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Aims and Scope

Global Journal of Advanced Computer Science & Technology deals with information technology, its evolution and future prospects and its relationship with the Business Management. It addresses technological, managerial, political, economic and organizational aspects of the application of IT in relationship with Business Management. The journal will serve as a comprehensiveresource for policy makers, government officials, academicians, and practitioners. GJACST promotes and coordinates the developments in the IT based applications of business management and presents thestrategic roles of IT and management towards sustainable development.

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Point of Single Contact - The Key to Obtain Cross- Country Interoperability of Medical Data

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A B S T R A C T

Electronic communication of clinical data between various healthcare providers existing in different countries seems crucial for a cost-effective patient treatment in nowadays when mobility is the most important aspect of our lives, when there are no barriers between countries. In order to meet the growing need for improved data communications, it is necessary to overcome the barriers of methodology, software heterogeneity and security of medical data in cross-institutional shared care communication. This paper analysis how interoperability of medical data, cross-countries in EU, may be achieved using the most important government project existing in all European countries: Point of Single Contact (PSC). We will take in consideration only medical data provided by public providers of medical services, they could be easily connected to PSC. Hospital information system must generate the same template of documents in order to generate the same documents in all medical fields (ex. Cardiology, Dermatology, Pediatrics, etc.) and this is the point of the beginning of achieving interoperability of medical data. The other very important issue of managing the medical records is how we store a huge amount of information, Cloud Computing being the easiest way for solving this problem.

Keywords- Interoperability of medical records, Cloud Computing, PSC, HL7/CDA, PKI

I. INTRODUCTION

Point of Single Contact (PSC) at the beginning was just a central communication office, phone number or website that channeled all incoming messages to the appropriate destination. Later, this idea was used to create, at the European level, the European PSC, which is used nowadays only for business activities. The businesses are able to complete the whole cycle of procedures and formalities related in order to access and accomplish their service activities without having to contact any institutional interlocutors other than the PSC [1].

Looking further in the near future, the medical services can be included in the object of PSC.

Medical data are provided by the medical services, all these data being very important for the medical services providers in order to take the best therapeutically decision and to minimize the costs of medical services (ex. a patient had to have a surgery at his knee in other country than his own, in order to make the intervention, the doctor had to perform a magnetic resonance imaging (MRI) at the injury knee, but the

patient already have a MRI from his own country. The doctor can use the existing MRI and this means the money spent for this procedure are saved and the time of decision for the doctor is shorter).

The main important attribute of medical data must be availability. So data must be ready to be used by all authorized personal, therefore it is mandatory to maintain the integrity of information stored in all forms and its confidentiality.

Another important point is represented by data backup and recovery process. Cloud computing is the key for the "storage". Cloud computing, defined by NIST (National Institute of Standards and Technology) [2] is a technology that supports ubiquity, it is convenient, supplies on demand access to the network for sharing computing resources (e.g., networks, servers, storage, applications and services), can be launched and developed quickly with minimal management and without service provider interaction". Cloud computing supports interoperability, but interoperability must be achieved by using standards world wide accepted, such as HL7/CDA (Health Level Seven /Clinical Document Architecture) for documents and DICOM (Digital Imaging and Communications in Medicine) for images.

II.INTEROPERABILITY MODEL THROUGH PSC

Using PSC-s, the medical data (provided by public hospitals) can be easily exchanged between EU countries (starting December 2009 all EU countries had to implement PSC) (Figure 1).

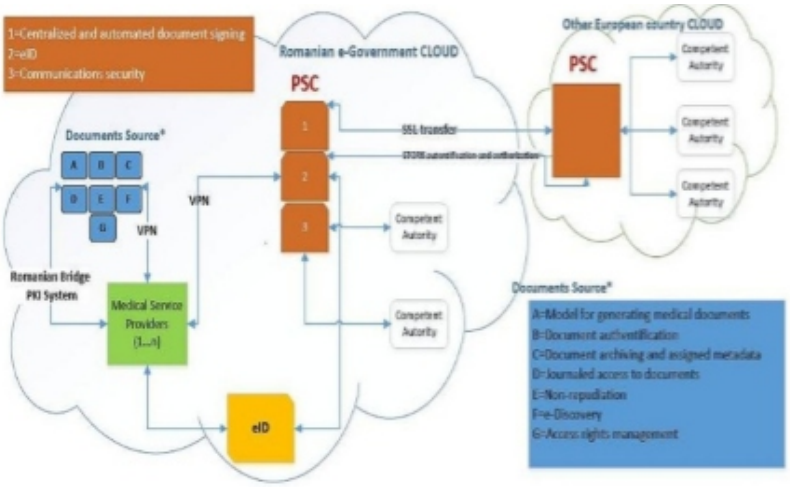

Fig. 1 - Interoperability model through PSC

In order to make this exchange of medical data a success we must accomplish these objectives:

A. Establish a model for generating all medical documents

That means that it is imperative to use HL7/CDA standard. CDA has three levels of document definition:
Level 1: root hierarchy and the most unconstrained version of document
Level 2: additional constrains on document via templates at the "Section" level
Level 3: additional constrains on the document at the "Entry" level and optional additional constrains at the "Section" level. [3]

CDA is based on Extensible Markup Language (XML) and it uses HL7's RIM (Reference Information Model) witch puts data in a clinical or administrative context. CDA uses the coding systems such as SNOMED CT (Systematized Nomenclature of Medicine - Clinical Terms) and LOINC (Logical Observation Identifiers Names and Codes) and allows Electronic Health Record's (EHR) and other health IT systems to process documents, while also let the authorized personal easily read them on web browsers and mobile devices.

There is another way to create templates for medical documents in all medical specialties and this is Info Path. InfoPath is a software application developed by Microsoft witch is used to create templates for electronic forms containing structured data. Templates had to have:

- One primary data source (for submitting)
- Multiple secondary data source (for retrieving data info form), they must be created in such way so they can be accessed through a web- service.

B. Resolving the problem of authentication of medical documents.

When a healthcare provider generates medical documents regarding one patient, the documents must be signed and stamped by the doctor, in order to certify that the documents have been created by that only doctor (on each stamp it exists a code which give uniqueness to his signature). On electronic documents it must be used the electronic signature and electronic stamp in accordance with the last EU recommendations. Electronic signatures are provided and certified by the Public Key Infrastructure (PKI) system. The role of PKI is to make possible the secure transfer of information, through PKI enabled SSL (Secure Sockets Layer) certificates. SSL is a protocol for transmitting private documents and it uses a cryptographic system that uses keys to encrypt data. [4]

The best architecture of PKI is the one who has o two-tier Certificate Authority (CA) architecture consisting of one Root (Self-Signed) and one Issuing (Subordinate) CA. The Root CA system is

connected only to the Issuing CA. The link is not permanent, being used only when the Issuing CA has to renew the authority certificate or when the Root has to issue the Certificate Revocation Lists. Attached to the Root CA is the Hardware Security Module (HSM), a piece of hardware specifically designed to safely store the Authority private key. The same module can be used for private key archiving, mandatory when the PKI is issuing encryption certificates. [5]

In Romania, the electronic signature is authorized and verified by the Romanian Bridge PKI system and uses cross-certification process and involves the following steps: application, submit documentation, mapping policies, technical interoperability testing, approval of the application, and the negotiation of an agreement, cross certification.

C. Ensure the accuracy and archiving of the medical documents.

The PKI system has the ability to generate automatically an electronic signature for every single document that enters in the system, nobody can modify/guarantee the signature than the system itself. It is an automatically signature with an unqualified certificate which is recognized only in the interior of the process. It is very important that the metadata (witch are in fact keywords) to be assigned to the documents. Filtering through metadata makes much easier for someone to locate a specific document.

D. Journaling the access to the medical documents Confidentiality of medical records is a right of the patient. This right must be respected also in on-line management of medical data and this is why it is very important to know at every moment who accessed the medical file where, why and when.

There are two entities that can access medical records in this system:

1. Medical providers – every accessing of that medical document is made by authorized personal, identified by the system, and it remains in a journal.

2. Administrators of the system – for witch, in order to increase the confidentiality of the data, are necessary second authorization methods. There are, beside usernames and passwords, many other methods of securing the access to the system (for example: a cod which is sent by email, OTP-one time password, etc.)

Handwritten signature based authentication represents a very easy and safe way of securing the access to the system, it has a software component –authentication through handwritten signature and hardware equipment called "electronic pen".

Processing server component works as a web service and ensure compatibility with Notebook equipment, built on .NET 3.0 technologies WCF (Windows Communication Foundation). Besides the existence of a server component is mandatory to exist a sub- component - client acquisition module signature, built in Active X technology. The main function of this module (Active X) is to acquire data from the electronic pen. It can exists in two ways: registration and verification of signatures. When set on recording mode will purchase between 5 and 10 signatures. In check mode is purchase a single signature.

Handwritten signature recognition computer system is interactive and has methods for the acquisition and processing of bio kinetic information associated signature, in order to assess the authenticity of the handwritten signature dynamic. Biometry invention has applications in the field of behavior in situations where there is interest the user to validate the expression of the will's own handwritten signature.

E. Non –repudiation

It is possible through the verification of electronic signature by the PKI system. This means that the providers of medical services cannot deny the service that they decided to be the best for the patient at that moment when they interact with the patient. The non- repudiation system is described in the scheme below. (Figure 2)

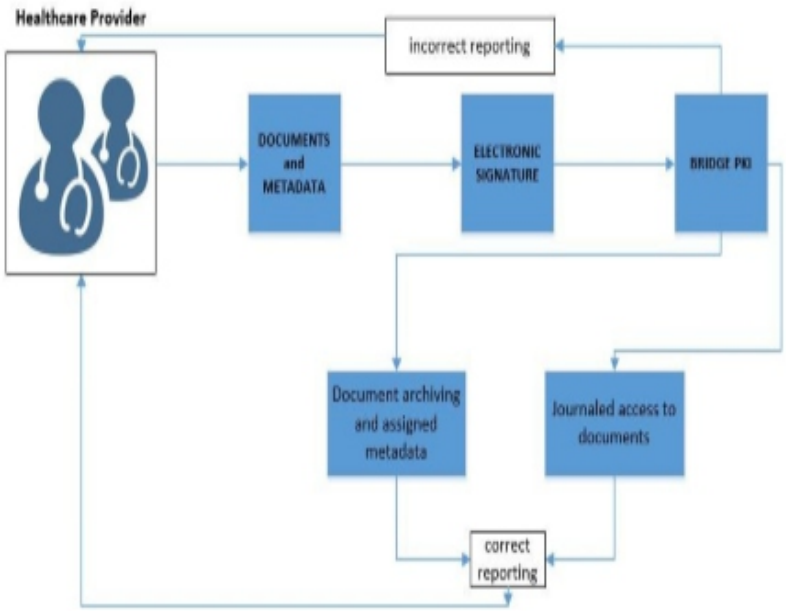

Fig. 2 - The non-repudiation system scheme

There is another way to transfer the medical data, which is functional in Germany, and is an example for how the transfer could be made, the method is called DE-mail. It is a German E-Government

communication service through the exchange of documents is possible and is secure. The government specifies legal and technical requirements for this service, but not provides it, private companies provide this service after an official certification process. It has secure login procedures, encrypted transport routes and secure send and receive confirmation enable secure and verifiable electronic communication.

F. e Discovery

Electronic information are different from paper ones because are not tangible in form or volume persistence and they are always accompanied by metadata. This is why it is very difficult to decide who the documents belong when the owner of the documents disappears.

In medical field, TRUST is the keyword for the patient to choose the medical provider. Trust in his medical ability, in his way of being there when you need it, and to maintain confidentiality. That is why the patient should trust in his medical provider to decide to whom he should transfer the medical records in case of his disappearance. After the owner is not active anymore the documents must be transferred automatically to the one who has a signed assignment.

But when we refer to medical documents (patients information) - the patient has the right to know, even from the beginning of his collaboration with the medical provider, to whom his information will be transferred in case of his actual medical provider does not exist anymore, and to sign a document of agreement.

G. Access rights management

The administrators will perform the access rights administration. They should take care of the confidentiality of medical data (the authentication of the administrators was described at point D).

Formal access rights administration for users consists in four processes [6]:

1. An enrollment process to add new users to system
2. An authorization process to add, delete or modify authorized users to operating systems application, directories, files and specific type of information
3. An authentication process to identify the users during subsequent activities
4. A monitoring process to oversee and manage the access rights granted to each user on the system.

All medical service providers will form groups; each group will represent a medical field (cardiology, dermatology, etc.) and it will be a group account for every medical field. A group account is a collection

of users and/or other groups. These groups are used to simplify management as a change in the access rights assigned to a group automatically applied to all users in the group. A user does not have to belong to any group, but often belongs to several.

The access rights are: read-only, write and read, full, and administrator right.

As is described in figure 1 scheme, in PSC there are three important issues that must be achieved, otherwise the interoperability scheme cannot be complete.

1) Represents the model of centralized and systematized way of signing the documents (this model was described at point B)
2) Represents the e ID provider. The e ID represents a means for entities that manifests in Electronic space, to identify them electronically and with the available information (identity, role, access etc) to obtain access to information or services supplied by electronic means. Identity allows an entity to be distinct from any other entity. Electronic identity management system is not necessarily a monolithic application, but rather a series of tasks performed by multiple software components and technologies.

Resource Owners have the ability to define and implement criteria based on identity data that will be used to grant and revoke access to resources. The electronic identity management system can be seen or done as a centralized or distributed applications that manage identities and mappings between them and the roles that a person using an electronic identity, has in different environments and information systems.

In Romania the e ID is based on the model of registration of persons in the National Registry of Person Evidence (RNEP) of the Ministry of Administration and Internal Affairs (Department for Persons Records and Database Administration) is strengthened at national level and on the modality single existing at the moment of identifying people who currently is provided by Personal Identification Number - PIN, and must be provided by the same entity (Ministry of Administration and Intern Affairs).
3) Represents the security of communication (all medical data are encrypted) between all the participants of this system and are transmitted via VPN.

The transfer of medical data between Romanian PSC and other European country PSC is possible because of the European project implemented in 2009 named STORK (Secure Identity Across Borders Linked). STORK is a European project whose aim is to achieve interoperability of electronic identifiers

in all European countries. It concerns the interchanging of personal data across borders, it specifies the data and the messages to be interchanged and guarantee that interchanged data are usable in the destination country.

It specifies what common functionalities of European e ID Interoperability are implemented in every country and are described also the specific functionalities for each country.

CONCLUSION

This paper represents a strategy for achieving interoperability of medical data through PSC. It can be applied at governmental level and only for public healthcare providers and make possible the interoperability only in EU, because the legislation and the flows are already established.

It still remains the problem of private healthcare providers, but I think it will be easy to connect both, private and public providers through EHR, a project that is under implementation in Romania right now.

ACKNOWLEDGMENT

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Evaluation of Data Transmission Using Parameters in Normal and Covert Mode in Vanets

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A B S T R A C T

Security is an importance issue in wireless networks resembling VANETS scenario because these networks are mobile and these are more lying in the front of attacks. So, to protect the data from the eavesdroppers a technique proposed in which data is being transmitting by using normal mode and covert mode in the same communication scenario so that it is unable to detect by the attacker about the data mode . In this paper, these two modes analyzed by using parameters like End to End Delay, Packet Drop, Packet Drop and Packet Delivery ratio (PDR) and Throughput individually. This analysis done with the help of NS2 simulator.

Keywords— Covert Mode, Normal Mode, VANET, PDR.

I. INTRODUCTION

N VANETS, for the intention of security a new scenario established in it which normal data and secure data both are transmitting over the same communication channel. In this way, the attacker will not detect the type of data because the mode of data (i.e. Normal mode or Covert mode) is not fixed, it is dynamically changes by the sender, If the sender wants to send normal data he/she will choose normal mode and if the sender wants covert data he/she will choose covert mode by selection of bits '0' or '1' randomly. The effectiveness of both the modes in transmission of data checked by using parameters named as End to End Delay, Packet Drop, Packet Delivery ratio and throughput. The formulas which are required in analysis of above parameters listed below in Table I.

Table I [8]. Formulas Used

S. No	Parameter Name	Formula Used
1.	End To End Delay	Delay of data = Time taken to send the data + Time taken to process the data + Time taken for the delivery of data
2.	Packet Drop	Packet Drop = Packet Transmitted – Packet Delivered
3.	PacketDelivery Ratio	Packet Delivery Ratio = ∑ Number of packets received/∑ Number of packets sent * 100
4.	Throughput	Throughput = ∑ (Traffic received – Traffic sent)/Total data packets received

II. ANALYSIS OF PARAMETERS IN NORMAL MODE

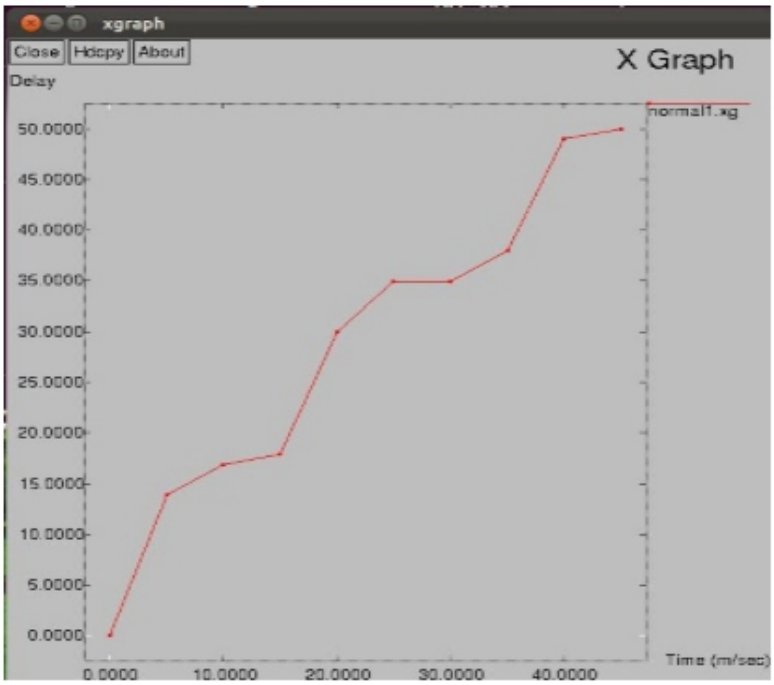
A. Evaluation of End to End Delay: End to End delay means to calculate the total time taken by the sender node to the destination node for transmission of data. The delay in normal mode is calculated with the help of the formula mentioned below:

Delay of data = Time taken to send the data + Time taken to process the data + Time taken for the delivery of data

Table II. Output readings tabulated by using End to End Delay in Normal Mode

Time(m/Sec)	Delay
0	0
5	13.87
10	16.89
15	17.92
20	29.94
25	34.95
30	34.95
35	37.97
40	48.97
45	49.99

Evaluation of this parameter done with the help of X- Graph in which time taken in the X-axis and delay taken in the Y-axis and the delay calculated with the above formula. The X-Graph which shows the end to end delay in normal communication as shown as Graph 1 below:



Graph 1: Delay in normal Mode

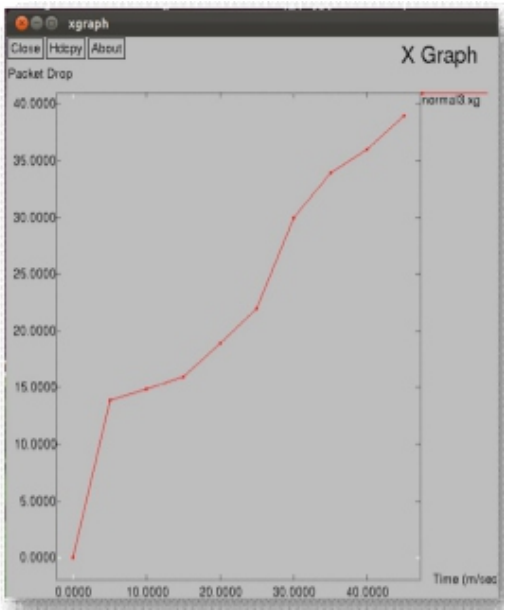
B. Packet Drop: Packet drop is that parameter used to calculate the number of packets lost in the transmission between the two nodes. Packet drop calculated with the help of formula written below:

Packet Drop = Packet Transmitted – Packet Delivered

Table III. Output readings tabulated by varying the Packet Drop in normal mode

Time(m/Sec)	Packet Drop
0	0
5	13.87
10	14.89
15	15.92
20	18.94
25	21.95
30	29.95
35	33.97
40	35.97
45	38.99

Evaluation of this parameter done with the help of X- Graph in which time taken in the X-axis and packet drop taken in the Y-axis and the packet drop is calculated with the above formula. The X-Graph which shows the packet drop in normal communication is as shown below:



Graph 2: Packet Drop in Normal Mode

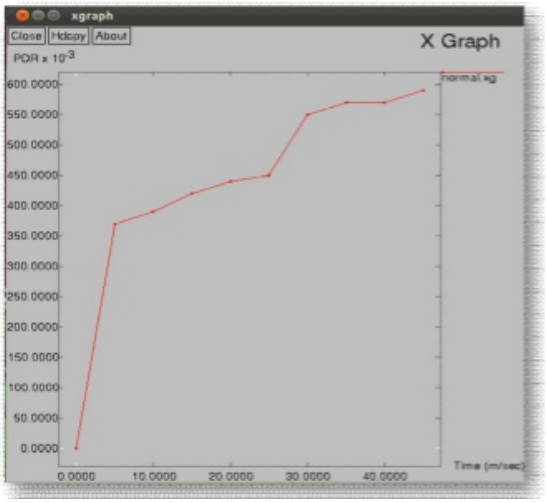
C. Packet Delivery Ratio: Packet delivery ratio is the ratio of summation of the number of packets received to summation of number of packets sent. The formula to calculate the packet delivery ratio is as mentioned below:

Packet Delivery Ratio = Σ Number of packets received/Σ Number of packets sent * 100

Table IV. Output readings tabulated by varying the Packet Drop in Normal Mode

Time(m/Sec)	PDR
0	0
5	0.37
10	0.39
15	0.42
20	0.44
25	0.45
30	0.55
35	0.57
40	0.57
45	0.59

Evaluation of this parameter done with the help of X- Graph in which time taken in the X-axis and packet delivery ratio taken in the Y-axis and the packet delivery ratio calculated with the above formula. The X-Graph which shows the packet delivery ratio in normal communication is as shown below:



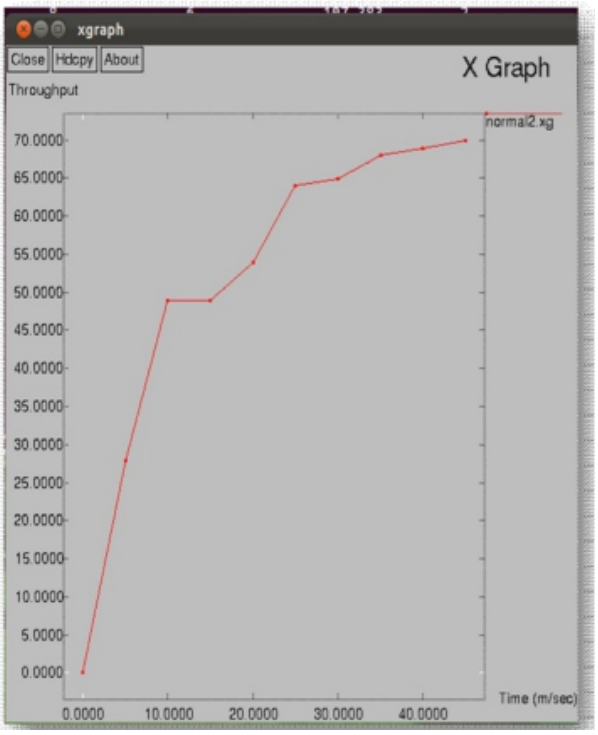
Graph 3: Packet Delivery Ratio in Normal Mode

D. Throughput: Throughput means how much data transferred in the communication scenario. It means that how much data or packets transmitted from the sender node to the destination node. Throughput defined as the ratio of summation of traffic received minus the traffic sent to the total data packets received. The formula for calculating the throughput is as follows:

Table V. Output readings tabulated by varying the Throughput in normal mode

Time(m/sec)	Throughput
0	0
5	27.87
10	48.89
15	48.92
20	53.94
25	63.95
30	64.95
35	67.97
40	68.97
45	69.99

Evaluation of this parameter done with the help of X- Graph in which time taken in the X-axis and Throughput taken in the Y-axis and the throughput calculated with the above formula. The X-Graph which shows the throughput in normal communication is as shown below:



Graph 4: Throughput in Normal Mode

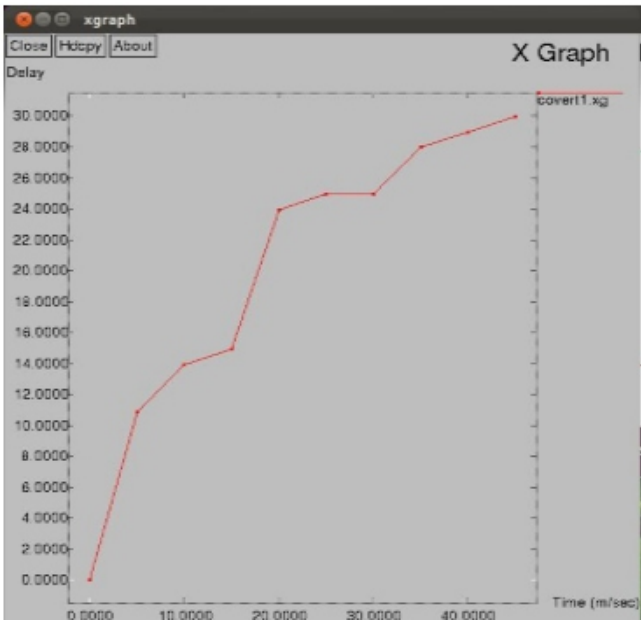
III. ANALYSIS OF PARAMETERS IN COVERT MODE

A. Evaluation of End to End Delay: End to End delay means to calculate the total time taken by the sender node to the destination node for transmission of data.

Table VI. Output readings tabulated by varying the Delay in covert mode

Time(m/Sec)	Delay
0	0
5	10.87
10	13.89
15	14.92
20	23.94
25	24.95
30	24.95
35	27.97
40	28.97
45	29.99

The evaluation of this parameter done with the help of X-Graph in which time taken in the X-axis and delay taken in the Y-axis and the delay is calculated with the above formula. The X-Graph which shows the end to end delay is as shown below:



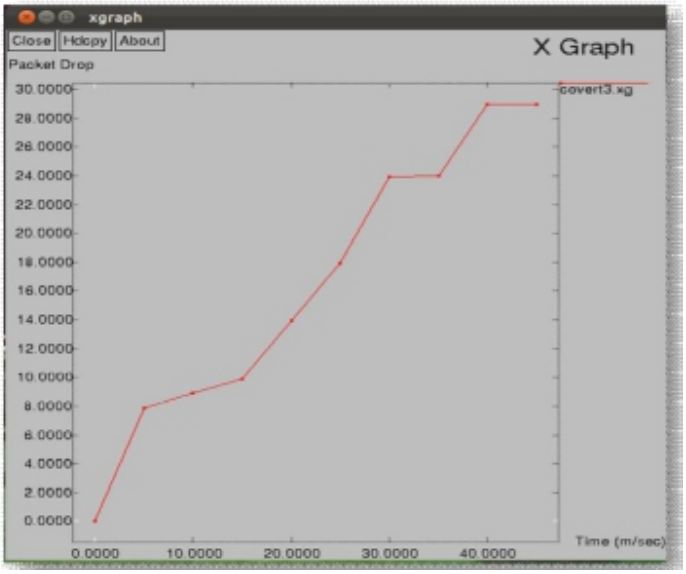
Graph 5: Delay in Covert Mode

B. Packet Drop: Packet drop is that parameter used to calculate the number of packets lost in the transmission between the two nodes.

Table VII. Output readings tabulated by varying the Packet drop in Covert mode

Time(m/Sec)	Packet Drop
0	0
5	7.87
10	8.89
15	9.92
20	13.94
25	17.95
30	23.95
35	23.97
40	28.97
45	28.99

Evaluation of this parameter done with the help of X- Graph in which time taken in the X-axis and packet drop taken in the Y-axis and the packet drop is calculated with the above formula. The X-Graph which shows the packet drop in Covert communication is as shown below:



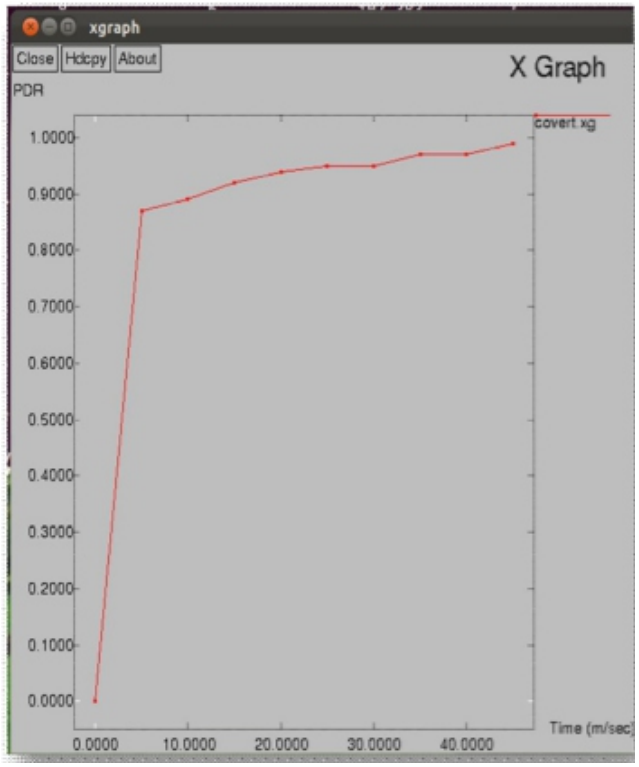
Graph 6: Packet Drop in Covert Mode

C. Packet Delivery Ratio: Packet delivery ratio is the ratio of summation of the number of packets received to the summation of number of packets sent.

Table VIII. Output readings tabulated by varying the Packet Delivery Ratio in Covert mode .

Time(m/Sec)	Packet Delivery Ratio
0	0
5	0.87
10	0.89
15	0.92
20	0.94
25	0.95
30	0.95
35	0.97
40	0.97
45	0.99

Evaluation of this parameter done with the help of X- Graph in which time taken in the X-axis and packet delivery ratio taken in the Y-axis and the packet delivery ratio is calculated with the above formula. The X-Graph which shows the packet delivery ratio in Covert communication is as shown below:



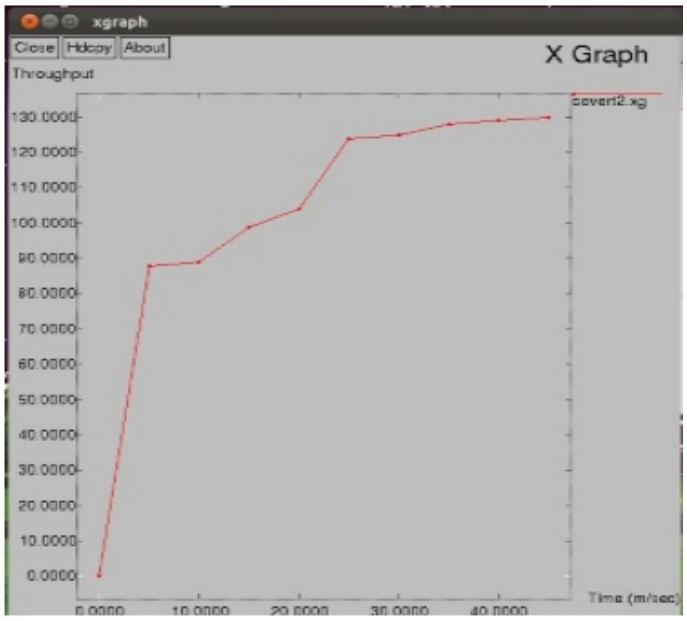
Graph 7 : Packet Delivery Ratio in Covert Mode

D. Throughput: Throughput means how much data transferred in the communication scenario. It means that how much data or packets transmitted from the sender node to the destination node. Throughput defined as the ratio of summation of traffic received minus the traffic sent to the total data packets received.

Table IX. Output readings tabulated by varying the Throughput in Covert mode

Time(m/sec)	Throughput
0	0
5	87.87
10	88.89
15	98.92
20	103.94
25	123.95
30	124.95
35	127.97
40	128.97
45	129.99

Evaluation of this parameter done with the help of X- Graph in which time taken in the X-axis and Throughput taken in the Y-axis and the throughput calculated with the above formula. The X-Graph which shows the throughput in normal communication is as shown below:



Graph 8: Throughput in Covert Mode

CONCLUSION

This paper is completed with the analysis of both the modes i.e. normal mode and covert mode via using the four parameters like end to end delay which means that total time taken by the transmission between sender and receiver, Packet drop which calculates the number of lost packets during the transmission , Packet Delivery ratio which is the ratio of total packet received to the total packet sent during the transmission and the last parameter throughput which means that the volume of data sent during a particular time.

FUTURE SCOPE

This research is extended further by doing comparison of the above four parameters discussed between the Normal mode as well as covert mode.

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Challenges and Way to the Solution of E-Waste

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ABSTRACT

Computers, electrical and electronic toys, household appliances, laptops, mobile phones, printers, fax machines etc. are intended to make our lives easier and happier. Technology advances at such a high rate that many such items and electronic devices become "junk" after a few short years (months, days or so) of use. The replacement of VCRs by DVD players, DVD players by blu-ray players and so are some of the examples in this concern. Such products that have become unwanted, non-working or obsolete, and have essentially reached the end of their useful life can be called as waste or better it can be known as electronic waste, or e-waste. It is created from anything electronic: TVs, monitors, cell phones, PDAs, CD players, and other devices mentioned as above. It contains both valuable materials as well as hazardous materials.Such materials require special handling and recycling methods. The landfills of the globe are rapidly filling by such obsolete electronic devices. Many form of harmful materials such as beryllium, cadmium, mercury and lead are the prime constituent of these electronics which are improperly thrown away. The threat to the environment is significant when such materials are added up in the volume. This work makes an attempt to provide a concise insight into this concept of e-waste, its generation especially in India and health concerns involved to it. It also looks into the global trade in e-waste and the international experience in this regard. Getting a solution for this e-waste problem starts with education, and habit changes as a result of knowledge.

Keywords— Computers, electrical and electronic toys, household appliances, laptops, mobile phones, printers, fax machines, electronic waste, e-waste, TVs, monitors, cell phones, PDAs, CD players, valuable materials, hazardous materials, recycling, landfills, harmful materials, , environment, health concerns, education.

I. INTRODUCTION

Society today revolves around technology and by the constant need for the newest and most high tech products we are contributing to mass amount of e- waste. Since the invention of the iPhone, cell phones have become the top source of e-waste products because they are not made to last more than two years. Electrical waste contains hazardous but also valuable and scarce materials.

Almost all electronic waste contains some form of recyclable material, including plastic, glass and metals. Most of us are trained to recycle a newspaper, bottles, and cans. Almost anything electronic in nature can be recycled properly with effort.

It is important that any e-waste processor is fully certified in safe destruction and follow certified documented procedures to safely dispose of electronic waste.

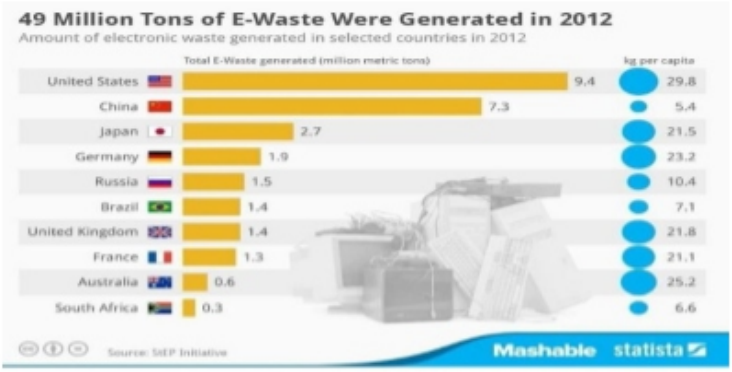
In addition to its damaging effect on the environment and its illegal smuggling into developing countries, researchers have now linked e-waste to adverse effects on human health, such as inflammation and oxidative stress -- precursors to cardiovascular disease, DNA damage and possibly cancer.

Besides adding harmful elements to the environment, improper disposal of e-waste is a recycling opportunity lost.

In the US alone, more than 100 million computers are thrown away with less than 20% being recycled properly. The EPA estimates as much as 60 million metric tons enter landfills every year.

E-WASTE: UNIVERSAL SCENARIO

Electronic waste has raised concerns because many components in these products are toxic and are not biodegradable. Based on these concerns, many European countries banned E-waste from landfills long before in the 1990s. Alarming levels of dioxin compounds, linked to cancer, developmental defects, and other health problems in the samples of breast milk, placenta, and hair, these compounds are linked to improper disposal of electronic products. Furthermore, surveys have indicated that much exported, E-waste is disposed of unsafely in developing countries, leaving an environmental and health problem in these regions. Impacts from those countries, especially Asia, have already been reported. Meanwhile, recycling and disposal of E- waste are also grown in the regions beyond Asia, particularly in certain African countries. Today's paradigm is one of disposable electronics, and as a result we now stand at the forefront of a growing environmental catastrophe.



E-WASTE: INDIAN SCENARIO

Countries like India are facing an imminent danger. E-waste of developed countries, such as the US, dispose their wastes to India and other Asian countries. A recent investigation revealed that much of the

electronics turned over for recycling in the United States ends up in Asia, where they are either disposed of or recycled with little or no regard for environmental or worker health and safety. Major reasons for exports are cheap labour and lack of environmental and occupational standards in Asia and in this way the toxic effluent of the developed nations' would flood towards the world's poorest nations. Penetration of personal computers in India has increased drastically in the recent years.

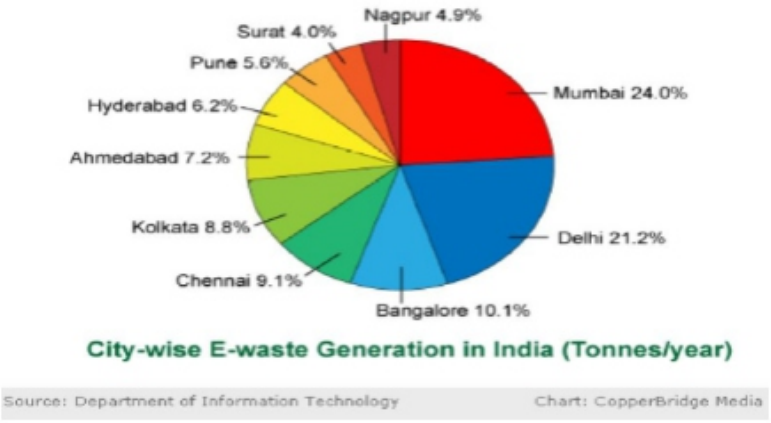


Table.1The total WEEE generation in the State of Maharashtra.

S. no	Place	Quantity of generation (tonnes)
1	Navi Mumbai	4636.96
2	Greater Mumbai	11,017.06
3	Pune	3584.21
4	Pimpri-Chinchwad	1032.37
	Total	**20,270.60**

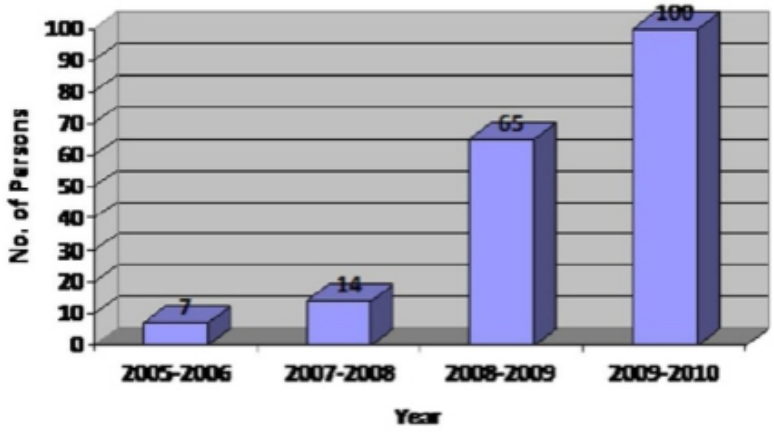


Figure.2 Usage of PCs for every 1000 persons

The magnitude of these problems is yet to be documented. However, groups like Toxic Links India are already working on collating data that could be a step towards controlling this hazardous trade. It is imperative that developing countries and India in particular wake up to the monopoly of the developed countries and set up appropriate management measures to prevent the hazards and mishaps due to mismanagement of e-wastes. Central Pollution Control Board (CPCB) estimated India's e-waste at 9

lakh tonnes per day .There are 10 States that contribute to 70 per cent of the total e-waste generated in the country, while 65 cities generate more than 60 per cent of the total e-waste in India. Among the 10 largest e-waste generating States, Maharashtra ranks first followed by Tamil Nadu, Andhra Pradesh, Uttar Pradesh, West Bengal, Delhi, Karnataka, Gujarat, Madhya Pradesh and Punjab.Among the top ten cities generating e-waste, Mumbai ranks first followed by Delhi, Bengaluru, Chennai, Kolkata, Ahmedabad, Hyderabad, Pune, Surat and Nagpur.

HAZARDOUS TECHNOLOGIES

Incineration

Incineration is the process of destroying waste through burning. Because of the variety of substances found in e-waste, incineration is associated with a major risk of generating and dispersing contaminants and toxic substances. The gases released during the burning and the residue ash is often toxic. This is especially true for incineration or co-incineration of e-waste with neither prior treatment nor sophisticated flue gas purification. Studies of municipal solid waste incineration plants have shown that copper, which is present in printed circuit boards and cables, acts a catalyst for dioxin formation when flame-retardants are incinerated. These brominated flame retardants when exposed to low temperature (600-800°C) can lead to the generation of extremely toxic polybrominated dioxins (PBDDs) and furans (PBDFs). PVC, which can be found in e-waste in significant amounts, is highly corrosive when burnt and also induces the formation of dioxins.

Incineration also leads to the loss valuable of trace elements which could have been recovered had they been sorted and processed separately.

Open Burning

Since open fires burn at relatively low temperatures, they release many more pollutants than in a controlled incineration process at an MSWI-plant. Inhalation of open fire emissions can trigger asthma attacks, respiratory infections, and cause other problems such as coughing, wheezing, chest pain, and eye irritation. Chronic exposure to open fire emissions may lead to diseases such as emphysema and cancer. For example, burning PVC releases hydrogen chloride, which on inhalation mixes with water in the lungs to form hydrochloric acid. This can lead to corrosion of the lung tissues, and several respiratory complications. Often open fires burn with a lack of oxygen, forming carbon monoxide, which poisons the blood when inhaled. The residual particulate matter in the form of ash is prone to fly around in the vicinity and can also be dangerous when inhaled.

Landfilling

Landfilling is one of the most widely used methods of waste disposal. However, it is common knowledge that all landfills leak. The leachate often contains heavy metals and other toxic substances which can contaminate ground and water resources. Even state- of-the-art landfills which are sealed to prevent toxins from entering the ground are not completely tight in the long-term. Older landfill sites and uncontrolled dumps pose a much greater danger of releasing hazardous emissions.

Mercury, Cadmium and Lead are among the most toxic leachates. Mercury, for example, will leach when certain electronic devices such as circuit breakers are destroyed. Lead has been found to leach from broken lead-containing glass, such as the cone glass of cathode ray tubes from TVs and monitors. When brominated flame retarded plastics or plastics containing cadmium are landfilled, both PBDE and cadmium may leach into soil and groundwater. Similarly, landfilled condersers emit hazardous PCB's. Besides leaching, vaporisation is also of concern in landfills. For example, volatile compounds such as mercury or a frequent modification of it, dimethylene mercury can be released. In addition, landfills are also prone to uncontrolled fires which can release toxic fumes.

Significant impacts from landfilling could be avoided by conditioning hazardous materials from e-waste separately and by landfilling only those fractions for which there are no further recycling possibilities and ensure that they are in state-of-the-art landfills that respect environmentally sound technical standards.

EFFECT OF E-WASTE ON ENVIRONMENT AND HEALTH

Electronic waste can cause the environmental damage throughout the world (Skinner et al., 2011). Every electrical and electronic product are a complex mixture of thousands compounds out of which many compound contains toxic chemicals and elements such as lead, mercury, cadmium, chromium, copper and some precious metal such as silver and gold. In general the electronic appliances are classified as:

1) White goods: common household appliances
2) Brown goods: camera, camcorder, Tvs
3) Grey goods: computers, calculators, printers, fax machines, scanners

Grey goods contain most toxic elements as compare to white and brown goods. In most of the developing country like India, electronic and electric waste are dismantled and sorted manually. These processes raise the risk of many health problems to workers as well as damage the environment. Some common ways by which toxic elements and chemicals can enter into the environment are:

1) Soil: open dumping and land fillings is the most common to dispose the wastes including E-waste. It is one of the most dangerous methods to discard the E-waste because toxic elements from E- waste can easily leach out into the soil and pollute it. Elements like, mercury and cadmium have the tendency to bio magnify. Once these element uptakes by plants from soil than they can bio magnify up to the highest tropical level.

2) Air: when e-waste burns large amount toxicants enters into the environment. Fugitive emissions and slag contain heavy metals. When we burn Circuits boards, plastic casings, cables and polyvinyl chlorides cable insulation can release dioxins and furans these are highly toxic. Brominated flame retardants are found in circuit boards and plastics.

3) Water: wastewater from e-waste recycling units is also a main source from which heavy metals enter into environment. And heavy metals present in E- waste dumped into the landfills can easily migrate into the groundwater especially in acidic conditions.

Table 1: Effects of E-Waste on human health and environment

Toxicant from E-waste	Sources	Effects on human health	Effect on environment
Mercury	thermostats, position censors, relays, switchs, discharge lamps, batteries	affects the human brain	biomagnifications
Lead	Cathode ray tubes (CRTs), glass of computer monitors and printed circuit boards	damage to the central nervous system and kidneys	
dioxin and furans	When inorganic material introduce to high temperature	respiratory problems, Reproductive and developmental problems Immune system damage; Interfere with regulatory hormones	bioconcentrate in organisms
Polychlorinated biphenyls (PCBs)	older capacitors, transformers and condensers	alter the sex hormone systems	biomagnifications
Cadmium	cathode ray tubes, plastic	Kidneys damage	biomagnifications
Brominated flame	Burning plastic	neurological system	
Barium(Ba)	panel of CRTs	Muscle weakness; Damageto heart, liver and spleen	
Beryllium (Be)	Motherboard	Carcinogenic, skin diseases	

Dioxin and furans also shows the bio concentration phenomenon as they and long life time once they released into the environment. Brominated flame can cause harmful effect on neurological system. Beryllium is also a toxic element which can cause the cancer. It is present in motherboard of computers. There is a need to search and find out the easy and cheap way to recycle and reuse the E-waste. It will help in reduction the amount of e-waste which goes to dumping site and burned opening and ultimately poses a great threat to human health and environment by the several numbers of ways.

HEALTH IMPACTS

The physiological and health impacts on humans and animals of many of the toxic substances contained in e-Waste are

1. Reproduction: damage to both male and female reproductive systems, including interfering with development of the testes; reduction in semen production and quality; abnormal morphology of Source of e-wastes Constituent Health effects rates.

2. DNA: damage in lymphocytes, fatal and developmental toxicity; growth retardation; abnormal brain development, which can result in intellectual impairment; and possible long-term impacts on memory, learning and behaviour.

3. Nervous system: damage to the central nervous system (CNS) and blood system, including CNS depression and neurotoxicity; immune system suppression, including inhibition of a key blood cell enzyme.

4. Organs: damage to the brain, including swelling; liver, including liver necrosis; kidney, including renal toxicity; thyroid; pancreas; lymph nodes; spleen; and bone, including bone toxicity.

5. Skin: contact dermatitis; skin lesions; carcinogenic, including tumour promotion and lung cancer; anaemia; CBD (a Currently-Incurable, Debilitating Disease that can Sometimes be Fatal); and mortality.

6. Hormonal system: Disruption to endocrine systems including the oestrogen, androgen, thyroid hormone, retinoid and corticosteroid systems; inhibition of human and organ hormone reception; and ability to mimic natural oestrogen hormones, leading to altered sexual development in some organisms.

7. Other: hypertension (high blood pressure); cardiovascular and heart disease; respiratory tract irritation, including irritation of the nose, mouth and eye

E-Waste Policy and Regulation:

The environmentally sound management of e-waste is a challenge for India. The challenge relates not only to disposal of e-waste, but also to the increasing amounts of WEEE day by day. The Environment (Protection) Act (EPA), enacted in 1986 following the Bhopal gas tragedy, was the first comprehensive law related to environment. The Act only defined hazardous waste in very broad terms and did not

address e-waste at all. However, what it did do was confer the power to enact regulations related environmental issues on the executive. Since then, the precautionary and the "polluter pays" principle have become part of Indian environmental policy. Although no e-waste laws exist till 2000, two regulations established under the provisions of the EPA – the Hazardous Waste (Management and Handling) Rules and the Batteries (Management and Handling) Rules – are applicable to some extent. The Indian Municipal Solid Wastes (Management and Handling) Rules of 2000 do not cover e-waste at all, although some e-waste could potentially be regulated on a municipal level. The HWM Rules require any company or individual receiving, treating, transporting or storing hazardous waste to first obtain permission from the relevant State Pollution Control Board (SPCB). In 2008, the Central Pollution Control Board (CPCB) released guidelines on e-waste management.

CONCLUSION

Environment friendly methods to dispose of and recycle IT and electronic equipment must be promoted and provided is the best solution for the problem of e-waste is the extract of this paper. This work confers that the assessments of the e-waste scenario, if performed accurately, results in the expression of proper views; thus the system based on the any systematic model could generate an overall improvement to the environment. The awareness that please don't throw away your computer or old monitor in the junk, it may be illegal should be spread. Solving the e-waste problem starts with education. Such good habit changes as a result of knowledge. Almost all of us are trained to recycle a newspaper, bottles, and cans. Almost anything electronic in nature can be recycled properly with effort. It is important that any e-waste processor is fully certified in safe destruction and follow certified documented procedures to safely dispose of electronic waste. Ask questions before you recycle.

FUTURE SCOPE

Subsequent from this initial work, a number of research questions arise. For a more complex environment, how much illustration would be required to train the system to a satisfactory level? To what degree should outlier decisions be identified and included in the system? The aim of future research will be to investigate these questions, the next stage being to develop a model of a real system.

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Recommendation System for Tourist Attraction Based on Pre-Image and Review

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ABSTRACT

This paper proposes a method to find a place for travelers to visit. Many travelers are struggling to find their destination suitable for their purpose of the travel. To find their destination, we consider pre-image and review. The pre- image reflects their own image, whereas, the review shows how other travelers felt during their travel there. The proposed method associate the pre-image of travelers with reviews of other travelers. An experiment is conducted to reveal the possibility of the system. The result shows it works well fornon-frequent travelers to intermediate level people for trip planning. We discuss the result based on the interview from subjects.

Keywords- travel, tourism, tourist attraction, recommendation, pre-image, review.

I. INTRODUCTION

More and more foreign tourists visit Japan in these days [1]. The Japanese government aims that Japan becomes a "Tourism-Oriented Country". To achieve this goal, it is indispensable to improve satisfaction of tourists [2]. However, the percentage of tourists satisfied enough with their travel is less than 25% [1]. One of the reasons why they are not satisfied with their destination is that they do not know the way to find their destination and make their itinerary which is suitable for their purpose. They rely on descriptions and review from various information from a Web site, a magazine, and so on. Some systems have started working for commercial use. Trip advisor [3] is one of the Web sites which help travelers to find their destination. Since it contains lots of reviews, travelers take much time and sometimes get confused. Moreover, each tourist has different purposes for traveling. The Web sites are too general to find a personalized travel destination. The best way to find their destination is to visit a travel agency and ask staffs for appropriate recommendations. One of the staffs obtains the information of traveler's purposes and image for traveling through the conversation with him/her. The staff is also aware of lots of information on each tourist attraction. The staff compares these two kinds of information. The staff tries to find the place which has highest possibility for the tourist to enjoy [4]. However, the number of destination which is recommended by the staff sometimes varies his/her knowledge. Recommended spots depend on staff's subjectivity. Furthermore, it takes much cost to hire and train each staff. We need a system which can provide a recommendation suitable for each tourist based on the information above.

II.RELATEDWORKS

Several methods are proposed to recommend tourism attraction to travelers. Kurashima et al. developed a recommendation system based on geotags [5]. It recommends the route, considering a spare time and their interests. The system depends on the history of their travel. Traveler's destination depends on their purpose and situation. However, travel history includes all of them. Kawai et al. proposed the method to recommend the tourism route [6]. Oku et al. shows the way to rank tourist attractions [7]. These methods do not reflect reputations. Those systems impose unnecessary loads on travelers with some preparations beforehand.

The system should obtain specific needs from travelers, to utilize them for the recommendation. Moreover, since reviews from other travelers show the reputation about tourist attractions, the system should consider about them.

III. PROPOSED METHOD

3.1. Method overview

When tourists make their decision on where they should visit, they evaluate expected utility for their destination. Expected utility is the value of a tourism attraction in the mind of each tourist. It consists of two components: subjective probability and subjective utility [8]. Subjective probability depends on how much money and time they can spend at the destination. On the other hand, subjective utility is highly dependent on pre-image and expected sufficiency for the place. Pre-image is what they imagine for their destination before they visit there. Expected sufficiency is the probability for a tourist to accomplish their purpose. Moreover, it relies on how other tourists experienced on the spot, whether they enjoyed or not.

This study discusses the method to evaluate pre- image and the sufficiency for the calculation of subjective probability from slight information provided by each tourist. We eventually aim at creating a system to provide a recommendation suitable for each tourist. Fig.1 shows how the system works in an actual environment. We call each tourist using the system a user.

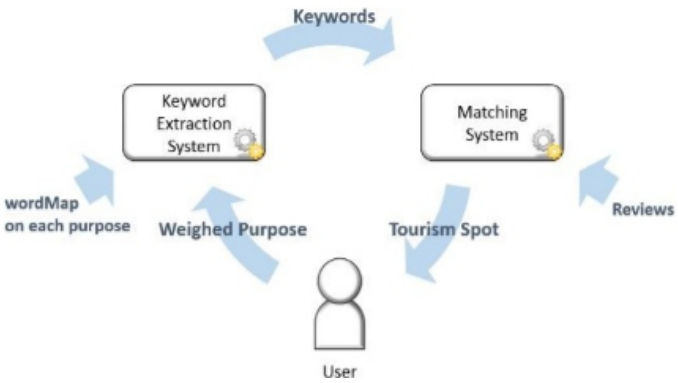

Fig.1. Overview of recommendation system.

First, each user presents his/her purposes for traveling. His/her purposes are weighted based on small amount of questionnaires. A wordMap graph is created in advance which includes keywords for some tourist attractions. Keywords in the wordMap graph reflects pre-image and sufficiency of the user, as well as what other tourists experienced. The keywords are provided for every purpose of the user. The system extracts keywords considering weighted purposes and keywords from the wordMap graphs. Sentenses stating reviews on Web sites for travelling information are cut into words. The system compares keywords with the words from the reviews. Finally, the tourism spot which has the maximum coincidence ratio is recommended to the user.

This system will be implemented as a recommendation application for both smartphones and PCs. A user is only requested to provide a few data like traditional methods. Moreover, we can find the specific gap between their pre-image and reviews. Pearce [9] shows that satisfaction depends on the difference between expectation and evaluation. The higher it is, the more satisfaction they feel. The expectation includes pre-image, as well as the evaluation includes sufficiency and tourist's experience. To meet tourist's satisfaction is important for recommendation systems. The method fairly respects these two points.

3.2. Travelers' weighted purpose

When tourists are planning to go sightseeing, they have their own purposes. They search their destination which meets their requests. For example, if a user wants to relax, he/she would not visit any noisy place but quiet places. Therefore, the system should recommend a forest bathing instead of a theme park. The system will provide wrong recommendations if it does not take tourist's purpose into account. RECRUIT CO., LTD. discovered eight main factors for sightseeing in Japan using Factor Analysis of the questionnaire [10]. These factors are regarded as tourist's purposes. Table 1 shows these factors and their details. In this system, every user is requested to state his/her purposes from the eight factors above.

Each tourist would have several purposes at the same time. The purposes are ranked in tourist'smind while planning his/her travel destination . It Is imperative for the system to grasp the ranked purposes. The analytic hierarchy process (AHP) is one of the methods to find importance of each input data [11]. AHP is well qualified for a data analysis method which is based on their personal view. The system requires the user to answer some questions following AHP. The number of questions depends on the number of factors they chose on the questionnaire. If the number of factors is num, the number of questions is numC2 . ahpi shows the value of AHP on the i-th factor.

Table 1: Eight main factors for sightseeing.

Factor		Detail
1	Special experience	A traveler who wants to experience local culture, history, world view, and nature.
2	Relax	A traveler who wants to relax, do not think about anything like their work and housework.
3	Romantic relationship	A traveler who wants to have a special date with their boyfriend, girlfriend, husband, or wife.
4	Hotel	A traveler who wants to stay a stylish hotel or a luxury one.
5	Hot spring	A traveler who considers the size and the quality of hot springs.
6	Sports or events	A traveler who wants to enjoy playing sports or events
7	Family relationship	A traveler who wants to enhance their relationship among family or friends.
8	Food	A traveler who wants to eat delicious or local food.

3.3 Keyword extraction

To reflect user's pre-image, user's sufficiency, and experience which other users had after their travel, wordMap is created. For evaluation of tourist's pre- image, some pictures from various tourist attractions are prepared in advance [12]. Volunteers are asked to vote how they felt when they saw each picture. They choose one or more factors from the eight ones shown in Table 1. Following equation, the character: i,j, and k represents any factor, spot, and word respectively. The pre-image pimij is calculated with

$$\text{pim}_{ij} = \frac{1}{N} \sum_{n=1}^{N} \frac{v_{ij}}{n}$$

The number of participants isn. The voted result is v^{ij}. Let the number of pictures at same spot be N.

Reviews on each tourism spot shows sufficiency and what tourists experienced on there. For evaluation of these components, we focus on reviews. All sentences in all reviews are cut into words using Morphological Analysis (MA). Content words including nouns, adjectives, and verbs, are picked up because these words show the contents fairly well. Term frequency inverse document frequency (tf-idf) [13] is calculated to evaluate each extracted word. Term frequency (tf) shows how frequent the word appears in the specific document, whereas inverse document frequency (idf) shows the word rarity among all documents. The sufficiency suffijk is calculated as follows. The value of tf-idf is t idfijk, and maximum value of tf-idf is t idfijmax.

$$suff_{ijk} = \frac{t\,idf_{ijk}}{t\,idf_{ijmax}}$$

The subjective probability is calculated as follows.

$sp_{ijk} = ahpi \cdot pim_{ij} \cdot suff_{ijk} \times 100$

A wordMap which is demonstrated in Fig.2 is created based on the value of sp_{ijk}.

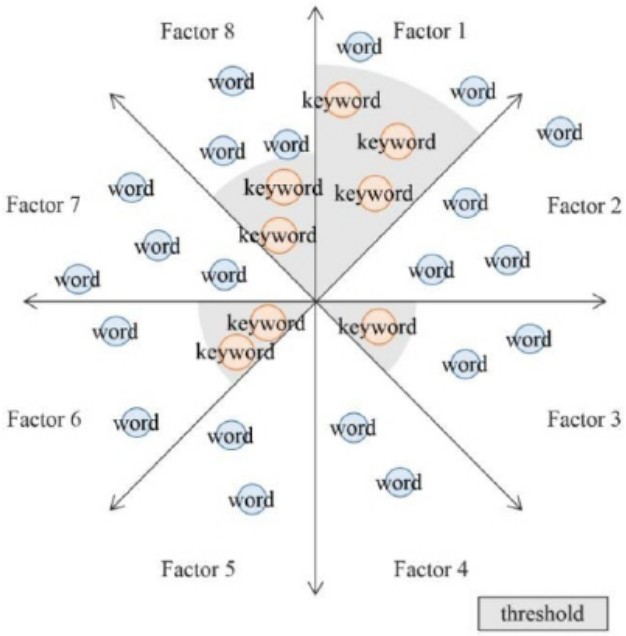

Fig.2. WordMap.

The word which meets a threshold is extracted as a keyword.

3.4. Matching

On the Internet, there are large amount of reviews on each tourism attraction. Fig.3 shows the detail of the matching system. MA is conducted on every review to divide sentences into some words. We refer to the total of these words of all reviews from one attraction as a wordset. Each wordset is compared with the keywords shown in Section 3.3. The place which has the highest concordance rate is chosen to recommend on all factors which are selected by the user.

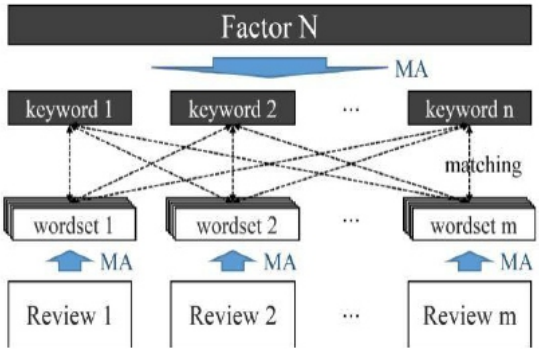

Fig 3. Matching system.

IV. POSSIBILITY OF RECOMMENDATION SYSTEM

4.1. Experimental purpose

We experienced to reveal the possibility of the system discussed in chapter 3. Pictures of five tourist attractions are selected from Google Images. The keywords for the search are chosen based on the Web site which show famous sightseeing site. These tourist attractions contain a park, a national museum, a theme park, a shrine, and a tower.

Three of five spots, the national museum, the shrine, and the tower have two pictures to compare each voted result at the same place. Volunteers for the vote are 18 males and three females, as well as subjects who use the system are five males and one female. One of them is an accomplished traveler. Each volunteer is asked to vote against the pictures to organize the wordMap in advance. Subjects are asked to choose the purpose from the eight factors shown in Table 1 which matches each of the provided situations specified in Table 2. Each situation includes two subjects.

Table 2. Provided situation.

Situation	Detail
1	You are going to go sightseeing with a friend from high school. Your friend does not have much time because he works hard. You decided to make the plan.
2	Recently, you are not free due to your tasks. You have finally got a vacation this week, and you decided to visit some spots this weekend.
3	Your second anniversary with your lover is coming. Since your lover planned the first one, you decided to make a plan this time.

They search the information on the five spot on the Internet for about an hour. After their search, they choose their destination. They also fill out a questionnaire regarding their destination.

4.2. Preparation result

The result of voting from 21 volunteers pimijis denoted in Table 3.According to the result, people expect tohave a special experience, a relaxation, a romantic experience, and an event for the family or a friendgroup from the picture of the shrine, the park, the tower, and the theme park. However, Factor 4, 5, 6, and 8 did not appear in this experiment.

Table 3. The result of voting.

j	spot	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8
1	park	0.429	1.000	0.667	0.048	0.048	0.143	0.524	0.048
2	museum	0.738	0.167	0.214	0.071	0.024	0.262	0.476	0.071
3	shrine	0.929	0.690	0.643	0.167	0.190	0.048	0.762	0.190
4	theme park	0.619	0.238	0.667	0.048	0.048	0.619	0.905	0.095
5	tower	0.667	0.119	0.857	0.357	0.024	0.214	0.095	0.333

Table 5 Purposes of each subject.

subject	situation	F1	F2	F3	F4	F5	F6	F7	F8	precision	recall	f
1	1	*		*	*				*	0.50	1.00	0.67
2	1	*	*	*	*					1.00	0.75	0.86
3	2		*		*				*	1.00	0.67	0.80
3	2		*		*	*				0	0	0
4	3	*	*						*	0.50	1.00	0.67
4	3	*						*	*	0.50	1.00	0.67

Table 4. The value of the sufficiency and subjective possibility.

k	word	word(English)	$suff_{13k}$	sp_{13k}
1	展	exhibition	1.000	92.9
2	常設	permanent	0.697	64.8
3	博物館	museum	0.614	57.0
4	国立	national	0.592	55.0
5	展示	exhibition	0.499	46.4
6	天満宮	Tenmangu	0.421	39.1
7	特別	special	0.369	34.3
8	太宰府天満宮	Dazaifu Tenmangu	0.335	31.1
9	大宰府	Dazaifu	0.320	29.7
10	九州	Kyushu	0.292	27.1

Top 10 values of sufficiency of the factor 1, special experience, on the spot 3, shrine, suff13k is shown in Table 4. The subjective probability sp13kis calculated frompim13 and suff13k. Table 4 shows the value of suff13kand sp13k. This time, we set every value of ahpiand the threshold to 1 and 50, respectively.Words which meet the threshold are extracted. From the words, wordMap is created. The number of words on each factor is 23, 13, 18, 0, 0, 2, 18, and 0. It means that no place will meet customer's demand on factor 4, 5, and 8.

4.3. Result

Subjects are asked to choose one or more of five tourist attractions. We compare subject's destination with the one recommended by the system. To evaluate the performance, the F-measure (f) is calculated from the precision and the recall.

$$f = \frac{2 \cdot precision \cdot recall}{precision + recall}$$

Table 5 shows the purposes subjects chose

considering the provided situation beforehand (the input data for the system), and the value of the precision and the recall. In the table, the items from F1 to F8 represent the 8 factors. The result shows the system found their destination fairly well. However, the system does not work well on subject 3. According to the questionnaire, the subject could not choose his destination to the last. He compared two spots, and one of them was the place the system chose. He decided the opposite one based on the surrounding environment. It means that tourists consider not only the spot but also the environment around it. Some tourists searched the way to the destination and how much fare they would spend. The accomplished traveler claimed that the system was not suitable for her, because she could imagine the spot very well. She is a quite frequent traveler. She uses a lot of information to determine her trip destination. However, others are not frequent travelers. They answered the system would be sensible for planning. Therefore, the system will work effectively mainly fornon-frequent travelers to intermediate level people for trip planning.

CONCLUSION

In this paper, we have proposed the method to find the destination suitable for a tourist. We have considered subjective probability, and which is divided into two components, subjective utility and expected sufficiency.Subjective probability depends on how much money and time they can spend at the destination, whereas, subjective utility dependson pre-image and expected sufficiency for the place. In this study, pre-image is given by voting from others, as well as expected sufficiency is given by reviews on the Internet. To reflect these two factors, we have created wordMap. An experiment has conducted to show the possibility of the proposed system. Through the interview of the subjects, we found the system is good for beginners and intermediates for planning their travel. As a future work, we will create larger wordMap handling many tourist attractions. Moreover, we need to consider the distance between each attraction, as well as travel fare for scheduling.

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Sediment Classification using Image Processing

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ABSTRACT

Sediment classification is required for identifying type of sediment present near the wall of dam. As the flow of water through gates of dam is irregular, sediments flow out through them causing damage to gates. In order to avoid this we are classifying the sediments depending on their sizes and accordingly manage the flow through gate. Presently sediments are classify using sonar imaging system, this system will transmit sound signal from surface of water and echoes are recorded. These echoes are used to plot the image of sub bottom profile of oceans. These systems are very costly and takes larger time for processing. The proposed system is using image of sediments. In this paper it is proposed that sediment classification is done into three different categories as rocky sediments which is having size greater than 25 mm, gravels that is medium size sediment having size between 2-8 mm. Coarse sand having grain size less than 2 mm. Input to the system will be the image of sediment. This input is given to system and it will extract the feature of input sample and it will try to match with database using artificial neural network. We are proposing an adaptive algorithm in which only the visual properties of sediments is used for classification. This will reduce the time for processing and make it easier for the adaptive algorithm to learn. The results are obtained on the actual data. Software Requirement for this system is MATLAB 2013b. The output of system is classification of sediments, which is much faster and accurate than present system.

I. INTRODUCTION

Sediments are formed due to natural processes of weathering and erosion of rocks, sedimentation in rivers basically occurs due to water flow and wind and by the force of gravity acting on particles. Water can cause sedimentation, such as gravel or Pebbles into a river, and eventually to that river's banks. River banks and the bottom of waterfalls are common areas where sediment Deposits. Purpose of this classification is to identify which sediments are present near the wall of dams. As flow of water through gates of dam is irregular it takes sediments near the gate with it, which further hits on the gates of dam. This process will makes the gates of dam weak. For the protection of dam Preventive measure should be done. Previously identification of sediments is done in oceans using sound navigation ranging [1], they are sending sound signal from surface if water and echoes are recorded. This reflected echoes are then used to plot the image of surface below water. This process needs costly instruments and time consuming process. Noise is also a biggest factor that cause error in the identification.

These noise can be removed in image processing algorithm. Some techniques are now invented which can remove the noise from images [2]. Image processing is an option for solving such type of problem. Sediment classification using image processing gives us fastest and correct classification. In this paper

proposed system uses artificial neural network for classification. ANN was proposed to train a set of particular class of network these are called as perceptron [4]. They are the network having neuron grouped in layer with only connection between them. These network are basically divided into two types i.e. supervised and unsupervised. This system is using supervised type of network in this paper. The detailed description is explained in ANN section. [5] [6]

II.SEDIMENT CLASSIFICATION BASED ON VISUAL PROPERTIES

River sediments are classified based on the source from which they are formed such as Lithogenous sediments, Hydrogenous sediments, biogenous sediments. Lithogenous sediments are derived from the land near the surface of water. Generally this type of sediments are formed in the river and water reservoirs such as dam, pond etc. In this paper Lithogenous sediments in river and dams are considered. For the purpose samples of sediments are collected from different rivers and dams. Some samples of Ganga River and Khadak-wasla dam are shown in fig 1, 2,3. Classification is done based on the visual properties such as grain size and color.[8] Important parameter that are considered during the classification are explained in the next section. :

A. Grain size

Gravitational force settles down the Particles with larger sizes and greater densities easily. In contrast colloidal material or small particles stay in suspension and make the water seem cloudy. The shape of the particle also affects the process. For instance, a round shaped particle will be settled easily compared to the irregular ones.

B. color image processing

The human visual system can distinguish hun-dreds of thousands of different color shades and intensities. Therefore, in an image, a great deal of extra information may be contained in the colour and this extra information can then be used to simplify image analysis, e.g. object identification and extraction based on colour. Three indepen-dent quantities are used to describe any particular colour.

1) Hue: The hue is determined by the dom-inant wavelength. Visible colours occur between about 400 nm (violet) and 700 nm (red) on the electromagnetic spectrum.

2) Saturation: The saturation is determined by the excitation purity, and depends on the amount of white light mixed with the hue. A pure hue is fully saturated, i.e. no white light mixed in. Hue and saturation together determine the chromaticity for a given colour. Finally, the intensity is determined by the actual amount of light, with lighter correspond-ing to more intense colours, Achromatic light has no

colour its only attribute is quantity or intensity. Grey level is a measure of intensity. The intensity is determined by the energy, and is therefore a physical quantity. On the other hand brightness or luminance is determined by the perception of the colour, and is therefore psychological.

Fig. 1. Fine Sand Sediment Sample

Fig. 2. Greval Sediment Sample

Fig. 3. Cobble Sediment Sample

3) Value: Colour depends primarily on the re- flectance properties of an object. We see those rays that are reflected, while others are absorbed. However, we also must consider the colour of the light source and the nature of human visual system. For example, an object that reflects both red and green will appear green when there is green but no red light illuminating it, and conversely it will appear red in the absence of green light.

III. IMAGE ANALYSIS

In this paper proposed algorithm using feed forward neural network. Input for the algorithm is image of sediment obtained by setting camera at fixed distance. Images are taken for every type of sample and by varying the angle of capture, complete area of sediment can be covered.

A. Algorithm

Designed algorithm for classifying sediments depending on their size and color features. flow chart for the algorithm is shown in fig 4. This algo-rithm is basically divided into two parts. First part is training and second is part is identification. Both the part of this algorithm will follow the same steps but difference will be first part of this algorithm is used for the training the neural network while the second part is used for classification of sediments. That is in the second part features are extracted and these features are provided to ANN network. Feed forward network will try to find out the match in his database and depending on that it will Classify the sediments.

1) Blur: Input image has variation in the sharp- ness and hence the object under observation is not clear. By applying the color blur technique edges are made smooth and their is very low transition at the edges. This is achieve using averaging filter which calculate avg values R, G and B and assign it to central pixel. Formula for calculating the average is explained in below equation.

$$Y(i;j) = \frac{1}{M} \sum_{j=1}^{PM} x[i;\bar{j}]$$

Where i,j are the pixel co-ordinates and M is total no of pixels. Y represents output.

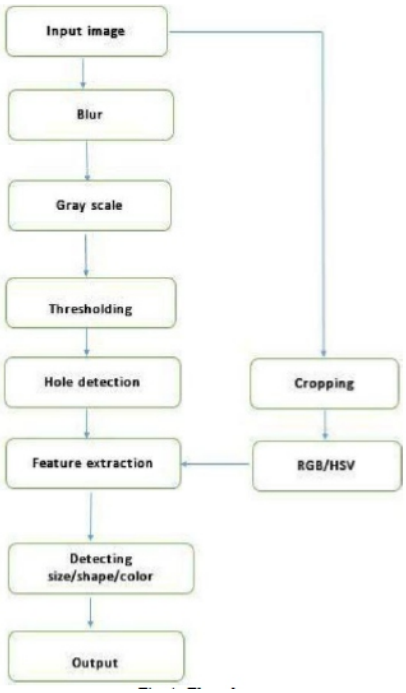

Fig. 4. Flow chart

2) Grey Scale: Color blur is followed by the gray scaling the image. This algorithm will convert 24 bit image into 8 bit image i.e 256 shades of gray color. Gray image will help in separating the front part and background.

$$\text{GrayScale} = \frac{R+G+B}{3}$$

Where R, G, B are the RGB value of every pixel.

3) Thresholding: Thresholding is value of gray scale above this value all the pixels are assign to zero. Below threshold it assign to one value to pixel this will provide converting the image into binary form i.e. 2 bit image. Background has always the higher value of grey scale so it is easy to separate the background and sediments from image. In this algorithm we are taking the value of threshold from user. This will help in providing better Thresholding value and area of interest can be separate out.

4) Feature Extraction: In this step features of sediments are extracted which includes area, size, Colour features. This has been done using blob detection and HSV properties of sediments. Blob detection will provide the size and area of sediment where HSV values gives the colour features of sediment.

Hue calculation:

$$H = \begin{cases} 0^\circ & \Delta = 0 \\ 60^\circ \times \left(\frac{G'-B'}{\Delta} \bmod 6\right) & , C_{max} = R' \\ 60^\circ \times \left(\frac{B'-R'}{\Delta} + 2\right) & , C_{max} = G' \\ 60^\circ \times \left(\frac{R'-G'}{\Delta} + 4\right) & , C_{max} = B' \end{cases}$$

Saturation calculation:

$$S = \begin{cases} 0 & , C_{max} = 0 \\ \frac{\Delta}{C_{max}} & , C_{max} \neq 0 \end{cases}$$

Value calculation:

$$V = Cmax$$

Fig. 5. HSV Calculation

RGB to HSV: In this step colour properties of sediment are extracted. This is done by applying RGB to HSV function to the input colour image. This will convert colour image into its respective HSV values. fig 5 shows HSV values methodology. In this step HSV values of input image are calculated and this values are stored for further reference for training the Artificial neural network.

Blob Detection : This step is used to calculate the size and area of sediment under observation. Blob detection required thresholded image as the input. This will provide only the area of interest as in-put.

Blob is the region of image where some properties are constant or approxi-mately equal. Their are different methods of calculating the blob. Some of them are based on edge detection, boundary detection technique. In this paper labeling algorithm for blob detection. Fig 6 shows blob detection technique.

B. Artificial Neural network

Feed forward network[7][6] is used to avoid the traditional way of designing an algorithm for classification. Parameters are extracted and used them for training ANN. Size, area, color features of each types of sediment and these are stored in array at the time of extraction. Now these parameters are provided to ANN and the feed forward network will generate the connection weights for each input parameter. Intermediate states are generated and by providing appropriate number of iterations the network is trained. Fig 7 shows the feed forward Network having two intermediate states.

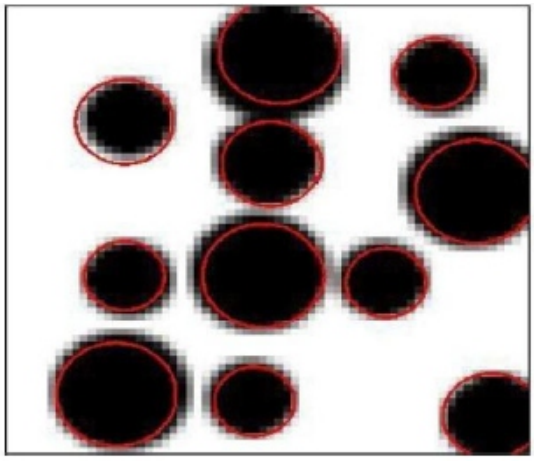

Fig. 6. Blob Detection

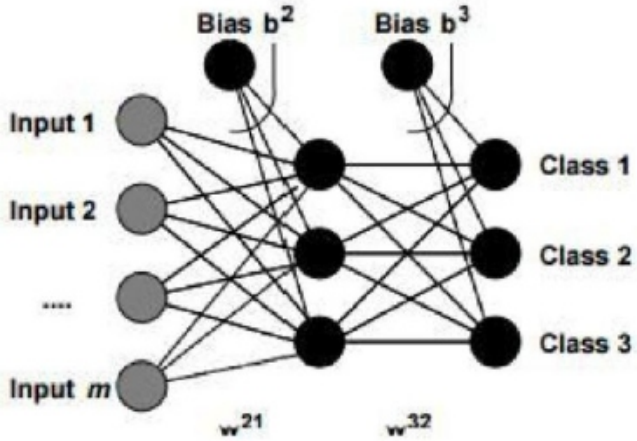

Fig. 7. Feed forward Network

IV. RESULTS

Sediments are classify into three categories and results are shown in fig. 7.

Result obtained from the color test and ANN are shown in different label.

CONCLUSION

Sediment classification using image process-ing is implemented. It is observed that the use of artificial neural network reduces the effort of designing algorithm for classification. This systems provides more faster results than the conventional algorithmic design methods. System is capable of classifying sediments of size 2 mm - 50 mm.

Fig. 8. GUI for displaying output

Accuracy of system can be further increase by providing more input samples during the training of ANN. It is also observe that the performance of system reduces with increase in the noise. This can be filtered out at the time of input.

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