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MOBILE CLOUD STORAGE USES BY SMART PHONE USERS

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ABSTRACT

With the launch of android Operating system for mobile phones, the era of smartphone originated. With the tremendous growth in smartphone technology and easily available internet services, the number of smartphone user increased rapidly. With this, various software developers have started developing application for smartphone. Due to this data has started growing exponentially and therefore storage space has fall shorten. This gave rise to the invention of mobile cloud storage. Mobile cloud is ad-hoc infrastructure based on smartphone devices laptops, tablets and all the devices connected to internet. Mobile cloud storage can term as infrastructure where Data is processed outside a mobile device. This paper is a study of how the concept of mobile cloud got importance and how it is growing with the increasing number of smart phone users. This paper also covers the concept, architecture and services of cloud computing and focuses its advantages over business organizations.

Keywords: Cloud Computing, Mobile computing, PaaS, SaaS, IaaS.

I. INTRODUCTION

With the increase in Information Technology the lives of people has changed gradually. It gave rise to many types of mobile devises such as laptops, tablets smartphones etc. With easily and cheaply available internet services form network provides, Smartphones have become a un-separable part of today's life. According to statistia.com, today 2.8 billion of world's population is using smartphone technology and it's also increasing daily [3] and therefore the use of Mobile cloud also increased. In Mobile cloud computing (MCC) environment, cloud based services are offer to smartphone users and the data of the users are stored on mobile cloud. Not only data, mobile cloud computing is also used to process the applications in centralized working environment. Mobile cloud storage concept is a powerful resource and has proved capable to serve a large number of smartphones or other mobile devises anywhere, anything with the support of Internet. MCC is also enhanced security of data by storing the data on cloud which reduces the risk of device crashing and data stealing. With the use of Mobile cloud computing, the load of the running applications is taken by cloud storage instead of local machine (computer). Some organizations prefer cloud storage service of third party instead of they being setup their own infrastructure for cloud storage. Mobile applications are widely used for shopping, payment, banking etc. These apps sometimes undergoes with few issues like limited storage space security of data, low bandwidth, and processing power hence is not widely used for business perspective. Mobile Cloud computing technology provides much larger storage capacity, more security, speed, fast computation, and on demand access to all this services [4].





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Fig-B: Growth of mobile cloud applications, www.appypie.com

Figure A & B shows graphical representation of number of smartphone users and growth in the used of mobile cloud application. Comparison between both the graphical analyses, illustrated that the growth in smartphone devices has incredibly increased over the number of year due to various applications that makes the todays life convenient, and therefore, to store data and applications there is an increasing need of Mobile cloud storage.

II. MOBILE CLOUD ARCHITECTURE



Mobile cloud computing is a grouping of three main parts that are , mobile devices (smartphone, laptops, etc), internet & cloud computing technologies. The services which are provided by mobile cloud computing are data storage, processing, configurations of speed, memory etc[4]. The base station established a connection between Mobile devices and network(internet). The base station controls the connection and operation which takes place in-between mobile devices and Mobile networks. When a mobile device users request for a service then information is transmitted to processors which are connected to server which provides network services. In Mobile cloud environment, the mobile cloud controller serves the request of Mobile device users by using cloud services.

III. MOBILE CLOUD COMPUTING MODELS A. Service Model Offered by MCC

i. Software as a Service (SaaS)

SaaS is an environment in which the cloud consumers upload their applications ,called as host architecture. Various clients access these application from the host architecture through network(Internet). In SaaS architecture applications are organized in a single logical environment to achieve optimization of speed, to increase security, availability of software, backup and fast recovery etc.

ii. Platform as a Service (PaaS)

PaaS is termed as a development platform which allows the cloud users to develop their own

Services or applications without building the infrastructure associated with it. It serves a

platform that hosts developed as well as in-progress applications.

iii. Infrastructure as a Service (IaaS)

It is a platform where Cloud consumers directly use IT infrastructures provided in the IaaS cloud with includes storage, networks and other computing resources. Virtualization is widely used in IaaS, it aims to provide virtualized resources to its users in order to integrate physical resources into a logical unit, so that the neverending demand of cloud consumers can be fulfilled.

B. Deployment model Offered by MCC

i. Public cloud storage

Public clouds are hosted by third party known as cloud service providers. Once can take the subscription of the cloud storage from the cloud service provider and can store his own data or application. The cloud service provider are responsible for managing and maintaining the infrastructure need by the cloud computing. Microsoft Azure is one of the example of a public cloud.

ii. Private cloud storage

A private cloud is owned by a single organization and is exclusively used for their business purpose. Private cloud is managed and maintained by its owner. It can be located on organization's data centers site who owns the private cloud.

iii. Hybrid cloud

Hybrid clouds combine the functionalities of public as well as private clouds. That is ,it is bound together by technology that allows data and applications to be shared between them. It also allowing data and applications to move between private cloud storage and public clouds storage and therefore it gives more flexibility and deployment options to a business. In a virtualized hybrid cloud environment, there are lots of small chunks to be managed individually *or else resources will not be optimized effectively*.

iv. Community Cloud

It is a multi- tenant cloud service model that is shared between many organizations. And it is governed and managed by all participating organization that are part of community cloud. With the community cloud the cost of deployment and access are spread across all the users.

IV. NECCESSITY OF MOBILE CLOUD IN TERMS OF SMARTPHONE DEVICES.

- i. Smartphone devices supports various types of applications and software's, these applications are easily available as smartphones are connected to cloud. Mobile cloud computing helps to deliver these applications to a particular mobile device. Further, with Mobile cloud storage all these applications can run on smartphone devices.
- ii. Mobile cloud storage provides a storage space for applications and data in turn increases the storage capacity of a smartphone device. With Mobile cloud, smartphone user can use software and applications remotely on server with greater speed flexibility
- iii. As there are number of applications running on a single smartphone device, there can be necessity to share or transfer data between two applications of a particular user. *For Example*, suppose a smartphone user a orders food on *Swiggy* and the payment is done using *PAYTM*, then here Mobile cloud plays an essential role in transferring of data between the application.
- iv. Up-gradation of operating system or applications of smartphone takes place automatically and easily whenever it rolls out provided smartphone devices are connected to Internet

V. BENEFITS OF MOBILE CLOUD STORAGE

A. Benefits of Mobile cloud storage to smartphone users

i. Flexibility

Due to Mobile cloud storage, users can retrieve their data from the cloud anytime, anywhere on any device provided that they are connected to internet.

ii. Multiple platform support

Users can download any software which are stored on cloud regardless of the underlying architecture of their device.

iii. Data Backup & Recovery

Users can store their data of their smartphone on mobile cloud and in terms of device crash, users can recover the data by retrieving it from Mobile cloud.

iv. Real time data

Due to Mobile cloud computing, the users can get real time data as data is managed externally.

v. Security -

Mobile cloud is one of the most reliable technology to take the backup of the data as it is very secure.

B. Benefits of Mobile Cloud Storage to Cloud service providers.

i. Supports Rapid Up-gradations of Applications -

As software companies are tremendously growing, new applications and version of existing applications emerging every minute. This new version can be easily uploaded on cloud which can be easily downloaded and used by smartphone users.

ii. Cost Efficient -

Mobile cloud computing bears the minimum cost of hardware, maintenance and up gradations. There are no charges for the up gradations and licensing of Mobile cloud computing.

VI. CLOUD-BASED SMART PHONE APPLICATION

Now a days there are any applications cloud-based application available for smartphones which are used by the users of smartphone devices to enhance the performance of their devise or for taking backup of their data over a safe, secure & flexible environment (cloud). Few applications are listed as below,

- 1. Goggle Drive: This is one of the popular and most used cloud platform. It is a great file storage d platform where user can save and edit documents, file whenever needed and also can share and backup their files. It supports up to 5 GB plus free data storage
- **2.** Dropbox: Dropbox is another popular cloud storage. It is used to sync files from different devices. Dropbox provide free storage of about 2 GB.
- **3.** Box: Box is an OpenCloud storage. It supports e-signing and wireless streaming of the data stored in cloud. It supports storage of free data of about 5GB.
- **4.** IDriveSync: This mobile application can access your files anywhere .It is like sharing file application. IT is used to share and sync the data of social site to a particular application of website. It supports free storage of about 10GB to 15GB.
- **5.** SugerSync: It acts like a intermediate between cloud storage and mobile application. The Pictures or videos taken by a smartphone gets directly save on cloud. It supports frees storage of about 5 GB.

VII. CONCLUSION

Mobile cloud storage facilitates the mobile user to enrich their device functionalities by enable data sharing, data and application storing, Data transferring and sharing between the application etc. Use of Mobile cloud computing will further increase in future since number of smartphone users is rapidly increasing as well as software companies are rapidly developing application such as m-commerce, m-leaning, m-cash, m-banking. Many numbers of users are constantly using these applications as they find it convenient to get connected. Mobile cloud computing itself supports many of this application to share and communicate users data within the application. This paper is mainly about the importance of mobile cloud storage with respect to smartphone devices.

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FISH DIVERSITY OF SAUNDAD LAKE

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ABSTRACT

The present study deals with fish diversity undertaken during period June 2012 to May 2013to census and commercially important fishes in the Saundad Lake. The present paper deals with the variety and abundance of fresh water fishes in Saundad Lake, Dist. Gondia (M.S.) India. The results of present investigation reveal the occurrence of 40 fish species belonging to 6 orders, 15 families and 23 genera. Among the collected species, order Cypriniformes was most dominant constituting 50% followed by order Siluriformes constituting 19% order Perciformes constituting 14.28%, orders Osteoglossiformes 9.58% and Synbranchiformes constituting 4.76% and orders Beloniformes constituting 2.38% of the total fish species.

Keywords : Fish diversity, Economic value, Nutritive Value, Saundad Lake.

INTRODUCTION

Biodiversity is essential for stabilization of ecosystem, protection of overall environmental quality for understanding intrinsic worth of all species on the earth.[Ehrlich, P.R. and E.O. Wilson, 1991]. Fish biodiversity of reservoir essentially represents the fish faunal diversity and their abundance. Reservoir conserves a rich variety of fish species which support to the commercial fisheries.

Fish plays an important role from ancient time in providing protein rich and less fat diet to the mankind .It is one of the main component of animal protein in diet, computed11kg/yr/person. (Government of India, 1980) Fishes are one of the important elements in the economy of many nations as they have been a stable item in the diet of many people. They constitute slightly more than one-half of total number of approximately 54,711 recognized living vertebrate species; there are descriptions of an estimated 27,977 valid species of fishes [Nelson, J.S., 2006].

In India potential of fish culture is yet to be fully exploited. Fishes being rich source of proteins and have high nutritive value. Extensive development of aquaculture needs to be given priority after green revolution to feed ever growing population. Success of fish culture depends apart from other factors, on selection of suitable species. Secondly the country is rich in diversity of such important group of animals. Further, there is a need of a survey of diversity of fishes in different types of habitats of Reservoir all over the country.

The total area of Saundad Lake is 80 hectare. It has catchment area of 100 sq.km. The catchment area of lake occupied by forest. It has capacity to irrigate 100 hectare. The length of Embankment is 1.0 km. Lake divided in to two parts due to crossing of national highway (Bombay-Kolkata) no.6.

Present investigation was undertaken to study the fish diversity of Saundad Lake, Ta. Sadak/Arjuni, Dist. Gondia (M.S.) India. the objective of study was to give recent data regarding Fish diversity of the this reservoir, aiming to contribute a better knowledge of the fish diversity and a tool for conservation planning of aquatic environments in this region. It is the first effort made in this direction, various indigenous, commercially important and economically valuable fishes were found in the Lake.

MATERIAL AND METHODS

Fishes were collected from Saundad Lake Dist. Gondia (M.S.) India with the help of local fishermen using different type of nets namely gill nets, cast nets, dragnets and Bhor jal. Immediately photographs were taken with help of digital camera.

Fishes were brought to laboratory and preserved in 10% formalin solution in separate specimen jars according to the size of species. Small fishes were directly placed in the 10% formalin solution. While large fishes were given an incision in their abdomen and preserved.

The Meristic and morphometric characters collected fishes were measured an identified up to the species level, with the help of standard keys and books (Day, F., 1967, Jayaram, K. C., 1999.Talwar, P.K. and A. Jhingran, 1991).

RESULT

During the study period different fish varieties have been observed in the Saundad Lake, Dist. Gondia (M.S.) India. The results showed that the area was rich in fish diversity. Fishes belonging to 6 orders and 15 families

were collected during course of the study period. Many collected fishes having economic importance sold after collection in the local fish market. In the present fish diversity study 40 species of 23 different genera 15 families and 6 orders were recorded from the Saundad Lake number of catches carried out during June 2012 to May 2013. The members of Order Cypriniformes were dominated by 15 species followed by Siluriformes 6 species, Perciformes 7 species, Osteoglossiforms 4 and Synbranchiformes with 6 species each and Beloniformes 2 species each.

15 fish families represented by 40 fish species, Family Cyprinidae was dominant group with 13species in the assemblage composition in which *Garra Lamta, Rasbora daniconius* and *Puntius ticto* were found most abundant. *Catla-caltla, Puntius punctius, Puntius sarana sarana, Puntius sophore, Lebeo rohita, Cyprinus carpio, Hypothalmichthys molitrix, Chela bacaila, Cirrhinus mrigala* found abundant. *Cirrhinus reba, Labeo calbasu* and *Gambusia affinis* were found less abundant. Followed by Family Bagridae in which *Mystus cavasius* was found abundant. *Mystus aor (Aorichthys)*, and *Mystus Seenghala* were found less abundant.

Among Family Channidae *Channa striatus* was found less abundant while *Channa punctatus* and *Channa gaucha* were found abundant. Followed by Family Notopteridae in which *Notopterus Notopterus* was found abundant. *Notopterus chitala* was found rare. Family Siluridae in which *Wallago attu* was found abundant. Family Ompok bimaculatus was found rare.Family Mastacembelidae in which *Mastacembelus armatus* and *Mastacembelus pancalus* were found less abundant. Followed by family nandidae in which *Nandus nandus* where found less abundant. Family Ambassidae in which *Chanda nama* and *Chanda ranga* are found less abundant.Family Claridae in which *Claris batrachus* found abundant.

Family Mugilidae in which *Mugil cephalus* was found rare.Family Belonidae in which *Xenentodon cancila* was found rare. Family Cichlidae in which *Oreochromis mossambica* were found abundant.Family Anabantidae in which *Anabas testudineus* were found abundant.Family Gobiidae in which *Glassogobius giuris* were found rare.

Fourty Eight species were identified and recorded in the Shionibandh Reservoir. Among these order Cypriniformes was most dominant constituting 50% followed by order Siluriformes constituting 19%, order Perciformes constituting 14.28%, orders Osteoglossiformes 9.58% and Synbranchiformes constituting 4.76% and orders Beloniformes constituting 2.38% of the total fish species showed in the (Fig. 1).

Fishing operations were done throughout year with so many different fish species catches in monsoon compared to post monsoon and summer seasons.

S.No.	Order	Family	Scientific name	Common name	Status
1	Osteoglossiformes	Notopteridae	Notopterus notopterus	Feather back	+
			Notopterus chitala	Moy	-
2	Cypriniformes	Cyprinidae	Catla catla	Catla	++
			Garra lamta	Garra	+++
			Rasbora daniconius	Black line	+++
				Rasbora	
			Rasbora rasbora	-	++
			Cyprinus carpio	Common carp	++
			Puntius ticto	Ticto	+++
			Puntius amphibious	Khavli	++
			Puntius sarana sarana	Khavli	++
			Puntius sophore	Sophore	++
			Cirrhinus mrigala	Mrigala	++
	Cypriniformes	Cyprinidae	Cirrhinus reba	Reba	+
			Labeo rohita	Rohu	++
			Labeo calbasu	Calbasu	+
			Labeo bata	-	+
			Oxygaster bacaila	Indian glass barb	+
		Bagridae	Mystus aor (Aorichthys)	Aor	+
			Mystus cavasius	-	+
			Mystus seenghala	Seenghala	+
3	Siluriformes	Siluridae	Ompok bimaculatus	Buter cat fish	-
			Wallago attu	Fresh water shark	+

Table 1 : The fish diversity and Economic value of Saundad Lake (June 2012 to May 2013)

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		Claridae	Claris batrachus	Mangur	++
		Sisiridae	Glyptothorax spp.	-	-
		Heteropneustidae	Heteropneustus fossillis	Singhur	-
4	Beloniformes	Belonidae	Xenentodon cancila	Kowa	
			Gadusia chapta	-	+
5	Synbranchiformes	Mastacembelidae	Mastacembelus armatus	Baam	+
			Mastacembelus	Malga	+
			pancalus		
			Mastacembelus	-	+
			aculeatus		
		Cichlidae	Tilapia mossambica	Telapi	+
6	Perciformes	Anabantidae	Anabas testudineus	Koi	+
		Gobiidae	Glassogobius giuri	Goby	-
		Nandidae	Nandus nandus	-	-
		Ambassidae	Chanda ranga	Glossyfish	++
			Chanda nama	-	-
		Channidae	Channa striatus	Banded snake	+
				head	
			Channa punctatus	Spotted snake	++
				head	
			Channa gaucha	Dhok	-
			Channa marulius	Maral	+

*Most abundant; ++ +, Abundant; ++, Less abundant; +, Rare; -.

DISCUSSION

Sakhare, V.B. and P.K. Joshi,(2003) Reported 34 species of fishes in reservoirs of Parbhani Dist. of Maharashtra.India (Shinde, S.E., et.al, 2009]) Reported the lchthyofauna of Harsool-Savangi Dam Aurangabad (M.S.) India. Total 15 fish species belonging to 3 orders, 4 families and 12 genera. The order cypriniformes found dominant with 11 species, followed by perciformes 3 species and siluriformes with 1 species.Mahapatra, D.K., (2003)Recorded abundance of catfishes in Hirakund reservoir (India). Total 43 species were present in which 18 were commercially important.

The work has been concluded with future strategies for development of fish fauna conservation of Saundad Lake, Ta.Sadak/Arjuni, Dist. Gondia (M.S.) India. Recent data regarding Fish diversity of the Saundad Lake, aiming to contribute a better knowledge of the fish diversity planning of aquatic environments in this region. To maintain Fish biodiversity has an immense importance as it is not always possible to identify individual species critically to sustain aquatic ecosystem.

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MUSHROOM CULTIVATION

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ABSTRACT

Mushrooms possess many medical and pharmacological properties. It is not only satisfy food requirement but also provide health benefits with different varieties having different medicinal properties. Mushroom has huge potential to be used as bioprospecting agents. Bioprospecting is the process of extraction and commercialization of new products based on biological resources. The role of mushrooms as anti-oxidant, anticancer, its anti- genotoxicity and anti-mutagenic agent, open up the new gates for pharmaceutical industries. In this chapter, bioprospecting aspects of mushroom cultivation have been discussed. In the near-term, mushrooms will be used for developing medicines for curing cancer like diseases and neurological disorders.

Keywords: mushroom, pharmacological properties, anti-genotoxic properties, bioprospective agent.

1. INTRODUCTION

The number of mushrooms on Earth is estimated at 140,000, yet only 10% (approximately 14,000 named species) are known. Mushrooms comprise of a vast and yet largely untapped source of pharmaceutical products. For millennia, mushrooms have been valued by humankind as an edible and medical resource. A number of bioactive molecules, including antitumor substances have been identified in many mushroom species. Polysaccharides are the best known and most potent mushroom derived substances with antitumor and immunomodulating properties (Mizuno 1996, 1999a, b, 2002; Lorenzen and Anke 1998; Borchers et al. 1999; Ooi and Liu 1999; Wasser and Weis 1999; Tzianabos 2000; Reshetnikov et al. 2001). In the Far East where knowledge and practice of mushroom use primarily originated, hot-water-soluble fractions (decoctions and essences) from medicinal mushroomshave been in use as medicine for a long time. (Hobbs 1995, 2000). Mushrooms such as *Ganoderma lucidum* (Reishi), *Lentinus edodes* (Shiitake), *Inonotus obliquus* (Chaga) and many others have been collected and used for hundreds of years in Korea, China, Japan, and eastern Russia. Those practices still form the basis of modern scientific studies of fungal medical activities, especially in the -field of stomach, prostate, and lung cancers (Wasser et al., 2002).

2. WORLDWIDE PRODUCTION OF MUSHROOM

- Globally, the production and per capita consumption of mushroom has increased at a rapid rate for last 5 decades.
- According to the United Nations Food and Agriculture Organization statistics, the average annual growth rate of edible fungi is 5.6% worldwide.
- During 1997-2012, annual per capita consumption of mushrooms increased from about 1 kg to over 4 kg. The main producer and consumer of mushroom is China (Royse 2014).
- In India, more than 40,600 tons of mushrooms are produced annually (Pandey et al. 2014).
- Mushroom cultivation is one of the eco-friendly ways to recycle agricultural and agro-industrial wastes.
- In 2016, market value of cultivated edible mushroom species was about 30-34 billion dollars and medicinal mushroom species was 10-12 billion dollars (Mushroom fact sheet, 2016).
- Therefore, it is a billion dollar agribusiness which provide great opportunities to the farmers and their families as well as others who are interested in cultivatingmushroom in spare time and get an additional source of income.
- In India, the total production of mushroom is about 1,29,782 metric tonnes (Sharma *et al.*, 2017), of which major share is contributed (73%) by button mushroom production by Agro Dutch, Lalru (Patiyala), followed by oyster mushroom which contributes about 16% in Punjab leading to a production of around 18,000 metric tonnes/annum (Sharma *et al.*, 2017).

3. MUSHROOM CULTIVATION

Mushrooms can be cultivated in two ways: Mushroom fruit bodies and mycelial biomass. Solid state fermentation produces mushroom fruit bodies and liquid culture produces mycelial biomass. Both of them have their own nutritional and medicinal properties. Depending upon the requirement, either one of them could be cultivated. Composition of the substrate is an important factor which affects the nutritional content, production and yield of mushroom.

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4. METHODS OF CULTIVATION

In solid state cultivation method, solid waste of agro-industries can be used for cultivation. The substrate is soaked in bavistin or formaldehyde containing solution overnight and then spread on a clean surface for removing excessive amount of water to maintain the moisture content upto 75%. The moist substrate is then sterilized by autoclaving at 121°C for 30 min orby free flowing steam at 100 °C for 2hrs. This is followed by filling the substrate in plastic bags and inoculating it with 2% spawn. The inoculated bags are incubated at appropriated temperature and humidity content which varies according to the mushroom species.

Solid state cultivation process also involves the tray cultivation methods. In tray cultivation method, trays are filled with sterilized substrate, inoculated with the spawn and incubated at appropriate temperature and conditions. After spawn run, the whole substrate is covered with mushroom mycelium. This is followed by the addition of casing layer with the caution that it must not penetrate the substrate layer.

Another method of solid state cultivation process is log cultivation method which is mainly used for shiitake mushroom. In this method, wooden logs are used for cultivation. Holes are drilled in the logs for the inoculation of mushroom spawn. The inoculated logs are incubated in appropriate condition for the production of mushroom fruit bodies.

All these methods provide mushroom fruit bodies for the consumption purpose. However, mushroom biomass can be produced by liquid culture method. This is performed in fermenter. The mushroom mycelium is cultivated as seed culture in the fermenter and this starter culture is used in the fermenter for the production of mycelial biomass in appropriate conditions. These conditions vary according to the mushroom species used.

5. NUTRITIONAL CONTENT OF MUSHROOMS

Mushrooms are rich source of protein which can be consumed to combat protein deficiency diseases like marasmus and kwashiorkor. They also possess crude fiber content and minerals such as calcium, iron, zinc, magnesium, manganese, selenium and arsenic (Alam et al., 2008). Mushrooms in diet can help to combat mineral deficiency related problems. It is good source of vitamin D which is used in calcium absorption (Feeney et al. 2014) and required for strengthening the bones. Low amount of fat and carbohydrate content in mushroom makes it suitable for consumption by diabetic patients.

6. ANTI-GENOTOXIC PROPERTIES OF MUSHROOM

The bacterial reversed mutation assay is used to evaluate the mutagenic properties. The test uses amino aciddependent strains of S. typhimurium. In the absence of an external histidine source, the cells cannot form colonies. Colony growth is resumed if a reversion of the mutation occurs, allowing the production of histidine to be resumed. The independent experimental results by (Prabakaran et al., 2011; Taherkhani, 2014; Devi et al., 2015) showed that *Phellinus spp.* extracts had antimutagenic activity when tested with S. *typhimurium* strains TA98 and TA100, especially the ethanol extract of P. rimosus. In the case of TA98, the ethanol extract of P. rimosus had strong activity at 1mg/ plate, whereas ethanol extract of P. rimosus showed strong antimutagenic activity at the concentration of 2 mg/plate for TA100. The ethanol fraction had the most active antimutagenic activity.Based on these findings, it is suggested that the antimutagenicity activity of ethanolic extract from P. rimosusis due to the presence of phenolic compounds in this mushroom. The mechanism by which the extract shows antimutagenicity is not clear. However, the antimutagenic activity of the extract against direct acting mutagens is probably due to the direct inactivation of the mutagens by complex formation with the ingredients present in the extract. The antimutagenic effect may also be a result f protecting the bacterial genome from the directly acting mutagens. This protection can be rendered by the rapid elimination of mutagens from bacteria before their interaction with the DNA, which may be mediated by facilitating or stimulating the transmembrane export system in bacteria(Ajith and Janardhanan, 2011; Laovachirasuwan et al., 2016). The anti-genotoxic potential of mushrooms is shown in table 1.

Agaricus blazei	Agaricus blazei is shown to decrease H ₂ O ₂ induced DNA damage	Živković et
	within 15 mins of its application, maximum potency being reached at	
	30 mins.	
89 different	Five extracts (Cortinarius evernius, Rozites caperatus, Lactarius	Filipic et
mushroom species	vellereus, Russula integra and Pleurotus cornucopiae) inhibit UV	al., 2002
	induced mutations	
Ramaria largentii	Ramaria largentii extract has a remarkable DNA protective activity	Aprotosoaie
(orange coral	against H _O - induced damage	et al., 2017
mushroom	2 2	

Table-1: Anti-genotoxic properties of mushroom.

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Agaricus	Co-treatment with quercetin (100 and 500 µmol/L) significantly	Radakovic
brasiliensis	reduced DNA damage caused by Thymol (200 μ g/mL)	et al., 2015

7. MUSHROOMS AS IMMUNITY BOOSTERS

Mushrooms are also known for their ability to boost up the immune response. Immunomodulatory properties of mushroom are shown in table 2. The main component for inducing immunity in the humans is mushroom glycans (also known as β -glucans. In mushroom glycans, the structural backbone is composed of glucose which has been reported to activate both the innate and adaptive components of immune system. These carbohydrate moieties act upon innate immune cells such as natural killer cells (NK), macrophages, neutrophils and dendritic cells to activate them to release important cytokines or reactive species in order to kill infectious microbes or tumor cells. The cytokines released in turn also activate the adaptive immune cells which along with the innate immune cells act upon foreign antigens by augmenting both the cellular and humoral immunities. An immunomodulatory heteroglycan isolated from the fruit bodies of *Astraeus hygrometricus* has been reported to induce immune stimulation in Dalton's Lymphoma tumor bearing mice which reduced tumor progression and increased the survival rate in the animal. In another study, heteroglycan isolated from the mycelia of *Pleurotus ostreatus* has also shown to inhibit tumor progression (in both Dalton's Lymphoma and solid Sarcoma 180 model) by augmenting the immune system. Therefore, mushroom especially, glycans can be an important source for immunomodulatory pharmaceutical products (Devi and Maiti, 2016).

Table-2: Immunomodulatory properties of mushroom

Mushroom	Model	Cellular Response	Dose	Reference
Grifola	In vivo, mouse	Increase in Tumor-	20 or 80 mg/kg PO for	Masuda et al,
frondosa	colon cancer	specific CD8+ and	20 d; Maitake D-fraction	2013
		CD4+ T cells, NK cells		
Ganoderma	In vivo, mouse	Increase in	50, 100, 200 mg/kg IP;	Zhang et al,
lucidum	cancer cell line	Phagocytosis via TLR4	standardized PSG-1	2013
	CT26		polysaccharide	
Agaricus	In vivo, mouse	Increase in CD3, CD19,	3 or 6 mg/kg PO \times 3 wk;	Lin et al, 2012
bisporus	leukemia	CD11b, Liver	hot water extract	
		weight, Spleen		
		weight, NK activity		
Ganoderma	In vitro, human	Decrease in MMP-9	0.5, 1.0 mg/mL every 48	Martinez-
lucidum	inflammatory breast		h of 96 h; extract of	Monte mayor
	cancer line		fruiting body and	et al, 2011
			cracked spores	
Cordyceps	In vitro, human	Decrease in MMP-9,	50, 100, 200 μg/mL;	Lee, Kim, and
	bladder cancer cell	NF-ĸB	cordycepin	Moon, 2010
	lines 5637 and T-24			
Turkey Tail	In vivo, human	Increase in Lymphocyte	6 or 9 g PO daily for 6	Torkelson et
	breast cancer, phase	count, NK	wk	al, 2012
	I clinical trial	activity,CD8+ T		
		cells,CD19+ B cells		

8. ROLE AS ANTIOXIDANT

A number of secondary metabolites of mushroom including terpenes, polyketides, steroids and phenolic compounds are the source of antioxidant activity (Table 3). Among the all compounds, polyphenols have highest antioxidant activity. Polyphenols are the group of compounds which bear an aromatic ring and one or more hydroxyl groups. The mostly known polyphenols are flavonoids, flavones and anthocyanin. Polyphenols have free radical scavenging , metal chelation, enzyme modulation activities. Besides, these polyphenols can inhibit low-density lipoprotein (LDL) oxidation.

Glutathione (GSH) plays a critical role as the master antioxidant in mammalian cells and tissues. Recent studies have also identified ergothioneine as a potentially important antioxidant/nutrient with preventive properties. It has been reported that mushrooms (particularly the yellow oyster and porcini) are a rich dietary source of these critical antioxidants. Both antioxidants have been reported to be more concentrated in pileus than stipe tissues in selected mushrooms species. Kalaras et al., (2017) have reported that *Agaricus bisporus* harvested during the third cropping flush contained higher levels of ergothioneine and glutathione compared to the first flush, possibly as a response to increased oxidative stress. They may have important translational implications,

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suggesting that mushroom consumption may be associated with reductions in oxidative stress related diseases and disorders (Kalaras et al., 2017).

S. No.	mushroom	Antioxidant properties	mechanism	reference
1.	Armillaria mellea,	B. badius and S. luteus	dried using both freeze drying and	Radzki et al.
	Cantharellus cibarius,	have antioxidant potential	convection drying at 50°C. water	(2014)
	Lactarius deliciosus,	due to presence of	and ethanolic extracts were	
	Leccinum aurantiacum,	phenolics.	prepared. Hot-air drying shows	
	Suillus luteus, and		more frequently negative effects as	
	Boletus badius		compare to positive effects.	
2	Terfezia boudieri	High contents of phenolic	A microwave-assisted extraction	Özyürek et al.,
	Chatin, Boletus edulis,	and flavonoid compounds.	(MAE) process for polyphenols	2014
	and Lactarius volemus	B. edulis showed the	was used to prepare methanol	
		higher TAC and TPC;	concentration of 80%, extraction	
		highest inhibitory effect on	temperature of 80 °C, and	
		DPPH and on reactive	extraction time of 5 min. Different	
		oxygen species (ROS).	antioxidant assays (i.e., total	
			antioxidant capacity (TAC) and	
			total phenolic content (TPC)) were	
			utilized to evaluate the antioxidant	
			capacity of the methanolic extracts	
			of mushrooms.	
3	Geranium nepalense	abundant contents of total	G.nepalense scavenged DPPH and	Sim et al.,
		polyphenol and flavonoid	ABTS radicals in a dose-dependent	2017
		contents	manner and strongly suppressed	
			cellular reactive oxygen species,	
			thereby protecting H_2O_2 -induced	
			cytotoxicity. It may be useful in	
			induced discesses including	
			Alzheimer's disease, respiratory	
			inflammatory disease, and chronic	
			kidney diseases	
4	Fomitopsis betulina	Phenolic acids (syringic	Phenolics have antioxidant ability	Sułkowska-
	1 011110 p 515 0 01111110	gallic, p-hydroxybenzoic.	The mycelium extract exhibited	Ziaia et al
		3.4-dihvdrophenvlacetic).	significant cytotoxic activity	2018
		indole compounds (L-	against prostate cancer cells, while	
		tryptophan, 5-hydroxy-L-	the fruiting body extract indicated	
		tryptophan, 5-	a moderate effect on the viability	
		methyltryptamine), sterols	of melanoma and prostate cancer.	
		(ergosterol, ergosterol	-	
		peroxide, hexestrol,		
		cholecalciferol), and		
		triterpenes (betulinic acid,		
		betulin)		
5	Pleurotus djamor	Phenolic, flavonoid	Radical scavenging activities of	Sudha et al.,
		contents of methanol and	methanol and aqueous extracts was	2016
		aqueous extracts of	assessed using 1,1-diphenyl-2-	
		mushroom	picryl-hydrazyl (DPPH), N,N-	
			dimethyl-p-phenylenediamine	
			(DMPD), total Fe ⁻⁺ reducing	
			power, pnosphomolybdenum,	
			metal chelating activity, and lipid	
			Poth extract types showed officient	
			redicel seavencing activities	
			against DDDH and DMDD redicate	
			against DFF Π and DIVIPD faulcals,	
			reducing powers motel sheleting	
			activities and lipid perovidation	
			inhibition	
6	Lactarius salmonicolor	n-hydroxybenzoic acid	antioxidant canacity was assessed	Athanasakis et
0	Lactarius saimonicoloi	p-injuitoxybelizbie aciu,	annonium capacity was assessed	

Table-3: Antioxidant properties of mushroom

		total phenolic content	by 1,1-diphenyl-2-picrylhydrazyl (DPPH) radical scavenging method and total phenolics and antioxidant activity wasreported to be significantly higher in the fractions of increased polarity.	al., 2013
7	Boletus chrysenteron, B. edulis, Leccinum scabrum, L. aurantiacum, and Macrolepiota procera	Scavenging ability was the highest for B. edulis and B. chrysenteron. Boletus chrysenteron and B. edulis were characterized by high scores of polyphenol contents and antioxidant activity in the FRAP, TEAC, and DPPH assays.	Antioxidant activity was measured with the FRAP, TEAC, DPPH scavenging ability and ferrous ions chelating ability assays which show the variation in the antioxidant properties of mushroom.	Witkowska et al., 2011
8	Pleurotus ostreatus, Morchella esculenta, P. ostreatus (Black), P. ostreatus (Yellow) and Pleurotus sajor-caju		The DPPH radical scavenging activity was highest in <i>Morchella</i> <i>esculenta</i> .	Ahmad et al., 2014
9	Lycoperdon perlatum, Cantharellus cibarius, Clavaria vermiculris, Ramaria formosa, Marasmius oreades, Pleurotus pulmonarius	bioactive components revealed that total phenols are the major bioactive component found in extracts of isolates.	Antioxidant efficiency by inhibitory concentration on 1,1- Diphenly-2-picrylhydrazyl (DPPH) was found significant when compared to standard antioxidant like Buthylated hydroxyanisol (BHA). The concentration (IC(50)) ranged from 0.94 ± 0.27 mg/mL to $7.57 \pm$	Ramesh and Pattar, 2010

9. ROLE AS ANTI-CANCER AGENT

Cancer is characterized by the aberrant behavior of a single cell type, which is difficult to treat by chemotherapy due to the lack of compounds specifically targeting only malignant cells. Even the most successful anticancer drugs were typically chosen because of their ability to preferentially inhibit rapidly dividing cells. Though, these drugs are aimed to eliminate neoplastic cells, while causing minimal damage to normal cells, their undesirable effects are inevitable. There is an increasing demand for novel diagnostic and medical therapies in cancer treatment. Lectins can play an important role in targeted drug delivery by increasing the efficacy of the treatment by enhancing drug exposure to the targeted site and limiting the side effects of the drug on normal and healthy tissues.

0.21 mg/mL.

Mushrooms are widely known for their anti-cancer properties. The anti-cancer activity in glycans of mushroom varies widely from the simple homopolymers to the complex heteropolymers. Mushroom polysaccharides that are bound to proteins or peptides have been noted to exhibit a higher anti -tumor potential as compared to the polysaccharides without any protein or peptide complexation. Mushroom glycans mediate their antitumor function mostly by augmenting the immune response of the host. It has been reported that the aqueous extract derived from *Cordyceps militaris* induces apoptosis by increasing Bax expression in A549 cells. In another case, protein bound glycan derived from *Phellinus linteus* was shown to inhibit SW480 colon cancer cells by inducing G2/M cell cycle arrest. Polysaccharides or glycans can also induce necrosis or programmed cell death as another mechanism for inhibiting tumor proliferation.

Macrophages secrete a repertoire of cytokines like TNF- α and NO that shows cytotoxicity to tumor cells. NO exerts its toxic effect by inactivating enzymes that contain iron-sulfur clusterandthereby inhibiting DNAbinding proteins by releasing zinc finger transcription factors and by disbalancing the mitochondrial membrane potential. Acidic glycans extracted from *Phellinus linteus* produced both NO and TNF- α which contributed to anti-tumoricidal functions. In addition, polysaccharopeptides from *Ganoderma lucidum* have shown a different mechanism of tumor inhibitory functions on vascular cell proliferation(anti-angiogenesis) as well as by imparting inhibition on VEGF secretion(Devi and Maiti, 2016).

Tumor lectinology has identified cytochemical and histochemical differences between normal and tumor tissues, between different types of tumors, and within a single class of tumors. Alteration in protein glycosylation and increased sialylation are hallmark features of cancer cell surfaces serving as targets for lectin-

based markers in histochemical studies. Therefore, lectins can be used to reveal the stages of carcinogenesis and can be very useful tools for histochemical and other methods for the identification of cancer and the degree of metastasis. There has been a tendency to shift the application of lectins from detection to combat cancer. Recent research shows cytotoxic, apoptotic, and necrosis inducing effects of certain lectins. Comparative studies using several lectins as antitumor or cytotoxic agents have shown a variety of effects depending on lectin source, cell line or cancer type. Some lectins inhibit cell proliferation in malignant cells by cross-linking cell surface glycoconjugates without any need for internalization. Other lectins like plant toxin ricin bind to glycoproteins on the cell surface from where it is endocytosed to the cytosol and enzymatically inhibits protein synthesis.

Initial studies on the role of lectins for human cancer treatment have focused on cytotoxic properties of plant lectin ricin (RCA) and abrin. Mistletoe lectin from *Viscum album* has also been widely studied against cancer, whereas phytohemagglutinin (PHA) and wheat germ agglutinin (WGA) are well known for their toxic effects on intestinal epithelial cells. Various other plant lectins with antiproliferative effects have also been reported, namely GSA (*Griffonia simplicifolia* agglutinin), Con-A (Concanavalin A), PNA (*Arachis hypogea*), SBA (*Soyabean agglutinin*), and VFA (*Vicia foba* agglutinin). The antiproliferative lectins from higher fungi are less documented, although some mushroom lectins have profound inhibitory effects on cell proliferation of malignant cells. They have been reported to be cytostatic and non-cytotoxic and their antiproliferative action is reversible. These properties of mushroom lectins combined with their unique carbohydrate specificity make them very attractive molecules for investigating their antiproliferative potential and possible role in cancer therapeutics (Singh et al., 2016).

In a study by Wang et al. (2014) water -soluble polysaccharide -BEP, has been reported to be successfully isolated and purified from the fruiting bodies of B. *edulis*, with an average molecular weight of 113,432 Da. BEP contains no protein and uronic acidbut has a high carbohydrate content of 93.4%. Monosaccharide component analysis indicated that BEP was composed of glucose, galactose, rhamnose and arabinose with molar ratios of 2.9:3.2:1.3:1.6. The data obtained from GC/MS, IR and NMR (1H and 13C) analysis revealed that BEP has a backbone consisting of $(1\rightarrow 6)$ -linked--d-glucopyranosyl, $(1\rightarrow 2,6)$ -linked-- d-galactopyranosyl, $(1\rightarrow 6)$ -linked--d-galactopyranosyl residue at the O- 2 position of $(1\rightarrow 2,6)$ -linked--d-galactopyranosyl residue at the O- 2 position of $(1\rightarrow 2,6)$ -linked--d-galactopyranosyl residue at the O- 2 position of $(1\rightarrow 2,6)$ -linked--d-galactopyranosyl residue at the O- 100 protection of the main chain in the ratio of 2.9:1.6:1.6:1.4:1.5.

BEP was shown to significantly inhibit the growth of Renca transplanted in mice during in vivo antitumor experiment and had no cytotoxicity to hematological system and liver/kidney function of tumor-bearing mice at test doses. Acute toxicity was also investigated by oral administration of serial BEP dilution (from 500 mg/kg to 2000 mg/kg body weight) in 200 L PBS to the normal mice. Acute toxicity results proved that there was no toxicity up to a concentration of 2000 mg/kg body weight in BALB/c mice as evidenced by absence of significant behavioral changes and animal death (data now shown). Furthermore, BEP was reported to significantly stimulate splenocytes proliferation, increase the spleen and thymus indices, elevate the activities of NK cell and CTL in spleen, and promote the secretion of the cytokines IL-2 and TNF- in Renca tumor-bearing mice. The above results suggested that the BEP had indirect anti-tumor activity achieved by improving immune response (Wang et al., 2014).

10. COMMERCIALLY AVAILABLE CHEMOTHERAPEUTIC FORMULATIONS

Mushrooms havemedicinal applications and commercial products have been developed. A few of them have been mention in the table 4. Lu et al. (2011b)reported the extraction of polysaccharide Krestin (PSK), a non-toxic immunomodulator, from medicinal mushroom*Coriolus versicolor*. When it is used for standard neoadjuvant therapyand administered withpaclitaxel and trastuzumab augments, it provide anti-tumor immunity and results in improved pathological complete response rate and overall survival in mouse models of HER2+/ER- and triple negative and locally advanced breast cancer. Paclitaxel/Docetaxel and PSK may work together to auto immunize the patients of their own tumors, resulting in tumor-destructive immunity.

Another mushroom, *Ganoderma lucidum* also known as Reishi enhances the function of immunosuppressing anti-tumor agent Cyclophosphamide and Cisplatin as reported by Zhu et al. (2007) and Masuda et al. (2009). Hence, it becomes very important to categorically analyze and select mushrooms of medicinal use and put them into application. Mushrooms are commercially also available in cosmetics as well supplements and food products for consumption.

Table-4. Chemother apeutic agents isolated if olir mush ooms.				
Chemotherapeutic Agent Indicated Mushroom Reference				
Trastudzumab	PSK (turkey tail <i>i.e. Coriolus versicolor</i>)	Lu et al, 2011b		

Table-4: Chemotherapeutic agents isolated from mushrooms.

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Cyclophosphamide	Reishi	Zhu et al, 2007
Cisplatin	Maitake (Grifola frondosa)Cordyceps,	Masuda et al, 2009, Yao et
	Reishi (Ganoderma spp.)	al, 2012
Docetaxel	Docetaxel PSK (turkey tail <i>i.e. Coriolus versicolor</i>)	
		Wenner et al, 2012
Doxorubicin	Agaricus	Lee and Hong, 2011

11. CONCLUSION

Mushrooms are being increasingly researched and used for their important health benefits with different varieties having different medicinal properties. The role of mushrooms as anti-oxidant, anti-cancer, its anti-genotoxicity and anti-mutagenic agent, open up wide areas in which mushrooms could be used. It has now become essential to harness the untapped potential of mushrooms in various fields and clinically and commercially make it available to everyone. More translational research is needed to understand different types of mushrooms and whether in extract form or other forms it can have a better effect. Further, a detailed research in this direction, can lead us to use these as strong medicine in future.

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SPRAY PYROLYSIS DEPOSITION AND CHARACTERIZATION OF NANOCRYSTALLINE $$\rm MnFe_2O_4$ THIN FILM

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ABSTRACT

 $MnFe_2O_4$ thin filmhas been deposited by chemical spray pyrolysis method on a glass substrate at a temperature of 350 °C. The deposited film was annealed at 550 °C for 4 h. X-ray diffraction technique was employed to confirm theformation of single cubic phase nanocrystalline thin film. The crystallite size of the present thin film is of the order of 15 nm confirming the nanocrystalline nature of the film. The thickness of the film was measured by surface profiler meter and is found to be 289 nm. The formation of spinel ferrite phase is confirmed to active Raman mode peaks of bands in the thin film by using Raman spectroscopy. The energy band gap(E_g) is found to 2.01 allowed direct electronic transitions was observed through UV-vis studies.

Keywords: Spray Pyrolysis; MnFe₂O₄; XRD; UV-Vis; Thin film.

1. INTRODUCTION

Ferrites are the most important magnetic material due to their combined electrical and magnetic properties, which can be modified for the desired application[1]. Now day's ferrite thin films are used in alot of applications, such as magnetic recording media, sensors, and microwave device[2-5]. The ferrite films are effectively utilized as magnetic core materials with thelow iron loss, opto-magnetic devices, and vertical recording magnetic material in surface magnetism study[6]. The spinel type refers to $M^{2+}M_2^{3+}O_4$, which attract great interest owing to their multipurpose practical applications. If $M^{3+} = Fe$, the resulting spinel ferrites can be represented by the general formula of MFe_2O_4 (M = Mg, Zn, Mn, Co, Cd) is extensively utilized as magnetic materials^[7]. However, the presence of the two cations in the spinel structure leads to improved sensing behavior towards target gas/vapors. This motivated us to investigate the ethanol and acetone vapor sensing properties of manganese ferrite ($MnFe_2O_4$). The spinel nanostructure form of $MnFe_2O_4$ with Fd3m space group is commonly illustrated by its unit cell of cubic structure having eight formula units. The entire unit cell from the cubic structure has twenty four cations arranged in eight of the sixty four tetrahedral sites (Mn) and sixteen of the thirty two are arranged at the octahedral sites (Fe²). In MnFe₂O₄ nanostructure, 80% have normal spinel structure and remaining 20% of Mn^{2+} cation arranged in octahedral site with Fe³⁺ cations[8]. The sensitivity of the sensing material highly depends on its size, composition and morphology along with its synthesis techniques[9]. Different preparation methods have been employed to produce nano-sized spinel ferrite MnFe₂O₄, such as co-precipitation, hydrothermal and solvethermal synthesis sol-gel, processing and microwave method[10-12]. The present investigation is to enhance the structural and optical properties of the MnFe₂O₄nanoferrite thin film by spray pyrolysis technique.

2. EXPERIMENTAL PROCEDURE

The manganese ferrite ($MnFe_2O_4$) thin film was deposited on to preheated glass substrate (350 °C) by using spray pyrolysis technique. The solutions are prepared by using amixture of $Mn(No_3)_2.6H_2O$ (manganese nitrate hexahydrate) of 0.08 M and Fe (No_3)_3.9H₂O (ferric nitrate nonahydrate) of 0.08 M in separately dissolving in double distilled water. The final solutions are prepared by mixing two initial solutions in 1:2 volumetric proportions.

The MnFe₂O₄ thin film was prepared by spraying solution on to glass substrate. The glass substrate was preheated with an ultrasonication for 30 min in distilling water before film deposition. Then after cleaning glass substrate was mounted on to asurface hot plate and set the substrate temperature to 300 °C. The temperature controller was used to control the temperature within \pm 10 °C through a thermal couple connected to the surface of a hot plate. The other preparative parameter such as spray rate 5ml/min. the solution of total quantity 75ml. the parameters of thenozzle to substrate distance 28.5 cm was kept constant and thefreshly prepared solution was atomized in air 0.30 M pa. Compressed air was used as a carrier gas to atomize the spray. The atomized droplets were transferred on to the heated glass substrate for 10s intermittently[13].

In spray pyrolysis method, the precursor material is dissolved in a suitable solvent and then the solution is sprayed on to the preheated glass substrate maintained at a desired temperature. By the spraying of amixture of metallic nitrides, chlorides with a particular concentration and semiconducting film can be prepared. In this process, the precursor solution is atomized through a glass nozzle. The nozzle converts to the solution into small

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droplets known as aerosols. These aerosols are allowed to travel through finally incident onto the heated glass substrates.

3. RESULTS AND DISCUSSION

3.1 Structural properties

The Fig. 1 shows that X-ray diffraction pattern of theMnFe₂O₄ thin film deposited on glass substrate at 300 °C temperature and annealed 550 °C for 4 hrs. The X-ray diffraction shows that some lower intensity peaks appeared in thenickel ferrite thin film due to the lower peaks as (220), (221) (311),(321), (421), (422), (511), (440) and (441) also the spinel cubic crystal structure of the deposited film. Average crystallite size of nanoparticles was calculated from the Debye-Scherrer's equation[14]. (1)

where, D is the crystalline size, λ is the wavelength of x-ray (1.5406 A), β the full-width of the diffraction line at half-maximum intensity and θ is the Bragg's angle. The crystalline size of themanganese ferrite was estimated to 15 nm in the **table 1**. The film thickness is one of the important physical parameters, its most of the properties depend upon a film thickness[15]. The grain size of film changes with thickness. The thickness of the film was measured using surface profiler and found to be 289 nm.



Fig-1: X-ray diffraction of MnF_2O_4 thin film



Fig-2: Raman spectra of MnFe₂O₄ thin film.

 $\label{eq:constant} \begin{array}{l} \text{Table-1: Lattice constant (a), X-ray density } (\rho_x), \text{ and crystallite size } (T) \text{ and energy band gap } (E_g) \text{ for } \\ & MnFe_2O_4 \text{ thin film.} \end{array}$

Lattice constant a (Å)	X-ray density ρ _x	Crystallite D	Energy band gap E _g
	(gm/cm)	size (nm)	eV
8.235	5.485	15	2.01

To have more information regarding the structure of manganese ferrite thin film analysis by using Raman spectra was recorded at room temperature are shown in Fig. 2.The Raman peak over the region 671.12 cm⁻¹ represents the modes of tetrahedral group and 467.08 cm⁻¹ region to the octahedral group of manganese ferrite thin film[16].

3.2 Optical properties

An optical property of manganese ferrite thin film on glass substrate was studied by using UV-VIS spectrophotometer. The optical absorptions spectrum of annealed $MnFe_2O_4$ thin film (550 °C) recorded at room temperature. The visible light absorptions a spectrum was examine using UV spectrophotometer having glass substrate. Fig. 3 shows the plot of absorption spectra of $MnFe_2O_4$ in 200-800 nm wavelength range. The direct optical band gap energy (E_g) of $MnFe_2O_4$ thin film are determined by the relation between absorption coefficient (α) and energy (hv) of the incident photon[17].

Where A is a constant independent of hv, $and(E_g)$ is the semiconductor band gap and n is a number equal to 1 for direct band gap. The plot of (αhv) versus (hv) is shown in Fig. 3. It is seen that the direct optical band gap (E_g) of mangnese ferrite thin film is 2.01 nm. The direct and indirect band gap energy of MnFe₂O₄ thin films has been determined by Tauc plot based on the above formula as shown in fig. 3. The value of optical band gap is calculated by extrapolating the straight line portion of the graph on 'hv' axis[18].

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 $r_{1}(y) = 100$ $r_{100} = 100$ $r_{100} = 1.5$ $r_{100} = 2.5$ $r_{100} = 3.0$ $r_{100} = 1.5$ $r_{100} = 2.5$ $r_{100} = 3.0$ $r_{100} = 3.0$

Fig-3: Direct band gap MnF_2O_4 thin film at annealed 550 °C

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TACT-GUARD USING HAPTIC FEEDBACK

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ABSTRACT

With increasing demand of touch-based IOT devices and emerging of all fields of industries towards technology and data-centric process, surface haptic feedback is soon to get a lot of attention and will play a significant role in the growth of various IOT devices. In this paper, we introduce a conceptual model of implementing the surface haptic feedback in a new way according to the rising era of data-centric industries. That is, by implementing surface haptic feedback using screen-guards based on data-driven algorithm approach. This paper is a focused study on haptic screen guard which we named as "Tact-guard", and its application in fields like e-commerce, fashion designing, product designing and interior & architecture designing, and gaming.

Keywords: Haptic Feedback (HF), Surface Haptics (SF), E-commerce, Tact-guard (TG), Touchscreen devices (TD).

I. INTRODUCTION

Humans have five different senses through which they interact with different things in the world. The world is getting more and more engaged with many IOT devices day by day, commonly smartphones, tablets, and computers. Interactions with these devices are based on some of our senses like visual sense, auditory sense and touch sense. The visual and auditory sense is much more enhanced in recent years with respect to IOT devices.

Throughout the day we use our smartphones through visual and tactile sense. Visual sensation has emerged a lot with graphical visual manipulation, etc. But there is still a lot of development to be done in the field of tactile sensation. Touch sense is the most powerful sense which we seamlessly use for sensing the texture of various things around us. Using of smartphone devices is bond to visual sense as there is a just flat rigid touchscreen display.

To overcome this limitation the ability of touchscreen interactions is increasing more and more through tactile haptic sensation. Various research have been done to virtually render the haptic texture effect through various types of displays.

Also, online shopping and e-commerce platform is emerging in recent years. But it is still limited to virtual shopping through electronic devices. Consumers need more realism in online shopping. According to a global survey, around 93% of consumers feel the need of emerging e-commerce platform through virtual haptic texture feedback to feel the texture of the objects sold at e-commerce websites. People are more inclined towards buying things with feelings its texture.

Through surface haptic, great level of virtual texture rendering has been made possible on vibrotactile based displays. Though still not perfectly accurate realistic rendering has been achieved through various means. Also, it has still not yet implemented by many smartphone or electronic device manufacturers, as it is still to emerge a lot.

In this paper, we have introduced a new way of implementing surface haptic for rendering tactile feedback through the electrostatic effect. In order to increase the touchscreen capacity in general for almost every possible devices in the market, we have introduced a concept of developing electrostatic based screen guards. Seamless virtual haptic rendering can be done through more enhanced haptic rendering algorithm and electrostatic surface haptic effect on the fingertip through screen guard. This will make available haptic rendering to all touch enabled devices in the market significantly changing the way of interactions with these devices on a huge scale, also helping to grow various fields of designing. This paper focuses on conceptual modelling of haptic screen guard which we named as "Tact-guard", and its application in fields like e-commerce, fashion designing, product designing and interior & architecture designing, and gaming.

II. LITERATURE REVIEW

Touchscreens have been a significant part of the mobile and computing world for user interactions. Along with audio-visual interactions the touch interactions has emerged a lot in recent years. Many kinds of research and experiments have been made in the context of surface haptics for better touch interactions and decreasing the gap between the virtual and real world. A comprehensive review of various approaches for haptic rendering is made with respect to its emerging real-world applications.

D.Meyer[1] in his study compares the electrostatic and ultrasonic haptic rendering through various modelling and experimental results. The experiment was focused on the generation of vibrations causing tactile effect and generation of friction effect on the fingertip which supports the vibration for creating a real textured surface haptic rendering. While the evaluation showed the capability of rendering a wide range of haptics using ultrasonic technique and capability of generating faster haptics on high bandwidth using the electrostatic technique.

Further, in another study, D.Meyer[4] emphasizes on detailing of friction property of haptics rendering with electrostatic force. Due to electrostatic attraction produced by sliding the fingertips on display, it produces friction on the display giving a tactile haptic rendering effect. The study gives an overall detail about the accuracy of haptic feedback with friction. With several testing, analyzation of friction force for haptic feedback is done, concluding friction force with electrostatic give nearly accurate haptic feedback results.

J.Mullenbach[2] gives a detailed study on TPad tablet was intended for creating an affordable, easy to use and open source platform for force based surface haptic interactions. Model of TPad fire tablet was tested and gave successful results of creating haptic interactions through friction variable based vibration haptics, overcoming the limitations of its previous models.

Further J.Mullenbach[3] in his another paper, proposes a new force based haptic device that combines a variable friction device (known as TPad) with an impedance controlled planar mechanism. Through this research, the author focuses on developing force-based feedback and affordances for users of touchscreen interfaces with enhancement of rendering of surface haptic feedback.

M.Munainandy[7] in his research work, has emphasized on implementation and study about the user acceptance of advanced haptic feedback technology in the field of e-commerce. Due to the popularity of online shopping because of its wide variety, all-time availability and other factors, there is a need to develop more in that field. However, one of the major concerns of users is the inability to feel any feedback when a product is selected on any e-commerce platform. So the researchers of this paper developed a testing system consists of questions by designing seven classes of different tactile patterns which consist of different time length, different strength level, and different base effect. After thorough testing, the authors have failed to provide the same experiment for all the users which is essential in deriving a conclusion. However, through distributing surveys among 207 people and collecting data authors analyzed some concrete information on user acceptance of haptic feedback for e-commerce. Resulting from the survey some positive data came out as over 93% of respondents were interested in using haptic-based touchscreen devices, also about 88% people based on age groups on an average accepted to use haptic feedback for e-commerce and approximately 91% of times it proved to be more profitable for users in online purchasing.

As per the research article in "Data-Driven Rendering of Fabric Textures on Electrostatic Tactile Displays"[6], by forming the new electrostatic rendering algorithm through real-world tactile data of texture feeling, a similar perceptual of real-world texture feeling can be rendered. Through this paper, the author J.Jiao evaluates a realistic data-driven haptic texture rendering by doing some psychophysical experiments with a group of people which is based on data-driven texture rendering algorithm using periodic applied voltage signals. The results of experiments show virtual textures generated with the data-driven haptic texture rendering algorithm was developed and tested based on inputs of real-world bare finger interaction for 10 types of fabrics, further evolution made more realistic haptic texture rendering with large-scale bare finger interaction database.

In the study done by K.MacLean[5], the author gives an overall idea about the way human tactile operates (human sense), also their capabilities, and other details. The study provides an insight into the sensors involved in human tactile feedback, also how the tactile feedback is performed in coordination with all those senses. Taking into considerations various human constraints and hardware constraints for one hand haptic tactile feedback and comparing different haptic hardware like Force feedback devices & tactile displays the author provides the evaluation of better hardware for realistic haptic rendering.

III. METHODOLOGY

The tact-guard enhances the capability of current screen guards. The proposed system consists of a haptic screen guard and its supported algorithm for efficient accurate haptic rendering.

There are several layers of different materials in regular screen guard. Tact-guard can be developed by adding a layer of electromagnetic material on top of all layers of regular screen guards (PET / TPU). The guard can be connected to the device through transparent thin silicone wires. The tact-guard will work by taking electrical

data inputs from the device and producing a haptic rendering effect by generating vibration based on the provided data. Haptic rendering will be supported by an efficient strong algorithm which will provide data regarding displayed product texture like friction modulating coefficients, the voltage for applying proper vibration, finger positioning, etc.

The tact-guard will be placed on top of device screen connected through input mechanism. When the user touches the guard, finger position of the user is sampled and the algorithm will pass the processed haptic data of that position to the tact-guard system. The tact-guard will then generate accurate haptic vibration based on the electric voltage signals. Every time when finger position is changed this process will be carried out seamlessly giving the haptic rendering effect of that position through tact-guard.

The applications supporting haptic feedback will have to integrate the algorithm used for generating haptic data.

IV. APPLICATIONS

A. E-commerce

In recent years tremendous growth in e-commerce platform has been seen and almost all fields of business are now digitized and growing under one roof of e-commerce. Various new technologies have been implemented to overcome the gap of a virtual world and the real world. The tact-guard technology can play a huge role in changing the way users interact with an e-commerce platform, also dealing the biggest dilemma of tactile feel of various products on e-commerce. As the tact-guard technology will be globally compatible and can be easily implemented in the current market, it may prove as a big step in improving e-commerce.

B. Designing

Use of haptic tact-guard will lead to a new era in the designing world. This technology can be implemented by making use of tact-guard with various touch-based devices in various designing aspects like fashion designing, interior & architecture designing, and product designing in multiple industries. For example, Fabric texture can be felled by multiple fashion designers remotely working on a particular product through tact-guard haptic rendering with touch-enabled devices. Also, this technology can be used by interior & architecture designers to make consumers feel the texture of designed floors or walls.

C. Gaming

Figure Labels: Use 8 point Times New Roman for Figure labels. Use words rather than symbols or abbreviations when writing Figure axis labels to avoid confusing the reader. As an example, write the quantity "Magnetization", or "Magnetization, M", not just "M". If including units in the label, present them within parentheses. Do not label axes only with units. In the example, write "Magnetization (A/m)" or "Magnetization $\{A[m(1)]\}$ ", not just "A/m". Do not label axes with a ratio of quantities and units. For example, write "Temperature (K)", not "Temperature/K".

V. CONCLUSION

This paper proposed a new methodology of haptic rendering through touch screen guard which can enable haptic rendering over a huge number of devices present in the market. Further enhancement should be made in the system by implementing it according to industry standards and doing a feasibility study. Hence implementing this system will make some significant changes in technology-based markets and will help them to grow.

Also, this technology will be most convenient to have virtual surface haptics as it can be implemented for making screen guards of all sizes according to every device in a various cost-efficient manner.

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SAFETY SECURE SYSTEM WITH RASPBERRY PI

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ABSTRACT

The paper presents device that will focus on LPG leakage and also on LPG wastage. We are going to set device with stove to achieve accurate results. There are three parts or modules of project that is input, processing and user indicator. Where I am using weight sensor, temperature sensor and gas leakage sensor at particular locations for accurate results. Processing module consist of Raspberry Pi which is going to decide danger situations depending on inputs from sensors. Now if Raspberry Pi detects danger then it will start indicator that consists of sound and light indicators.

Keywords: Internet-Of-Things, Raspberry Pi, Sensors, Detectors, Python

1. INTRODUCTION

Liquefied petroleum gas is used as fuel in heating appliances, cooking equipment and vehicles, also on domestic level LPG is one of the important parts of kitchen for cooking heating and other uses. But LPG is also dangerous because it is highly flammable concentrations as low as 2 % will ignite in air and it is also heavier than air so it can travel along floors, downhill into gullies faster, it can cause toxic effect with high amount of concentration. That is why proper precautions should be taken while handling LPG.

While transporting LPG there are several precautions and equipment's are used to keep it safe and technology is still improving but when it comes to domestic level, we can see there are not many improvements. The total number of accidental deaths by cooking gas cylinder/ stove burst in India was 3525 during 2014 and many critical injuries. In this am going to build equipment that can reduce these accidents.

2. OBJECTIVES

There are few human mistakes that can cause wastage and accidents are as follows

- 1. When we keep stove keys turned on without lighting it or Due to wind blow fire goes and LPG starts leaking, this issue is very danger in some cases.
- 2. Sometimes we remove vessel from stove but forget to turn off, in this type of mistake there is wastage of LPG and also chances of blow down through wind are more.

I am going to point these issues to achieve safety and as well as save from LPG wastage.

2.1 Purpose

To achieve safety in LPG leakage my research project can be good tool to avoid accidents and we will try to achieve portability in project so it can be easy to install in our kitchen's stove and also can be pre-install in Stoves.

Important purpose of this is to achieve safety and as well as to avoid wastage of LPG with low cost and easy portable installation.

2.2 Scope

There are not many improvements we have seen in domestic LPG over years, important part of project is portability that we are going achieve, so that we can use device to upgrade safety old stove.

Even for new stove we can use this device pre-installed by manufacturing in it so customer can get safety level.

2.3 Problem Definition

LPG is one of the important part of kitchen. But LPG is also dangerous because it is highly flammable, it can cause toxic effect with high amount of concentration. That is why proper precautions should be taken while handling LPG.

While transporting LPG there are several precautions and equipment's are used to keep it safe but when it comes to domestic level, we can see there can be improvements.

3. PRELIMINARY PRODUCT DESCRIPTION

Important part of project will be Raspberry Pi that is going to control whole device based on inputs and output will be sound as well as bright light to indicate danger situation. To on the circuit, it is connected to the ignite key of stove so whenever we start key for gas our circuit will get on. There will be three sensors one is gas

sensor temperature sensor and other is weight sensor, all of them will be connected to the Pi. Depending on situation Pi program will decide the danger situation and activate output accordingly. Using modern technology this is how I am going to achieve high level safety for our domestic LPG uses to avoid critical accidents.

There is also one important feature we are getting with this project is that if we forget to keep vessel on stove and keep stove on none of other device can't detect that but weight sensor it will be easy for us to detect that and inform user that will save LPG misuse.

We are going to use combination of hardware and software to get desire output from system. We can simply classify project into three parts depending on their functionality first is input module after that system processing module and finally indicator module.

3.1 Input Module

• Sensors

1. Weight Sensor

Weight sensor will be as input device for Raspberry PI, Important use of this sensor is to detect if there is any vessel on stove. It will indicate if there is no load on stove, if we keep stove on and forget to put vessel on it that will be wastage of LPG and that is how we will save wastage of LPG with help of weight sensor

2. Temperature Sensor

Temperature sensor is important part of our project which is going to help to detect temperature changes near stove, when temperature is below 50°C that means there is no flame on stove and if key is on then it means that gas is directly leaking through stove and that will indicate Raspberry Pi to indicate danger situation.

3. LPG sensor

This is direct LPG leakage sensor that is going to indicate leaking LPG which will be placed at moderate distance from gas cylinder. This is important if there is any other leakage taking place other than stove and which will indicate if there is any LPG leakage.

3.2 Processing Module

• Raspberry pi

The Pi 3 runs at 1.2 GHz, and also has an upgraded power system and the same four USB ports and extendable 'naked board' design. 50% more processing power and a Quad Core 64bit processor. It also opens up even more possibilities for IOT and embedded projects. The new Raspberry Pi 3 Model B offers higher level of performance than any other Raspberry Pi.

This is heart of our project which is going to work according to our program and activate indicators according to criticalness of situation and going to program it with help of python programming.

There is chart below which will be proper presentation of python program working for Raspberry Pi with input sensors and accordingly outputs of program.

Weight Sensor	Temperature Sensor	LPG sensor	Output Indicator
1	1	0	No
1	0	1	High
1	1	1	Moderate
0	0	0	High
0	1	0	Moderate
0	0	1	High

1 - Presence of input

No - Normal situation

0 - Absence of input

Moderate - Only sound indicator

High- Both sound and light indicator

1. No Danger

This is usual situation in which weight is present on stove flame is there on stove and there is not any LPG leakage detection on.

2. Moderate Danger

This is danger situation in which there are two possibilities one is weight is missing from stove in this case flame is there on stove but there is no weight on stove which LPG is getting utilized this is wastage of LPG and user should get indicated but not in danger level. Case two is LPG is leaking through cylinder or any other joints this is important but user can act on it.

In this level of danger, we are going to use only sound indicator to inform user.

3. High Danger

This is danger situation in which flame is directly missing from the stove and LPG is leaking through stove. This is actual urgent situation where user have to act quick and should be indicated as fast as possible and properly so in this, we are going to use both indicator devices sound and light.

3.3 Indicator Module

Sound

There will be two levels as we showed in programming chart Moderate and High level so sound is going to play in both level and it will be loud so we have to provide external battery source.

• Light

In light indicator we are going to use red light for sign of danger and it will be there only for High level risk, and because of this user will react quickly.

4 CIRCUIT DAIGRAM



Fig-4.1: Gas Sensor (MQ-2)



Fig-4.2: Weight Sensor (HX711) and Temperature Sensor (DS18B20)

5 FLOW DAIGRAM

Using flow diagram, we are going to explain now different type of situation we are going to handle in this project

5.1 Gas leaking directly through stove

In this type of case gas will be directly leaking through stove may be because flame of stove gets blown away by air or some other reasons. In this case now reaction of three sensors will be like weight present so '1' from weight sensor, LPG sensor will detect LPG but too late as we are going to place it away from stove and temperature will fall down low as flame is absent on stove so temperature sensor will give '0' analogy input to Raspberry Pi. As we have already set in python programming whenever temperature sensor gives '0' raspberry will activate high level indicator.



Fig-5.1: Gas leaking directly through stove

5.2 Stove is on we forget to put vessel on it-

In this type of case temperature sensor will give signal '1', LPG sensor will give '0' as no LPG leakage and weight sensor will give signal '0' as there is no weight on stove. This case directly shows that gas is on but it is getting wasting because there is not any vessel. Flow chart for this case will be as below.



Fig-5.2: Stove is on we forget to put vessel on it

5.3 LPG is leaking through pipe, joints or cylinder.

In this type of case leakage is not taking place through stove but from other places and this sensor working will be irrespective of other sensors. When there is LPG detected by sensor it will give signal '1' and raspberry will activate moderate level indicator.



Fig-5.3: LPG is leaking through pipe, joints or cylinder

CONCLUSION

In our device by using weight, LPG sensor and Raspberry Pi we can secure kitchen from LPG leakage accidents. And also, with the help of temperature sensor near stove we can detect LPG wastage and reduce it.

This device is portable and can be install in existing kitchens easily.

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LDA ALGORITHM FOR TOPIC MODELLING

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ABSTRACT

Topic Modelling is a type of statistical model for discovering the abstract "topics" that occur in a collection of documents. This paper concentrates and implements LDA algorithm for topic modelling on text classification. The topic similarities between two texts are measured with the topic-word matrix and the information of their discriminative terms. The data present in multiple texts or short texts are segregated and corpus is created. The Document term matrix for text is applied and LDA algorithm is implemented to obtain efficient topic model. The topics related to the documents were generated and the efficiency of the algorithm is measured using gamma metrics and word cloud is generated based on word frequency.

Keywords: Latent Dirichlet Allocation (LDA), Text classification, efficiency, pre-processing, Document Term Matrix, Topic Models, Word cloud.

1. INTRODUCTION

Topic models are statistical framework that helps users understand large document collections; not just to find individual document but to understand the general themes present in collection. In simple terms, the process of looking into a large collection of documents, identifying clusters of words and grouping them together based on similarity and identifying patterns in the clusters appearing in multitude. The generative process of topic model includes: First topic modelling needs to simulate the generative process of documents. Each document is assumed to be generated as follows: for each word in the document, choose a topic assignment and choose the word from the corresponding topic. The output of a topic model actually reflects the ability of cluster for the corpus. This is because documents with a similar topic probability distribution can be grouped together. Applications of Topic Models describes the recent academic and industrial applications of topic models. In addition to topic model's effective application to traditional problems like information retrieval, visualization, statistical inference, multilingual modelling, and linguistic understanding. The paper is organized as section II with literature survey, III depicts the overview of the data set collected and integrated, IV with the methodology and section V with the results.

2. LITERATURE SURVEY

This work proposes a topic-based language modelling approach that uses a more informative prior based on the topical content of a document. This paper explored the possibility of using a document specific term prior based on inferred topics induced from the corpus [1]. In [2] the work has resulted in two datasets showing the effectiveness of this method — Latent Dirichlet Allocation(LDA) which is a classic topic model that can extract latent topic from large data corpus. This model assumes that if a document is relevant to a topic, then all tokens in the document are relevant to that topic and probability distributions are obtained by normalizing the word counts of the associated documents due to the dimension of the news texts is too high, this model uses topic model to make text dimension reduced and get features. At the same time, the author in [3] makes a research on SoftMax regression algorithm to solve multi-class of text problems in our life and make it as model's classifier. The similarity measure method with the topic-word matrix and the relationship of the discriminative terms between two short texts [4] and the Dirichlet Distribution methodology uses prior knowledge sources to influence a topic model in order to allow the labels from these external sources to be used for topics generated over a corpus of interest [5]. In this paper, Document Topic Modeling approach has been proposed to generate topics and word cloud from the large collection of textual information. The document consists of cluster of topics and the topics consist of clusters of most likely and frequently occurring words with probabilities [6]. To make it efficient, for each document the author has calculated the probability P(Topic T/Document D) and P(Word W/Topic T) and reassign the word to the new topic by calculating the probability P(Topic T/Document D)*P(Word W/Topic T). Various other mechanisms can be used to analyse the efficiency of the algorithm used. Precision measures the percentage of how much the topic words considered pertinent by the extractor application are actually relevant. Recall finds out the percentage of pertinent topic terms that were considered suitable for the extractor application [7]. Therefore, LDA allows to incorporate inferred semantics from the past data to guide the inference process of the upcoming streams. This is achieved by considering all the topic-word distributions learned within a sliding" history window" when constructing the current priors. In this work, they have proposed a novel approach based on LDA to understand software evolution at both two views, i.e., strength evolution and content evolution, simultaneously [8]. A novel technique for transformation of

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gene expression levels to words is presented and shown to be effective. Comparative evaluation of this approach with state-of-the-art pattern classification methods confirms the effectiveness of the proposed methodology [9]. To improve they have introduced traditional Approximate Distributed LDA (AD-LDA) algorithm by weighted factor during iteration of Gibbs sampling, and propose a novel model called Weighted AD-LDA (WAD-LDA). Experiments are conducted over real-world dataset and the results show that their method can promote the computing efficiency significantly and can achieve meaningful topics as AD-LDA simultaneously and a parallel LDA model based on AD-LDA, combined with weighted sampling and distributed platform, named WAD-LDA, to speed-up the computing efficiency of AD-LDA [10]. The motivation of Latent Semantic Indexing (LSI) is to analyse text in semantic space, but not in Vector Space Model (VSM) which is based on traditional Term Frequency (TF) or Term Frequency–Inverse Document Frequency (TF-IDF). One of the most drawbacks of VSM is that it cannot analyse synonym and near synonym. Probabilistic Latent Semantic Indexing (PLSI) is based on the dual-mode and an outstretched classical statistical method of co-occurrence data analysis. Here, the so called dual-mode is that word and document are considered at the same time. The so-called co-occurrence is that word and document are in the same matrix. PLSI is a probability version of LSI [11] and the use of Latent Dirichlet Allocation (LDA) is examined to recommend appropriate tags for journal abstracts. Abstracts are analysed by using LDA with CVB0 and Gibbs sampling techniques to establish the number of topics. The results showed that the extracted topics capture meaningful structure in the data and effective topic models can be applied to tag the journal abstracts into appropriate category [12]. Finally, a document consists of cluster of topics and the topics consist of clusters of most likely and frequently occurring words with probabilities. In this paper, Collapsed Gibbs Sampling Method is used for generating top words. As a result, Topic Models connects Words with similar meanings and distinguishes words with different meanings. Topic Models are effectively used to interpret the information from the entire collection of documents [13].

3. OVERVIEW OF DATA

The text documents related to English novels is collected and stored in a folder. The data set is pre-processed using R tool. The pre-processing includes Removing stopwords, punctuations, numbers, whitespaces, tokenizing, and stemming. After pre-processing of documents Document Term Matrix is generated.

Removing of stopwords means removing of common terms in a dataset.

Tokenizing is the task of chopping the character sequence into pieces called tokens.

Stemming is the process of reducing the inflected words to their base form.

4. METHODOLOGY ADAPTED



Fig-4.1: Block Diagram of Topic Modelling

The block diagram in figure 4.1 represents the process of topic modelling. Initially the data set is collected and pre-processed and then Document term matrix is generated using R tool.

Topic modelling is implemented using Latent Dirichlet Allocation (LDA) . This technique automatically discovers topics that a set of documents contain and used to analyse volumes of text efficiently.

There are 2 benefits from LDA defining topics on a word-level

- 1. Infer the content spread of each sentence by a word count.
- 2. Derive the proportion that each word constitutes in given topics.

Topic Models connects Words with similar meanings and distinguishes words with different meanings and these are effectively used to interpret the information from the entire collection of documents. LDA is a graphical, probabilistic generative and statistical model for building a model of words distributed inside topics and topics distributed inside words and the topics consist of clusters of most likely and frequently occurring words with probabilities are formed into Word cloud.

In natural language processing, Latent Dirichlet Allocation (LDA) is a generative statistical model that allows sets of observations to be explained by unobserved groups that explain why some parts of the data are similar. For example, if observations are words collected into documents, it posits that each document is a mixture of a small number of topics and that each word's creation is attributable to one of the document's topics. LDA is an example of a topic model and was first presented as a graphical model for topic discovery. In LDA, each document may be viewed as a mixture of various topics where each document is considered to have a set of topics that are assigned to it via LDA. This is identical to probabilistic latent semantic analysis (PLSA).

To pre-processed documents LDA Algorithm is applied and evaluated using Gamma metrics. Based on the frequency of words the word cloud is generated. The generative process of topic model includes: First topic modelling needs to simulate the generative process of documents. Each document is assumed to be generated as follows: for each word in the document, choose a topic assignment and choose the word from the corresponding topic. The output of a topic model actually reflects the ability of cluster for the corpus. This is because documents with a similar topic probability distribution can be grouped together. The obtained results were then combined to obtain statistical overview of the total dataset, in graphical format.

5. RESULTS

This paper has introduced the basic idea of LDA, briefly described framework and algorithm process of text classification system based on LDA. However, when it deals with huge numbers of data, the computing speed would be slow. As a result, Topic Modeling serves as an efficient method for accessing the data and has been proposed to generate topics and word cloud from the large collection of textual information. The figure 5.1 shows the results that we have obtained after analysing the results obtained by applying LDA.



Fig-5.1: Word cloud and Statistical representation of word frequency

In figure 5.1 the first diagram represents the word cloud of frequent words of all documents. The word cloud is the cluster of words that frequently occur in the dataset considered. The bar graph depicts the probability of most frequently occurring words with respect to word frequencies. Based on the word cloud generated the bar graph is plotted with the word frequency.

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6. CONCLUSION AND FUTURE SCOPE

The objectives such as segregating and pre-process the documents them to build the corpus and imply Document Term Matrix to the documents. The documents are evaluated by evaluations techniques such as gamma metric and LDA algorithm is applied to those documents to obtain the efficient topic model then finally the cluster of words and the statistical representation of the frequently occurred words are obtained. In future we would like to enhance the project with more features and applying and demonstrating with other topic modelling algorithms.

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MANUSCRIPT SUBMISSION

GUIDELINES FOR CONTRIBUTORS

- 1. Manuscripts should be submitted preferably through email and the research article / paper should preferably not exceed 8 10 pages in all.
- 2. Book review must contain the name of the author and the book reviewed, the place of publication and publisher, date of publication, number of pages and price.
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EXAMPLES OF REFERENCES

All references must be arranged first alphabetically and then it may be further sorted chronologically also.

• Single author journal article:

Fox, S. (1984). Empowerment as a catalyst for change: an example for the food industry. *Supply Chain Management*, 2(3), 29–33.

Bateson, C. D.,(2006), 'Doing Business after the Fall: The Virtue of Moral Hypocrisy', Journal of Business Ethics, 66: 321 – 335

• Multiple author journal article:

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