob has two beam splitters, a diagonal and vertical/horizontal - and two photon detectors. Bob randomly chooses one of the two beam splitters and checks the photon detectors. The process is repeated until the entire key has been transmitted to Bob. Bob then tells Alice in sequence which beam splitter he used. (1) Alice compares this information with the sequence of polarizers she used to send the key (2) Alice tells Bob where in the sequence of sent photons he used the right beam splitter. (3) Alice tells Bob where in the sequence of sent photons he used the right beams splitter. (4) Now both Alice and Bob have a sequence of bits (sifted key) they both know. All in all, a pretty cool way of securely transferring an encryption key between two different locations.

1.4 SECURE COMMUNICATIONS BASED QUANTUM

Secure Communication based on Quantum Cryptography (SECOQC) is a project that aims to develop quantum cryptography. Christian Monyk, the coordinator of SECOQC, said people and organizations in Austria, Belgium, the United Kingdom, Canada, the Czech Republic, Denmark, France, Germany, Italy, Russia, Sweden, and Switzerland would participate in the project. On October 8, 2008 SECOQC was launched in Vienna. Quantum cryptography, usually known as Quantum Key Distribution (QKD) provides powerful security. But it has some limitations.

Following no-cloning theorem, QKD only can provide 1:1 connection. So the number of links will increase $N(N-1)/2$ as N represents the number of nodes. If a node wants to participate into the QKD network, it will cause some issues like constructing quantum communication line. To overcome these issues, SECOQC was started. SECOQC network architecture can be divided into two parts: trusted private networks and quantum networks connected via QBBs (Quantum Backbones). The private networks are conventional networks with end-nodes and a QBB. Each QBB enables quantum channel communication with another QBB and consists of a number of QKD devices that are connected with other QKD devices over 1-to-1 connections. From this, SECOQC can provide easier registration of new end-node in QKD network, and quick recovery from threats on quantum channel links [8].

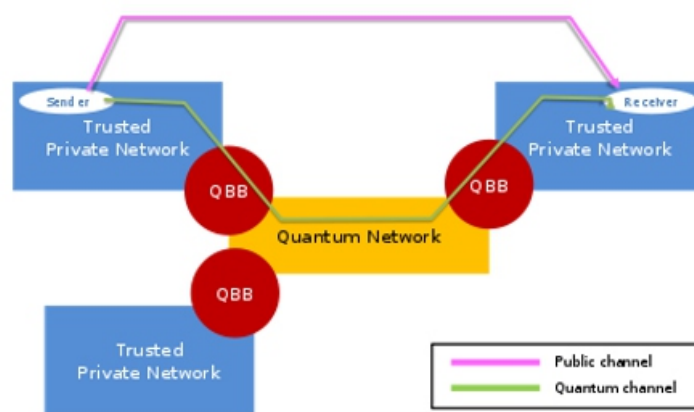


Figure 1.2 Quantum Network

1.5 TRADITIONAL KEY EXCHANGE METHOD

Key exchange (also known as "key establishment") is any method in cryptography by which cryptographic keys are exchanged between two parties, allowing use of a cryptographic algorithm. If sender and receiver wish to exchange encrypted messages, each must be equipped to encrypt messages to be sent and decrypt messages received.

Example 1 Diffie–Hellman Key Exchange

The crucial part of the process is that Alice Diffie–Hellman Key Exchange establishes a shared secret between two parties that can be used for secret communication for exchanging data over a public network. The following conceptual diagram illustrates the general idea of the key exchange by using colors instead of very large numbers. The process begins by having the two parties, Alice and Bob, agree on an arbitrary starting color that does not need to be kept secret (but should be different every time[8]); in this example the color is yellow. Each of them selects a secret color—red and aqua

respectively—that they keep to themselves and Bob now mix their secret color together with their mutually shared color, resulting in orange and blue mixtures respectively, and then publicly exchange the two mixed colors. Finally, each of the two mix together the color they received from the partner with their own private color. The result is a final color mixture (brown) that is identical to the partner's color mixture. If another party (usually named Eve in cryptology publications, Eve being a third-party who is considered to be an eavesdropper) had been listening in on the exchange, it would be computationally difficult for that person to determine the common secret color; in fact, when using large numbers rather than colors, this action is impossible for modern supercomputers to do in a reasonable amount of time.

1.6 TRADITIONAL KEY EXCHANGE CRYPTOGRAPHIC EXPLANATIONS

The simplest and the original implementation of the protocol uses the multiplicative group of integers modulo p , where p is [prime](#), and g is a [primitive root modulo \$p\$](#) . These two values are chosen in this way to ensure that the resulting shared secret can take on any value from 1 to $p-1$. Here is an example of the protocol, with non-secret values in blue, and secret values in red.

1. Alice and Bob agree to use a modulus $p = 23$ and base $g = 5$ (which is a primitive root modulo 23).
2. Alice chooses a secret integer $a = 6$, then sends Bob $A = g^a \bmod p$
 - o $A = 5^6 \bmod 23 = 8$
3. Bob chooses a secret integer $b = 15$, then sends Alice $B = g^b \bmod p$
 - o $B = 5^{15} \bmod 23 = 19$
4. Alice computes $s = B^a \bmod p$
 - o $s = 19^6 \bmod 23 = 2$
5. Bob computes $s = A^b \bmod p$
 - o $s = 8^{15} \bmod 23 = 2$
6. Alice and Bob now share a secret (the number 2).

Both Alice and Bob have arrived at the same value s , because, under mod p ,

$$A^b \pmod{p} = g^{ab} \pmod{p} = g^{ba} \pmod{p} = B^a \pmod{p}$$

Note that only a , b , and $(g^{ab} \bmod p = g^{ba} \bmod p)$ are kept secret. All the other values – p , g , $g^a \bmod p$, and $g^b \bmod p$ – are sent in the clear. Once Alice and Bob compute the shared secret they can use it as an encryption key, known only to them, for sending messages across the same open communications channel. Of course, much larger values of a , b , and p would be needed to make this example secure, since there are only 23 possible results of $n \bmod 23$. However, if p is a prime of at least 600 digits, then even the fastest modern computers cannot find a given only g , p and $g^a \bmod p$. Such a problem is called the discrete logarithm problem¹The computation of $g^a \bmod p$ is known as modular exponentiation and can be done efficiently even for large numbers.

1.7 CONCLUSION

The basic conclusion of Quantum cryptography is different from traditional cryptographic systems in that it relies more on physics, rather than mathematics, as a key aspect of its security model. Essentially, quantum cryptography is based on the usage of individual particles/waves of light (photon) and their intrinsic quantum properties to develop an unbreakable cryptosystem essentially because it is impossible to measure the quantum state of any system without disturbing that system. It is theoretically possible that other particles could be used, but photons offer all the necessary qualities needed, their behavior is comparatively well-understood, and they are the information carriers in optical fiber cables, the most promising medium for extremely high-bandwidth communications.

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A Compilation of Case Studies Multimedia and K-12: How e-Learning Companies Can Help

SNEHA SINGH

ABSTRACT

In India, according to Census 2011, the population in the school going age amounts to 354 million. The importance of this figure can be realized from the fact that this equals 29% of the total Indian population. Further, the Indian Budget 2014-15 announced a sum of USD 11.5 billion to be granted to the HRD Ministry along with its stress on its initiatives towards 'Digital India' (Ministry of Finance). In effect, Kindergarten to Class 12th, commonly known as K-12, has attracted a huge investment. By now, existing players in the market have already addressed 37% of the private schools (Anvekar & Sugant, 2014). Many private e-Learning companies stepped up with their innovative multimedia softwares seeing the rising opportunity in the K-12 market. To name a few, the competitive profile in the K-12 Market comprises Educomp, Everonn Education, Extramarks Education, Next Education and HCL Learning. Schools now highlight their partnerships with such e-Learning companies striving to prove their notch above the others.

1.1 INTRODUCTION

When studying the offerings of these companies, a recognizable pattern can be observed in them. These may be designed to assist the teachers inside the classroom in the form of digital storytelling, and even outside, in the form of online excel sheets. The multimedia offerings of these companies can be recognized to exhibit features classifying them to into one or more of the patterns mentioned:

- 1. Inside the classroom:** These are the means which assist the teachers in emphasizing the topics being taught, and in having a lasting impact on the students. These take the form of digital lectures, visual and interactive content, digital storytelling, etc.
- 2. Outside the Classroom, in Administering the Processes:** These assist the Teachers in increasing their productive hours. The efforts devoted for preparing report cards, attendance etc can be delegated to the automating softwares and the teachers can re-route their efforts towards those “Inside the Classroom”.

- 3. Data Analysis- Investing in the students:** Data on weak areas of a student can be collected from the pattern of his performances in the online tests. This can help in personalization of lessons/tests for student and can help the teachers provide psychometric services, for those again “Inside the Classroom”.

This study aims to consolidate these patterns in which the eLearning companies are assisting the teaching pedagogies in the form of case studies, with each case study reflecting a pattern mentioned above.

Case 1: Inside the Classroom

Oxford dictionary defines a classroom as “a room where a group (or a class) of students or pupils are taught”. Traditionally, this meant the presence of a teacher and a group of students in the classroom, a book, a chalk, a blackboard and a duster. But today, this definition has been extended by the participants in the K-12 market and it now also includes a projector, a computer, a mouse, a tablet, a VSAT network, an e-book and many innovative multimedia contents to facilitate learning.

One of the pioneers in this field of digital literacy in India, Everonn Education, was founded in 1986. With the revenue of Rs 43.57 crore (Everonn Education., 2014), it has the world's largest VSAT educational network.

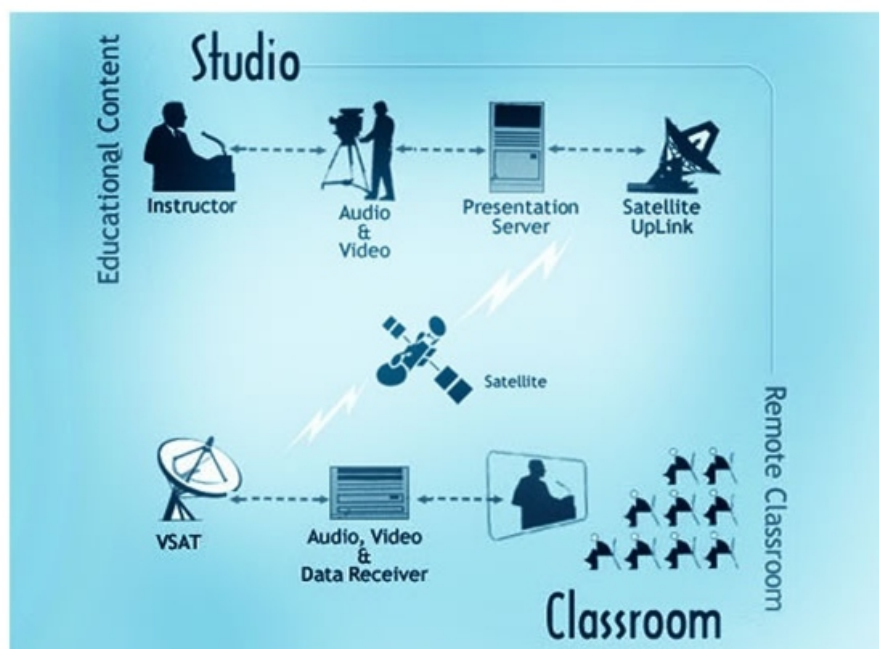


Fig 1.1: Everonn Education VSAT Network (Sourced from Hughes India Case Study)

This network best suits the education system in Indian environment. This is because infrastructural development has not yet been able to set its foot into remote locations of the Indian geography, where the central and state government schools have. Everonn Education has entered into a PPP (Public-Private-Partnership) with Indian state governments and it offers solutions like digital and computer literacy, innovative multimedia content for assisting the existing teaching pedagogies and training projects for teachers/headmasters/ headmistresses (Everonn Education., 2014). The content it offers for enhancement of learning is also available in local language, be it in the form of digital storytelling or in the form of books in the local language. It also pioneers for instructor-led training sessions by providing trained full-time instructors for imparting computer education. The satellite network model helps Everonn Education cross geographical boundaries and thousands of students can connect with the best academicians and peers in a single virtual classroom. Dial-ups and technological advancements enable interactive sessions even in such virtual classrooms. Thus, Everonn has been able to spread its expanse over remote areas of Gadchiroli, Maharashtra and Rajasthan as well.

Everonn Education also runs its own K-12 CBSE school in the name of Everonn Public School, now known as GEMS Public School. Its focus on digital literacy is evident in its school programs where there are chapter-wise online content for the students as well as the teachers. These contents include e-books, visual aids, interactive sessions, animations and many more. Missed lectures and visual aids when students are absent from the class can be viewed online later. The assignments can be uploaded from home which is a step towards paperless education. These also aid the teachers in easy assessments of the tests.

Everonn also offers an e-Learning Portal under the brand name of “Classontheweb.com”. This portal provides many different sections for students to choose from, namely, Curriculum Courses (NCERT and other state boards), Board Exam preparation, preparation for Olympiads and NTSE tests, online test series, video lectures, newsletters, with special emphasis on maps which are best viewed and studied visually.

The company's performance however, varies proportionately with the policies of the government. The IP protection laws, policies towards education and policies towards technology along with fast changing technology have the potential to largely impact the revenue and other performance aspects of the company. Nonetheless, the company with such far reaching geographical expanse and with the shield of its philanthropic arm named VGF (Varkey GEMS Foundation) is helping millions in changing their lives (Everonn Education, <http://www.everonn.com>).

Case 2: Outside the Classroom, in Administering the Processes

A teachers' responsibility is not limited only to disseminating knowledge in the classroom. His responsibilities also include preparing report cards, maintaining attendance records, balancing the lecture's session to meet the needs of both average and fast learners, fee collection, informing the students about the syllabi/schedule of examinations, administering fee collection and that the students reach school/home on time and many more. If such responsibilities are designated to some other department, the teachers save on their time. This time can be utilized in arranging better content for the classroom. But, some people will have to be specially hired to take up the new responsibilities. Also, if the teacher is unaware of some processes like those of evaluating assessments, he will not be able to know about the students who need special attention in areas where they do not perform well. As a result, digitization or automation of such administering processes in a way that the teacher saves time, but can still keep an eye on outcomes proves to be a better alternative. The e-Learning companies today are offering many services which cater to this opportunity in the K-12 market. One of such companies is Next Education India Pvt Ltd.

Founded in 2007, Next Education India Pvt Ltd is a Hyderabad based private limited company earning a revenue of Rs 150 crore (Khetarpal, S., 2014). Figure 2.1 elaborates the bouquet of the offerings of Next Education India Pvt Ltd in the K-12 segment of the market.



Fig 2.1: Bouquet of offerings of Next Education India Pvt Ltd (Sourced from Company Website, Nest Education., n.d., <http://www.nexteducation.in>)

TeachNext is a classroom solution of the digital form which comprises of features classifying it in the “Inside Classroom” pattern. The solution includes interactive content, different forms of student assessment in the classroom, mapping content to syllabi etc.

LearnNext is the learning platform for individual students. This solution offers curious innovative students with the knowledge in the field of their choice. It facilitates students enhance their self-learning in the direction of their desired goals.

NextLabs in the form of ScienceLab, MathsLab, RoboticsLab and EnglishLab focus on knowledge enhancement of young and budding scientists in the individual fields of interest.

NextERP, the Next Education's, a customizable school management offering, provides a variety of services catering to the automation of school management processes. It is a cloud based solution with AWS (Amazon Web Services) at its core. The solution comprises of a well-designed Report Cards, Attendance, Fee Collection and many other modules. The solution also provides a seamless connectivity between teachers, students, parents and the management staff such that any relevant information can be communicated to individual parents/students/teachers or broadcasted to all in the form of SMSs, as and when required.

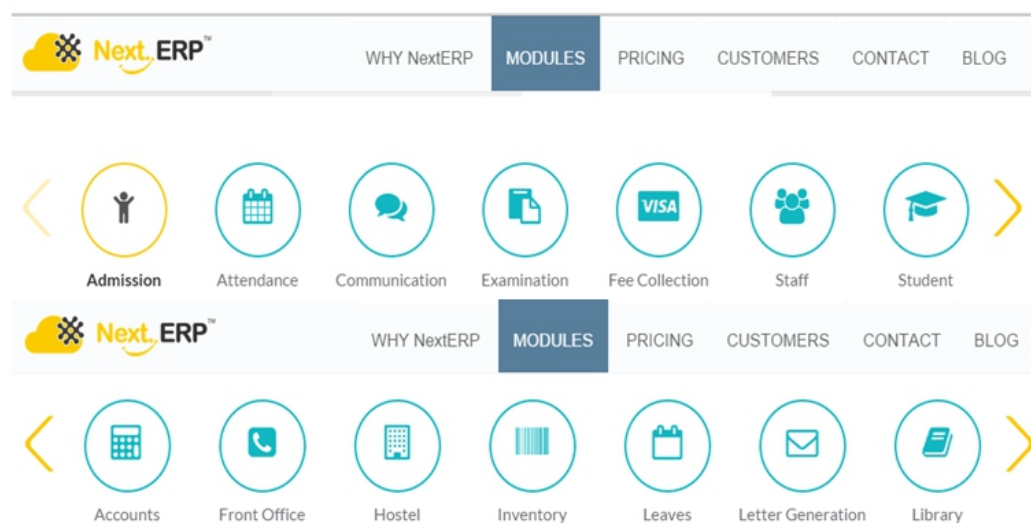


Fig 2.2: Modules of NextERP (Sourced from Company Website, NextERP., n.d., <http://www.nexteducation.in>)

The Next ERP module for Attendance is based on individual logins into the portals provided to the students and teachers. Logins are considered to be counted as attendance, if a specified amount of time is spent on the portal as well as if the specified content is accessed. Students who miss the class for any reasons, can access the content from their homes as well and their virtual attendance is counted.

The attendance, virtual attendance and leaves for each student can also be observed in the form of dashboards and can be used to identify patterns in the reasons for leaves, time spent on each content etc. The module for Report Cards collects information about the student online evaluations/ assessments available with its Student and Examination modules, and needs offline information about the same to prepare the report cards of the students in the specified format. The consolidated information can be used to study the individual year-on-year performances of the students, their performance in individual subjects etc. The same can also be used to study the strong areas of the students, of the individual classes and of the entire school.

The module for fees facilitates effective communication to students and parents on the last dates for fee submissions, provides the break-up of fee structure, reflects advance fee collected etc. The direct communication with parents removes the necessity of teachers' involvement in the fee collection.

Parents can also trace their students while commuting from their homes to their schools and vice-versa. This has been made possible by the GPS-enabled tracker provided by NextERP, which again eliminates the necessity of involving the teachers in the same.

With a customer base of 6500 private schools, NextEducation is experiencing an increasing demand of its innovative services from the schools in non-metro regions as well. However, the company's focus remains majorly on private schools and even cherry-picking from among them to stay profitable. The company faces immense competition in this segment with peers like Educomp (customer base of nearly 15000 schools in India) being able to earn a revenue of Rs 237.21 crores, a figure nearly 1.6 times higher than its own. Nonetheless, it has been able to bag Ind-Ra rating of BBB- with a stable outlook as compared to Educomp's rating of BBB- with a negative outlook (Ind-Ra Ratings, n.d.) and has set examples of how teachers can be assisted outside the classroom so that they are able to tend the budding academicians attending lectures inside the classroom.

Case 3: Data Analysis- Investing in the Students

Educomp, a leader by revenue in the K-12 market, earns a revenue of Rs 237.21 crore, was founded in 1994. Educomp's bouquet of offerings comprises of solutions for digitization of classrooms (Educomp **smartclass**TM), online portals for assisting teachers and students in the class (online **smartclass**TM), online labs for special focus on specific subjects (**smartclass**TM lab), online mentor for English Tutorials etc (Educomp., n.d.). But one of its solutions, **Educomp INSIGHT** is based upon a very unique concept. This solution assists the students in exploring different fields and identifying their areas of interests, which are then strengthened and given a shape for achieving a competency in these areas.



Fig 3.1: Educomp's Bouquet of Offerings in the K-12 Market (Sourced from Company website)

Educomp INSIGHT has been developed as a systematic and structured solution to be implemented in three different stages. In each stage, the students are made to appear through various assessments and tests. The results of these tests are used to identify their strong areas and even the areas where they need more attention. Based on this identification of their strong and weak points, each student is provided with personalized study materials. Based on these, the students are further re-evaluated and their progress in the same is identified.

The different phases in which the solution provides INSIGHT (Educomp Annual Report., 2014) are:

- **The Inspire stage:** The focus of this phase is on students of classes 3 to 6. This stage functions with an objective of motivating the students to learn and explore their interests in various subjects and areas.
- **The Nurture stage:** This stage focuses on the students of classes 7 to 10. The students in this stage are evaluated on their aptitudes and abilities in different subjects. The students of this stage are shaped and enabled to consolidate the concepts they learn.
- **The Excel stage:** The focus of this stage is on students from classes 11 and 12. The evaluations and assessments of this stage enable the students to excel in the fields of their choice. The students are assisted in the preparation for their board exams and for the entrance examinations of their preferred colleges.
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Every individual is unique and Educomp INSIGHT is thus investing in this individuality of the students. The evaluations and assessments, study materials and dashboards (graphs, pie charts etc) reflecting the progress etc are all customized. The teachers are the ones who interact with their students the most and that too, regularly in their classrooms. They are already informed about the students' leaves, their health, their response during interactive lectures. This knowledge combined with the insights provided by Educomp INSIGHT can work wonders. The teachers will be empowered to provide the perfect blend of knowledge to the students, which the students can relate. After all, sitting among them are the budding academicians of our future!

Conclusion

A teacher's role is not only limited to teaching the students, but it also involves taking their attendance, preparing their report cards, and assisting the students in their weak areas, monitoring their performance, conducting parents-teachers meet etc. The e-Learning companies are helping the teachers in each of the above activities with the help of their multimedia offerings. Inside the classroom, these companies provide multimedia content, audio and visual aids to assist the teachers' in emphasizing the lessons being taught. Outside the classroom, these e-Learning companies are providing automation softwares to prepare report cards, to mark online attendance, to conduct tests etc. In this way, the teachers can save their time which they use to devote to such administering processes and can re-route the time saved towards better classroom experience, activities and lectures for the students. These e-Learning companies are also providing a platform for analytics on students' data so that each student's year-on-year performance can be monitored and improved by providing customized learning aids for each one of them. Thus these multimedia offerings are helping the teachers' in investing in the future of the students, be it inside the classroom or outside or be it their year-on-year performances.

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Open Sources Tools in Web Mining Method

A. Seshagiri Rao¹ & Dr. P. Venkatraman²

¹Research Scholar, Sathyabama University, Chennai, India.

²Prof, Dept. of CSE, Sathyabama University, Chennai, India.

ABSTRACT

This paper aims to focus about web mining research direction, open source tools and their several applications to the commercially supported users. The World Wide Web is a huge, information center for a variety of applications. Web contains a dynamic and rich collection of hyperlink information. It allows Web page access, usage of information and provides numerous sources for data mining. Web mining is a research topic which combines two of the activated research areas: Data Mining and World Wide Web. It give the superficial knowledge and comparison about data mining. This paper describes the current, past and future direction of web mining. Here we introduce online resources for retrieval Information on the web i.e. web content mining, and the discovery of user access patterns from web servers, i.e. web usage mining that improve the data mining drawbacks. Furthermore cloud mining is a future of web mining.

Keyword- *Web Mining, Web Content Mining, Web Structure Mining, Web Usage Mining*

1 INTRODUCTION

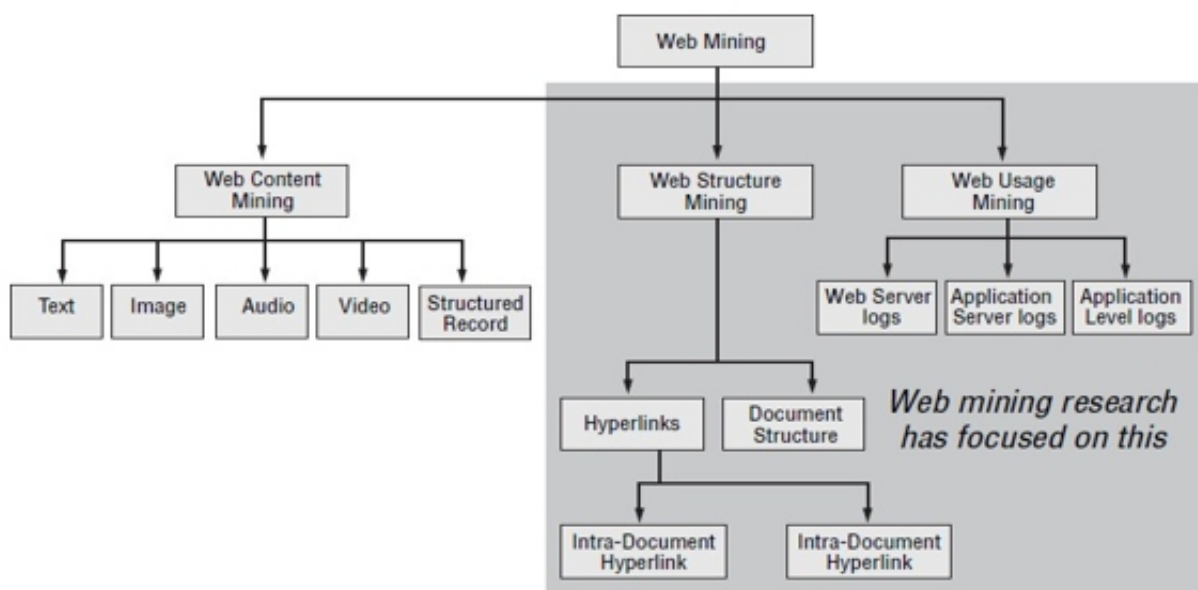
The term Web Mining is a technique used to crawl through various web resources to collect required information, which enables an individual or a company to promote business, understanding marketing dynamics, new promotions floating on the Internet, etc. There is a growing trend among companies, organizations and individuals alike to gather information through web data mining to utilize that information in their best interest. The Web is changing fast over time and so is the users interaction in the Web suggesting the need to study and develop models for the evolving Web Content, Web Structure and Web Usage. World wide web is a enormous amount of widely dispersed, interconnected, beneficial and dynamic hypertext information. It has used in different needs of us in various stages like communication, business, entertainment and so on. Web data mining is not only focused to gain business information but is also used by various organizational departments to make the right predictions and decisions for things like business development, work flow, production processes and more by going through the business models derived from the data mining. Web data mining technology is opening avenues on not just gathering data but it is also raising a lot of concerns related to data security. There is loads of personal information available on the internet and web data mining had helped to keep the idea of the need to secure that information at the forefront.

II WEB MINING

Web mining aims to discover useful information or knowledge from the Web hyperlink structure, page content, and usage data. Although Web mining uses many data mining techniques, it is not purely an application of traditional data mining due to the heterogeneity and semi structured or unstructured nature of the Web data. Many new mining tasks and algorithms were invented in the past decade. Based on the primary kinds of data used in the mining process, Web mining tasks can be categorized into three types: Web structure mining, Web content mining and Web usage mining.

Two different approaches were taken in the web mining.

- i) **“process-centric view”** - defined web mining as a sequence of tasks.
 - ii) **“data-centric view”** - types of web data that was being used in the mining process.
1. Resource finding: It is used to extract the data from online text resources available on web.
 2. Information selection and pre-processing: This process transforms the original retrieved data into information.
 3. Generalization : Individual web sites as well as across multiple sites.
 4. Analysis: It involves the validation and interpretation of the mined patterns.



Taxonomy of web mining

Web Content Mining:

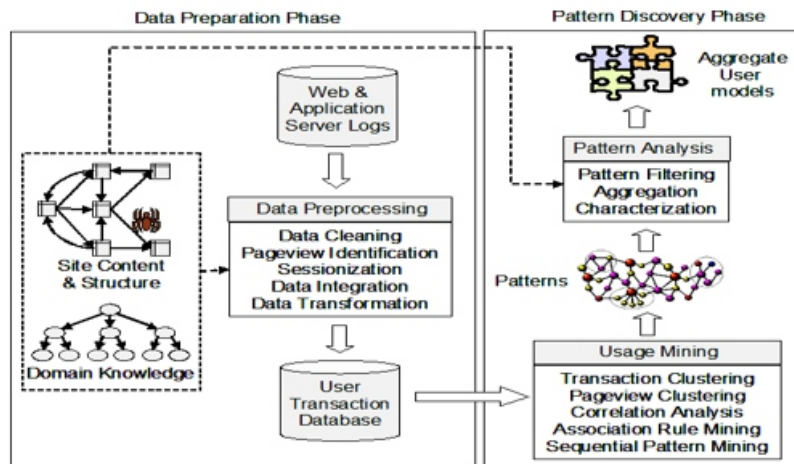
Web content mining is also known as text mining is generally the second step in Web data mining. Content mining is the scanning and mining of text, pictures and graphs of a Web page to determine the relevance of the content to the search query. Content mining provides the results lists to search engines in order of highest relevance to the keywords in the query. Web text mining is very effective when used in relation to a content database dealing with specific topics. For example online universities use a library system to recall articles related to their general areas of study. The ability to conduct Web content mining allows results of search engines to maximize the flow of customer clicks to a Web site, or particular Web pages of the site, to be accessed numerous times in relevance to search queries.

Web Structure Mining:

Web structure mining, one of three categories of web mining for data, is a tool used to identify the relationship between Web pages linked by information or direct link connection. This structure data is discoverable by the provision of web structure schema through database techniques for Web pages. Structure mining uses minimize two main problems of the World Wide Web due to its vast amount of information. The first problems is irrelevant search results and another one is inability to index the vast amount of information provided on the Web. The main purpose for structure mining is to extract previously unknown relationships between Web pages. This structure data mining provides use for a business to link the information of its own Web site to enable navigation and cluster information into site maps.

Web Usage Mining

This type of web mining allows the collection of Web access information for Web pages. This usage data provides the paths leading to accessed Web pages. This information is often gathered automatically into access logs via the Web server. CGI scripts offer other useful information such as referrer logs, user subscription information and survey logs. This category is important to the overall use of data mining for companies and their internet/ intranet based applications and information access.



Process of usage mining

Web Mining				
	Web Content Mining		Web Structure Mining	Web Usage Mining
	IR view	DB View		
View of Data	-Unstructured -Structured	-Semi Structured -Web Site as DB	-Link Structure	-Interactivity
Main Data	- Text documents -Hypertext documents	-Hypertext documents	-Link Structure	-Server Logs -Browser Logs
Representation	-Bag of words, n-gram Terms, phrases, Concepts or ontology -Relational	-Edge labeled Graph, -Relational	-Graph	-Relational Table -Graph
Method	-Machine Learning -Statistical (including NLP)	-Proprietary algorithms -Association rules	-Proprietary algorithms	-Machine Learning -Statistical -Association rules
Application Categories	-Categorization -Clustering -Finding extract rules -Finding patterns in text	-Finding frequent sub structures -Web site schema discovery	-Categorization -Clustering	-Site Construction -adaptation and management -Marketing, -User Modeling

Classification Web Mining

Analysis of this pertinent information will help companies to develop promotions that are more effective, internet accessibility, inter-company communication and structure, and productive marketing skills through web usage mining.

III. WEB MINING RESEARCH METHODS

1. Ranking Metrics-for Page Quality and Relevance

Searching the web involves two main steps are there Extracting the pages relevant to a query and ranking them according to their quality. Ranking is important as it helps the user look for “quality” pages that are relevant to the query. Different metrics have been proposed to rank web pages according to their quality. We have two type of prominent ones Page rank and Hubs and Authorities.

2. Robot Detection and Filtering

It provide a human and nonhuman web behavior .Web robots are software programs that automatically traverse the hyperlink structure of the web to locate and retrieve information. The importance of separating robot behavior from human behavior prior to building user behavior models has been illustrated. First, e- commerce retailers are particularly concerned about the unauthorized deployment of robots for gathering business intelligence at their web sites. Another, web robots tend to consume considerable network bandwidth at the expense of other users. Sessions due to web robots also make it difficult to perform click- stream analysis effectively on the web data. Conventional techniques for detecting web robots are based on identifying the IP address and user agent of the web clients. While these techniques are applicable to manywell -known robots, they are not sufficient to detect camouflaged and previously unknown robots. classification based approach that uses the navigational patterns in click-stream data to determine if it is due to a robot. Experimental results have shown that highly accurate classification models can be built using this approach. Furthermore, these models are able to discover many camouflaged and previously unidentified robots.

3. Information Scent-Appling Foraging Theory to Browsing Behavior

It is used for snippets of information present around the links in a page as a “scent” to evaluate the quality of content of the page it points to, and the cost of accessing such a page. The key idea is to model a user at a given page as “foraging” for information, and following a link with a stronger “scent.” The “scent” of a path depends on how likely it is to lead the user to relevant information, and is determined by a network flow algorithm called spreading activation. The snippets, graphics, and other information around a link are called “proximal cues.” The user's desired information need is expressed as a weighted keyword vector. The similarity between the proximal cues and the user's information need is computed as “proximal scent.” With the proximal cues from all the links and the user's information

need vector, a “proximal scent matrix” is generated. Each element in the matrix reflects the extent of similarity between the link's proximal cues and the user's information need. If enough information is not available around the link, a “distal scent” is computed with the information about the link described by the contents of the pages it points to. The proximal scent and the distal scent are then combined to give the scent matrix. The probability that a user would follow a link is then decided by the scent or the value of the element in the scent matrix.

4. User Profiles- Understanding How Users Behavior

The web has taken user profiling to new levels. For example, in a “brick-and mortar” store, data collection happens only at the checkout counter, usually called the “point-of-sale.” This provides information only about the final outcome of a complex human decision making process, with no direct information about the process itself. In an on-line store, the complete click- stream is recorded, which provides a detailed record of every action taken by the user, providing a much more detailed insight into the decision making process. Adding such behavioral information to other kinds of information about users, for example demographic, psychographic, and so on, allows a comprehensive user profile to be built, which can be used for many different purposes. While most organizations build profiles of user behavior limited to visits to their own sites, there are successful examples of building web-wide behavioral profiles such as Alexa Research⁶ and DoubleClick⁷. These approaches require browser cookies of some sort, and can provide a fairly detailed view of a user's browsing behavior across the web.

5. Interestingness Measures- When Multiple Sources Provide Conflicting Evidence

One of the significant impacts of publishing on the web has been the close interaction now possible between authors and their readers. In the preweb era, a reader's level of interest in published material had to be inferred from indirect measures such as buying and borrowing, library checkout and renewal, opinion surveys, and in rare cases feedback on the content. For material published on the web it is possible to track the click-stream of a reader to observe the exact path taken through on-line published material. We can measure times spent on each page, the specific link taken to arrive at a page and to leave it, etc. Much more accurate inferences about readers' interest in content can be drawn from these observations. Mining the user click-stream for user behavior, and using it to adapt the “look-and-feel” of a site to a reader's needs was first proposed. While the usage data of any portion of a web site can be analyzed, the most significant, and thus “interesting,” is the one where the usage pattern differs

significantly from the link structure. This is so because the readers' behavior, reflected by web usage, is very different from what the author would like it to be, reflected by the structure created by the author. Treating knowledge extracted from structure data and usage data as evidence from independent sources, and combining them in an evidential reasoning framework to develop measures for interestingness.

6. Preprocessing- Making Web Data Suitable for Mining

The Preprocessing of web data to make it suitable for mining was identified as one of the key issues for web mining. A significant amount of work has been done in this area for web usage data, including user identification and session creation, robot detection and filtering and extracting usage path patterns. dissertation provides a comprehensive overview of the work in web usage data preprocessing. Preprocessing of web structure data, especially link information, has been carried out for some applications, the most notable being Google style web search.

7. Online Bibliometrics

Web having become the fastest growing and most up to date source of information, the research community has found it extremely useful to have online repositories of publications. online makes them more easily accessible than offline. Such online repositories not only keep the researchers updated on work carried out at different centers, but also makes the interaction and exchange of information much easier. With such information stored in the web, it becomes easier to point to the most frequent papers that are cited for a topic and also related papers that have been published earlier or later than a given paper. it helping researchers to explore new areas. Fundamental web mining techniques are applied to improve the search and categorization of research papers, and citing related articles.

8. Visualization of the World Wide Web

Mining web data provides a lot of information which can be better understood with visualization tools. It is possible with pure textual representation. Hence, there is a need to develop tools that provide a graphical interface that aids in visualizing results of web mining. Analyzing the web log data with visualization tools has evoked a lot of interest in the research community. An interactive web log visualization tool that is designed to display the user browsing pattern on the web site at a global level, and then display each browsing path on the pattern displayed earlier in an incremental manner. The support of each traversal is represented by the thickness of the edge between the pages. Such a tool is very useful in analyzing user behavior and improving web sites.

IV PROMINENT APPLICATION

Past few years has led to the web applications being developed at a much faster rate in the industry than research in web related technologies. Many of these are based on the use of web mining concepts, even though the organizations that developed these applications.

1. Web Search--Google

Google is one of the most popular and widely used search engines. It provides users access to information from over 2 billion web pages that it has indexed on its server. The quality and quickness of the search facility makes it the most successful Search engine. Earlier search engines concentrated on web content alone to return the relevant pages to a query. Google was the first to introduce the importance of the link structure in mining information from the web. Page Rank, which measures the importance of a page, is the underlying technology in all Google search products, and uses structural information of the web graph to return high quality results. The Google toolbar is another service provided by Google that seeks to make search easier and informative by providing additional features such as highlighting the query words on the returned web pages. Google's web directory provides a fast and easy way to search within a certain topic or related topics. The advertising program introduced by Google targets users by providing advertisements that are relevant to a search query. One of the latest services offered by Google is Google News. It integrates news from the online versions of all newspapers and organizes them categorically to make it easier for users to read "the most relevant news." It seeks to provide latest information by constantly retrieving pages from news site worldwide that are being updated on a regular basis.

2. Web-Wide Tracking

"Web-wide tracking," is an individual across all sites he visits, is an intriguing and controversial technology. It can provide an understanding of an individual's lifestyle and habits to a level that is unprecedented, which is clearly of tremendous interest to marketers. Example- DoubleClick Inc.

3. Understanding Web Communities-(AOL)

It is One of the biggest successes of America Online (AOL) has been its sizeable and loyal customer base. A large portion of this customer base participates in various AOL communities, which are collections of users with similar interests. AOL provides them with useful information and services.

Over time these communities have grown to be well-visited waterholes for AOL users with shared interests. Applying web mining to the data collected from community interactions provides AOL with a very good understanding of its communities, which it has used for targeted marketing through advertisements and e-mail solicitation. Recently, it has started the concept of “community sponsorship,” whereby an organization, say Nike, may sponsor a community called “Young Athletic Twenty Some things.”

4. Ebay

The genius of eBay's founders was to create an infrastructure that gave this urge a global reach, with the convenience of doing it from one's home PC. E-bay has detailed data on bid history, participant rating, bid data, usage data. In addition, it popularized auctions as a product selling and buying mechanism and provides the thrill of gambling without the trouble of having to go to Las Vegas. All of this has made eBay as one of the most successful businesses of the internet era. eBay is now using web mining techniques to analyze bidding behavior to determine if a bid is fraudulent. Recent efforts are geared towards understanding participants' bidding behaviors/patterns to create a more efficient auction market.

5. Personalized Portal for the Web—My Yahoo

Yahoo is an one of the search engine. Yahoo was the first to introduce the concept of a “personalized portal,”

i.e. a web site designed to have the look-and-feel and content personalized to the needs of an individual end-user. Mining My Yahoo usage logs provides Yahoo valuable insight into an individual's web usage habits, enabling Yahoo to provide personalized content, which in turn has led to the tremendous popularity of the Yahoo web site.

6. V-TAG Web Mining server-can notate Technologies:

The web mining server supports information agents that monitor, extract and summarize information from web sources. It is easily to set up graphical user interface. Automation of tracking and summarizing helps businesses and enterprises to analyse the various processes easily.

V FURTHER RESEARCH DIRECTION

Web and its usage grows, it will continue to generate ever more content, structure, and usage data, and the value of web mining will keep increasing. To develop a web mining technologies that will enable this value to be realized.

A) Process Mining

Mining of market basket data, collected at the point-of-sale in any store, has been one of the visible successes of data mining. However, this data provides only the end result of the process, and that too decisions that ended up in product purchase. Click-stream data provides the opportunity for a detailed look at the decision making process itself, and knowledge extracted from it can be used for optimizing, influencing the process, etc. it has conclusively proven the value of process information in understanding users' behavior in traditional shops. Research needs to be carried out in (1) extracting process models from usage data, (2) understanding how different parts of the process model impact various web metrics of interest, and (3) how the process models change in response to various changes that are made, i.e. changing stimuli to the user. Example-online shopping.

B) Web Mining and Privacy

There are many benefits to be gained from web mining, a clear drawback is the potential for severe violations of privacy. Public attitude towards privacy seems to be almost schizophrenic, i.e. people say one thing and do quite the opposite. For example, famous cases like those involving Amazon and Double click seem to indicate that people value their privacy, while experience at major e-commerce portals shows that over 97% of all people accept cookies with no problems, and most of them actually like the personalization features that are provided based on it. The research issue generated by this attitude is the need to develop approaches, methodologies and tools that can be used to verify and validate that a web service is indeed using user's information in a manner consistent with its stated policies.

C) Fraud and Threat Analysis

The anonymity provided by the web has led to a significant increase in attempted fraud, from unauthorized use of individual credit cards to hacking into credit card databases for blackmail purposes. Example is auction fraud, which has been increasing on popular sites like eBay.

Since all these frauds are being perpetrated through the internet, web mining is the perfect analysis technique for detecting and preventing them. Research issues include developing techniques to recognize known frauds, characterize them and recognize emerging frauds. The issues in cyber threat analysis and intrusion detection are quite similar in nature.

D) Web Services Performance Optimization

These services over the web continue to grow, there will be a continuing need to make them robust, scalable and efficient. Web mining can be applied to better understand the behavior of these services, and the knowledge extracted can be useful for various kinds of optimizations. The successful application of web mining for predictive prefetching of pages by a browser has been demonstrated. It is necessary to do analysis of the web logs for web services performance optimization. Research is needed in developing web mining techniques to improve various other aspects of web services.

VI. WEB MINING PROS AND CONS

PROS: Web usage mining essentially has many advantages which makes this technology attractive to corporations including the government agencies. This technology has enabled e-commerce to do personalized marketing, which eventually results in higher trade volume.

CONS: This technology when used on data of personal nature might cause concerns. The most criticized ethical issue involving web usage mining is the invasion of privacy. Privacy is considered lost when information concerning an individual is obtained, used, or disseminated, especially if this occurs without their knowledge or consent.

VII. OPEN SOURCE TOOLS

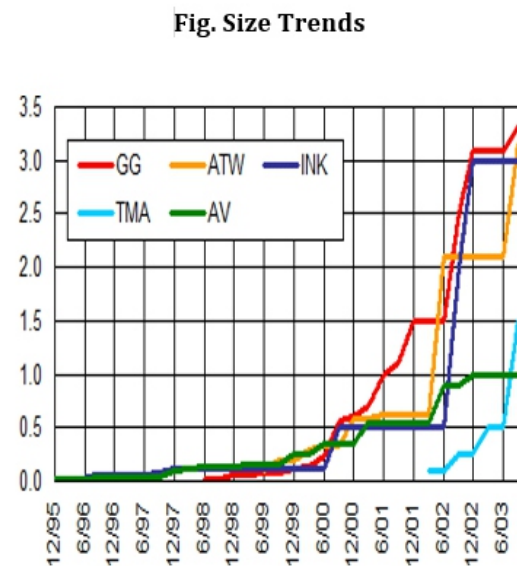
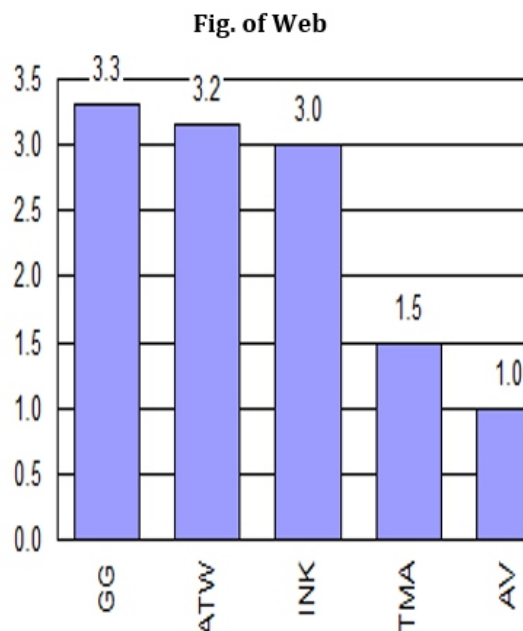
Web data mining tools vendors DMOZ, Kdnuggets also has a list is categorized commercial or free. Two very well-known industry vendors are SAS and COGNOS. Bixo is an open source web mining toolkit that runs as a series of Cascading pipes on top of Hadoop. By building a customized Cascading pipe assembly, you can quickly create specialized web mining applications that are optimized for a particular use case Bixo is an open source project released under the Apache License, Version 2.0.

Bixo Tool: Bixo is a major tool of web mining. Bixo consists of a number of Cascading Operations and Subassemblies, which can be combined to form a data processing workflow that (typically) starts with a set of URLs to be fetched, and ends with some results extracted from parsed HTML pages.

Fetch Subassembly	Component where the heavy lifting is done.
Parse Subassembly	Used to process the fetched content. It uses Tika to extracting text from various formats.

VIII WEB SIZE

- ❑ Some 80% of Web pages are in English
- ❑ About 30% of domains are in .com



IX. BENIFTS OF WEB MINING

- ❖ Personalization
- ❖ collaborative filtering,
- ❖ customer support enhance
- ❖ Product and service strategy in marketing
- ❖ Marketing and fraud detection

X. APPLICATION OF WEB MINING

- ❖ Information retrieval search on the web
- ❖ Network management

XI. ISSUES IN WEB MINING

- ❖ It contain very large data set on Web
- ❖ It cannot be mine on single server
- ❖ How to organize hardware and software to mine in multi-tera byte data sets?

XII. CONCLUSION

Today Web mining growth is continuously to increase. Web mining is one of the most important applications of data mining. It is having its own benefits and successful applications with which we can overcome the problems or difficulties faced in data mining. Usage of the internet in the present day is growing in faster rate, the personalization process of the web mining provides us a great opportunity of maximizing the efficient usage of the internet. Web mining in future growing online shopping activities, e-services industry and e-commerce are important domains. For Counter terrorism, many challenges are needed yet to be addressed to make data mining to become a useful tool. Research is to be carried out is to explore the semantic Web structure in the Web for getting benefits in many areas of the industries. Web mining enables us to screen specific data through content mining, to discover the structural summary of web sites through structure mining and to predict the behaviour and interaction of the surfers' with the web through usage mining and encompass a broad range of issues. Towards this goal, in this paper, we proposed a definition of web mining, research direction and benefits of web mining, and web mining taxonomies. We identified some of the issues and problems in this area that may require further research and development. Web mining is applied to various fields E-Commerce, Information filtering, Fraud detection Education and research.

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Impact of Social Networking In Dynamic Conditions

Vikas Verma¹ & Sunil Dhawan²

¹Department of Computer Applications, Chandigarh Business School, Landran

²Research Scholar, Department of Computer Science, NIMS University, Jaipur

ABSTRACT

In this paper, we discuss the impact of social websites on society as a whole with 17-25 age group in particular. Social networking websites like Facebook and twitter etc. have their positive as well as negative impacts on their users. The 17-25 age group is the most active age group on social networking. Finding through research suggests that it's doing more bad than good. The primary goals are being hampered due to the activity time being utilised on these websites. The time that can be utilised surfing for various areas of education and technology is wasted on these websites which have become a common phenomenon these days especially teenage students. Findings provide us information regarding how the internet usage pattern has changed. Social networking being just a small internet application a few years ago today is one of the most prominent applications on internet.

Keywords: *Social Networking, Internet Usage, Impact of Social Networking*

1 INTRODUCTION

In the four decades since its inception, the Internet has driven dramatic change. It has enabled flows of information, including entertainment, news, and financial and academic material. It has brought people closer together by enabling various forms of interpersonal communication, notably e-mail, instant messaging, video conferencing, and social networking. And it has allowed consumers to purchase virtually anything at any time, while providing producers with direct access to a wide range of markets. Furthermore, the Internet is a bustling industry, spurred by entrepreneurship and supported by a variety of industries and large enterprises. Online productivity tools and communications advancements provide benefits to almost all enterprises and governments. The Internet has helped governments to broaden their services to citizens and improve their delivery. In a very short period, it has become difficult for most of us to imagine a world without instant and continuous access to the Internet.

A large number of people started using social networking sites for fun sake or just being connected to their friends and family but now it has taken another dimension. Internet is a very big evolution of technology but when we talk about the social networks it is extremely dangerous for youth and become enormously common and widespread in past few years[1].

The phenomena of social network is quite simple to understand, it is a web based facility which allows individual user to build a profile identity and generate subjective associations and connections among himself and list of other friends and communicate with them at a central location [2]. Although social network can be used for good purposes but it is generally used for involvement of digital snapshots, illuminating demographic material and information, exposing securities, and conducting online conversations, because many communities motivate user for this kind of inappropriate actions [3] and these communities has almost spoiled the image of social networks. In late 1990's social network born with Web 2.0 introducing features of blogging and posting with the website named six degrees.com (1997) which allows user to create profiles and make friends, later it come up with new features in year 2003 a new face of social networks linkedin.com and myspace.com but in year 2003 facebook.com and orkut.com change the total concept of social networks in the history of social media and web sciences, it changes the definition of social networks. After year 2003 social networks were very much advance with new features, by new features the user even can change the whole front end appearance of the website on his profile which is a step for evolution.

2. REVIEW OF SOCIAL NETWORKS

We have used two most prominent networks Facebook and Twitter for the research purposes. First we would look at these social networking websites and their users.

Facebook: Facebook first went online for social networking in February 2004, from a college dormitory at Harvard. It was initially restricted to Harvard students until expanding first to area colleges, then all colleges, and eventually the world. Facebook currently has expanded to over 500 million users, surpassing MySpace in registered users and web traffic. Myspace allows its users to customize their own profile page and provide status updates similar to Facebook. It provides its users with the option of adding music and multimedia to a user's profile page, which is a feature Facebook does not allow. Myspace is essentially a single webpage devoted to the user which can be used to communicate with friends. Both sides allow a user to post comments to friends. Perhaps the reason Facebook became more successful was due to its simplicity of operation and greater continuity throughout user profiles.

Twitter: The idea of Twitter takes the concept of Facebook and simplifies it further. What sets Twitter apart from both Facebook and Myspace is that it only allows users to post up to 120 character comments. This equates to faster, easier message reading. Users can read four tweets in the time it would take to read one Facebook comment. A Twitter even has a simpler profile page which shows the

users tweets in large font on the left of the page, while displaying followers on the right. Traditional Facebook or Myspace profiles display what can be an intimidating amount of information. This “ease of use” may help Twitter to grow in the future.

Potential Benefits: Sixty percent of adults maintain a profile on a social networking site, and 70% read blogs and tweets (Galagan,). Social media has expanded from a small communication portal between students to an advertising gateway for business. Scott Cooley argues in an article titled “Social Networks and Facebook”, that people can go on Facebook and read wall posts to get a sense of the reputation of a person. Cooley says that if a company has a large Facebook following it will increase his chances of doing business with them. Many businesses will actually search a person's name on Facebook before considering them for hire.

Companies big and small alike have also created fan pages to better promote their business. A Facebook fan page has become an important relationship builder with clients. The site has become the new marketing strategy, replacing older types of advertising. With a fan page, companies can draw in Facebook users providing a brief summary of the operations of the business. If the user likes what they see, it is then possible to follow a link to the business website for more information. The best part, a fan page is free.

Colleges and Universities are also leaving traditional brochure and letter sending methods for the more favourable online approach. Colleges have discovered that prospective students are more likely to respond to a counsellor who attempts to contact through a networking site like Facebook.

Potential Hazards:

1. Impersonation: Does the social networking account (e.g., Twitter Account) belong to the actual person or company it is representing? For example, if you look at the Twitter account johnsileo, you will see that my name is used to send business to a gentleman who is also an identity theft speaker. My actual account is john_sileo. Whether this is considered social networking squatting or social networking identity theft, it's impersonation.

2. Ownership: Who owns the data on the social networking sites' servers? Do you own what you post on Facebook, what you email through GoogleMail or the financials you backup off- site on someone else's servers? The fact that you don't know should trouble you as much as it does me.

3. Breach: How is your social networking site protecting your profile and posting data? Are they susceptible to bots like ZombieSmiles that allow hackers into your Facebook profile through Facebook's own client interface? Is it easy for a hacker to post something or appeal to your friends as if the hacker is actually you (account takeover impersonation)?

4. Fraud: Social networking is based in relationships of trust. You trust the people you befriend. Unfortunately, some studies suggest that 25 percent of the users accept friend requests from total strangers. This, along with account takeover impersonation, opens you up to “friend in distress” scams, information gathering and other forms of social networking fraud.

5. Disclosure: We are far bolder and far less discretionary with what we share online versus what we share in person. This means we risk giving out information that, given a second thought, we didn't want to. Think of the New York Times reporters who tweeted about a closed-door meeting where they discussed charging for online content.

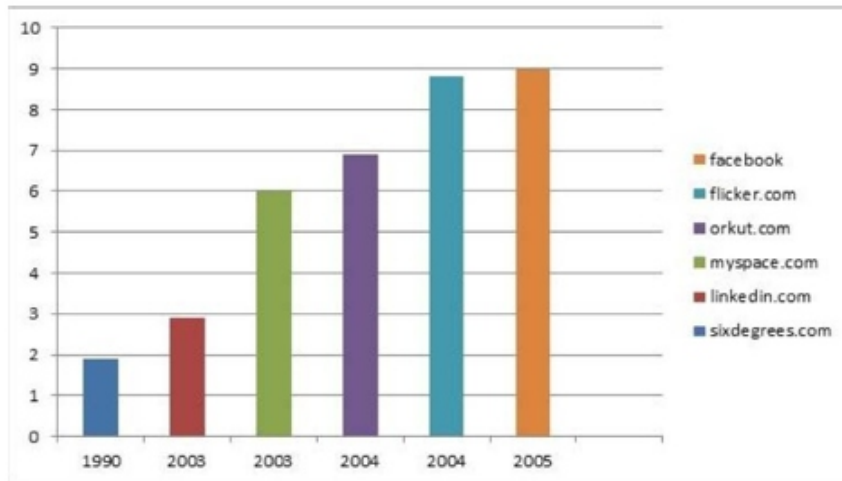
6. Human Error: Have you ever hit the button on an email that was meant to go to someone else? The same phenomenon happens on social networking sites, but the damage is exponential because of the medium—you might have just sent it to hundreds or thousands of followers or friends. I call this phenomenon Tweet Breach.

7. Underestimation: Because social networking started out as a personal application and still has the flavour of being controlled by individuals (as opposed to corporations), we often underestimate the sheer destruction caused by mishandling this tool. I believe that this is what happened to the military. They originally underestimated the data leakage taking place in the social networking sphere and have since, wisely, begun to rethink their strategy. Until we recognise that anything posted on the internet (especially if social networking is involved) is public, permanent, and admissible in court, we will continue to underestimate the hazards of social networking.

3. ANALYSIS AND FACTS

Social Networks Web Popularity

Following are the graphs describing the effective social networks and how much presence is there on the internet.

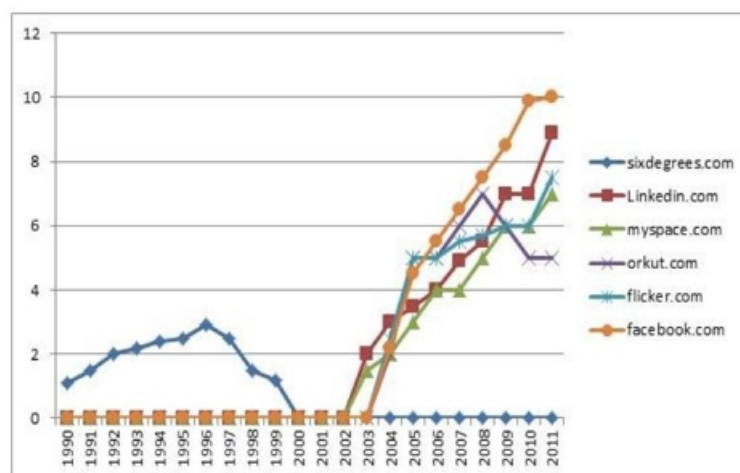


Popularity Factor of Social Networking Sites

As we can clearly see the picture describes Facebook and Flickr are the most popular websites. Thus it clearly mentions its impact out of the 500 billion users who use social networking websites. This graph uses 1 to 10 level index system for ascertaining the impact of social networks and out of those which are the networks which have maximum impact.

Social Networks Usage Index

The following graph shows the usage and growth of different social networks. The index used here is a 12 point index shows the sustained growth of the different networks. The history of the social networks is plotted and it's growth can be plotted. It has been seen that we have conducted their growth analysis in a way that the suffixed growth of their impact factor is not ignored.



Here we can clearly see the actual timeline of different social networks. The social networks that constantly update their interface are continuously growing compared to the networks like six degrees don't have impact due to the changing conditions. One of the most important facts that are being highlighted by conducting the analysis the amount of users involved in social networks is on a constant or at a growing rate that is certainly exponential. The users base has grown multi fold for companies like Facebook and twitter. There is also growth in no. of hours i.e. Average time spend by a particular person on social networks multiplied by no. of users.

Impact of Social Networks on Education: Education is very essential part of an individual's life for every teenager education is more important than anything. Technology has shown a fast development by producing small communication devices but these small communication devices can be used for accessing social networks any time anywhere, these devices include pocket computers, laptops, iPads and even simple mobile phones (which support internet) etc. Technology is step towards betterment, no doubt but any technology which can provide ease of social networks can be dangerous for social network addicts. Providing ubiquitous facility of social networks is a straight invitation of addiction to any teenager and even an adult, as academic satisfaction is not enough for those students who suffers from social isolation [4]. Social networks use support of difference implicit applications by virtue of which it grabs the attention of students and increase the number of users. The applications include games, advertisements, and other online activities like online live television etc. User can use these applications free, so that's why gaming freaks and addicts use to play these games without any installation and any other formality any time anywhere, these free of cost pleasure destruct students from their education, and they do not concentrate on their education. As all of the applications are based on 2D screen play so by watching long time same screen could cause high blood pressure and anxiety which could be dangerous for education and health. According to survey students do not take their meals on time and do not sleep on time which causes a very non serious attitude with education. All they need after addiction is use of social networks. When they use social networks they feel like in heaven but this addiction kills their inner self confidence for ever. Becoming addict of social networks feels like you have so many friends but in real all of the contacts are virtual contacts. This act of going far from your family, friends, teachers and other associations could be very much dangerous for life and education. It changes the mindset of student completely like fantasies. This virtual life of student destructs his thoughts from education towards other activities and by living inside fantasy world student slowly starts to hate educated life and studies. One of very common action performed by almost every user on social networks is eavesdropping. It is phenomenon of understanding the other users by spying their profiles, actions, likes, comments and other activities performed [5]. Social networking websites obligate a very negative impression people of every age including teenagers, young adults and adults are continuously attracted towards social networks, international and national jurisdiction must take action against social networking websites.

Conclusion and Future Work: Youth is raising their voice against social acts like violation of Human Rights, corruption etc. These social networking sites are proving themselves an advantage at least in bringing opinion of people on these social issues. Youth are getting more aware about the social issues mainly from Facebook. But instead of getting the knowledge the youth generally don't discuss them, they just share it or like it and the issue just remains focused on web only. Most of the people think that youth can play a positive role in changing our society which is represented in most of the responses to different queries. These social networking sites are proving themselves a boon at least in bringing thoughts of people on these social issues. It is also being generated from the information so obtained that people are getting more aware about the social issues mainly from Facebook. But instead of getting this knowledge the people generally don't discuss them and if they do, they just sign off the sites after discussion and the issue just remains focused on web only. Social networking websites have become essential need today, but it should not be motivated at all. It could ruin the future of teenagers and children and it had a very bad impact on education as it is discussed above. There is no third party or any other community which could check for what actions are being performed by which user, so it is strongly recommended to check children's activities on social networks and don't let them use social networking websites.

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