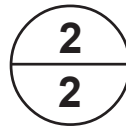# INFORMATION AND COMMUNICATIONS TECHNOLOGY

STANDARD - X

Part 2 $\frac{2}{2}$

Government of Kerala
Department of General Education

State Council of Educational Research and Training (SCERT)
2019

The National Anthem

Jana-gana-mana adhinayaka jaya he
Bharatha-bhagya-vidhata,
Punjab-Sindh-Gujarat-Maratha
Dravida-Utkala-Banga
Vindhya-Himachala-Yamuna-Ganga
Uchchala-Jaladhi-taranga
Tava subha name jage,
Tava subha asisa mage,
Gahe tava jaya gatha.
Jana-gana-mangala-dayaka jaya he
Bharatha-bhagya-vidhata,
Jaya he, jaya he, jaya he,
Jaya jaya jaya jaya he!

Pledge

India is my country. All Indians are my brothers and sisters.

I love my country, and I am proud of its rich and varied heritage. I shall always strive to be worthy of it.

I shall give my parents, teachers and all elders respect, and treat everyone with courtesy.

To my country and my people, I pledge my devotion. In their well-being and prosperity alone lies my happiness.

Preface

Dear children,

Information and Communications Technology (ICT) does not have much history to claim compared to other subjects. However, in terms of features and applications, it has become widespread. It has brought extensive and fascinating changes in the field of Science and in all walks of our life. We make use of ICT in almost all the subjects that we study, be it Mathematics, Science or Social Science.

You have to analyse and interpret the exercises given in these chapters. It is necessary that we should develop new insights on the multiple application of ICT in different fields. This textbook has been prepared keeping in mind the above need and taking into consideration the scope of this branch of Science in enriching the quality of curricular and co-curricular activities.

Try out all the activities mentioned here using the facilities in your school laboratory to the maximum. It will help you to become familiar with the basic concepts of ICT and make your own contribution towards it.

Dr. J Prasad
Director
SCERT, Thiruvananthapuram

CONSTITUTION OF INDIA
Part IV A

FUNDAMENTAL DUTIES OF CITIZENS

ARTICLE 51 A

Fundamental Duties- It shall be the duty of every citizen of India:

(a) to abide by the Constitution and respect its ideals and institutions, the National Flag and the National Anthem;

(b) to cherish and follow the noble ideals which inspired our national struggle for freedom;

(c) to uphold and protect the sovereignty, unity and integrity of India;

(d) to defend the country and render national service when called upon to do so;

(e) to promote harmony and the spirit of common brotherhood amongst all the people of India transcending religious, linguistic and regional or sectional diversities; to renounce practices derogatory to the dignity of women;

(f) to value and preserve the rich heritage of our composite culture;

(g) to protect and improve the natural environment including forests, lakes, rivers, wild life and to have compassion for living creatures;

(h) to develop the scientific temper, humanism and the spirit of inquiry and reform;

(i) to safeguard public property and to abjure violence;

(j) to strive towards excellence in all spheres of individual and collective activity so that the nation constantly rises to higher levels of endeavour and achievements;

(k) who is a parent or guardian to provide opportunities for education to his child or, as the case may be, ward between age of six and fourteen years.

CONTENTS

Certain icons are used in this textbook for convenience
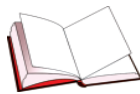
For further reading
(Evaluation not required)

Let's evaluate

Extended activities

Chapter 7

The Working of the Internet

In the future, we won't even feel the existence of the Internet. It will permanently be a part of our lives like air and water. *- Eric Schmidt, Programmer, Software Engineer.*

You have been introduced to the topic of electronic banking in your Social Studies textbook. For more information on the topic, Ami and Anu have been searching on the Internet. The moment they assigned the term 'electronic banking' in a search engine, there started the flood of thousands of links providing technical and nontechnical information! How much information is available on this topic in the Internet! Really astonishing! The medium of Internet has grown so much that it can provide answers to any of our queries on any topic.

How did all such information reach the Internet? How do we get it? In which computer is all this information stored?

Establishing a global network...!

We have understood the ways of networking computers and the benefits derived from it. But our understanding was based on a limited number of computers inside the lab.

Try to imagine a larger form of this network! A network that includes all the computers across the world! Anyone can join this network at any time and come out of that, too.

There exists such a global network today as mentioned above. This huge network with infinite potential for communication is called the Internet. What are the advantages of this? Some of them are given below. Find out more and note them down.

- Files can be copied from one computer to another. (What if these files are letters?)

- People living in far off places can see and talk to each other. (In that case, won't it be possible for a teacher in Kerala to teach a student in America?)

- We can purchase things by giving orders to the sellers through the Internet. (It is enough to send the ordered materials by post.)

- We can easily share information with others. (If a person or a company has information to be shared with others, won't it be sufficient then to collect that information in a networked computer? Whoever wants it can access it then).

- ....

- ....

Everything mentioned above has been put into practice now. But, when they were implemented, more technical arrangements were needed in addition. That's all. Let's inquire about some of them in detail.

Server computers

You must have heard about *Kerala Kalamandalam.*

Fig. 7.1 - HTML Page

Kerala Kalamandalam in Thrissur is an institution where a lot of people, including foreigners, come to learn the art forms of India. Those who wish to study here have to get information about the kind of courses conducted here, the time of commencement of the courses, their duration, and so on. This is most needed by people from all corners of the world.

Suppose, the authorities of Kalamandalam prepare all the information and in HTML files store them in a computer connected to a network as we discussed earlier. This computer can be called *Server*. A separate software has to be set up in that computer to exchange information on the Internet. An IP address also has to be provided for the computer. It is enough to publish the IP address for everyone. But now this entails another set of problems, too!

1. Won't we have to run the computer all the time if everyone in the world should have access to it?

2. Wouldn't it affect the performance of the computer if a lot of people try to access it simultaneously?

3. Can everyone remember this IP address? Is it practical to remember all such IP addresses?

IP Address and Domain Name

Websites are normally installed in such servers around the network. This is technically called Website hosting. The server must be given an IP address such as 103.251.43.162.

Any computer in the network would be having an IP address. Likewise, an IP address will be provided to the server also which will strictly be unique.

Server computers

A server is a computer in which a website is hosted on the Internet. Special programs will be installed in order to satisfy the needs of a variety of users using the services provided by the website. The server software developed by companies like Oracle and Apache are examples. The operating capacity of a server computer should be high because many people may use the website at the same time.

Activity 7.1 - IP address of a website

Let's give the IP address 216.58.197.35 on the address bar of the *Web browser*. Which website will be opened?

We have to deal with many such IP addresses while browsing websites. Type the following IP address (Table 7.1) in a browser and observe the website loading.

IP address	Which website did you get?
216.58.197.73	
164.100.78.61	

Table 7.1 - IP address and the corresponding website

Now you realise that it is not easy to remember an IP address. A method is there to overcome this. How about connecting these IP addresses to names that we can easily remember (and vice versa)? These names are called domain names.

Some such domain names are given below.

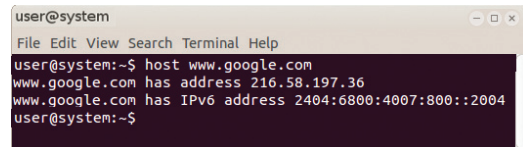1. birdsofindia.org
2. gimp.org
3. irctc.co.in
4. ....

> ### Domain Name Server (DNS)
>
> What we type in a browser is domain names like www.google.com. Domain Name Server (DNS) is a service in the Internet itself, used to identify the corresponding IP addresses of a domain and vice versa.

Fig. 7.2 Find out the IP address

Activity 7.2 - Finding out the IP address from a hostname

We can find the IP address of a website if we know the hostname. Open a *Terminal* in your computer and give the following command:

host www.google.co.in

Given below (Table 7.2) are some hostnames. Find out their IP addresses.

	Hostname	IP Address
1	fsf.org	
2	imd.gov.in	

Table 7.2 Websites and their host IP addresses

> ### Server Software
>
> The server software installed in a computer can manage more than one website at a time. For Eg. scholarship.itschool. gov.in, resource.itschool. gov.in are websites on the same server.

There exists only one server with an IP address at a time. But is it possible that a domain name could host only one IP address? Very busy Internet Service Providers sometimes host their website in different servers at different places to improve the speed and the efficiency of their service. They have different IP addresses. The user will get service from the most convenient server. That is to say, one website can also have different IP addresses.

Information on the Internet

We have seen why institutions like Kalamandalam build and maintain websites. Similarly many institutions and individuals have websites of their own. All of them give information on different subjects. We can get all such information if we know the addresses of those sites or from the search engines.

Web pages and their exchange norms

What we call web pages are pages created in HTML. This indicates that the pages are meant to be published on the Internet (web). What is stored on the server will be a folder containing the necessary files, including web pages, images, sound files, animations, videos, software, etc. This is known as a website. You know that every network needs a protocol which will specify how the files can be exchanged. HTTP (Hyper Text Transfer Protocol) is the protocol for conveying HTML files and other resources to the Internet. This protocol software is available on all server computers. It is there in our computer also as part of browser software.

Activity 7.3 - Inside a website

Visit the website of Kerala Kalamandalam and see how the website is organised. Click the right button of the mouse on this page (somewhere in the blank space of the page) and save the page to your computer. Examine the files that are saved and list the following.

What are the different types of data (images, video, etc.) used in this website?

Is this website made up of cascading stylesheet (CSS)?

World Wide Web

Suppose someone comes to know of the art form Mohiniyattam when she is viewing the website of Kalamandalam. What if that person wants to know more about it? Won't it be good if she can go from this page to another page that contains the details of Mohiniyattam?

This can be done if a hyperlink is given from this word to another page that contains the detailed information. You can see that an information network comprising many pages with hyperlinks to more pages is there on the Internet. We can call it the World Wide Web. It works with HTTP, an application protocol for transferring resources on the Internet.
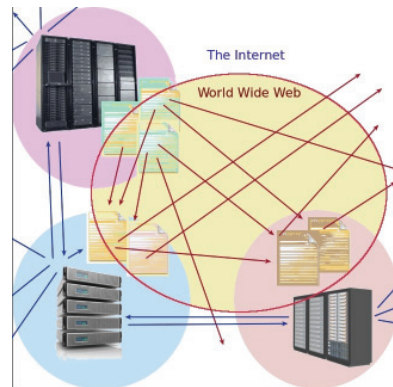

Fig. 7.3 Web page

Fig. 7.4 Diagram of the World Wide Web

Resource Index

A website which has to be transferred by HTTP, apart from its domain name, for every file and other resources in it, will have separate addresses. This is called Uniform Resource Locator (URL). The uniform resource locator contains the protocol for exchanging the file, name of the website and the place where it is saved. Look at the example below.

http://www.plainenglish.co.uk/files/email.swf			
Exchange protocol	Name of the site	Place saved	Name of the file
http	www.plainenglish.co.uk	/files	email.swf

This means the animation file 'email.swf' is saved in the folder /files of the site www.plainenglish.co.uk.

Activity 7.4 - Different types of web services

Anyone can build and maintain a website. Many are making use of this technology for different purposes. Find out the websites given below for various purposes (Table 7.3), with the help of search engines.

Field	Website
Online Malayalam newspapers	....
Online publications	....
Websites to publish research journals	....
Online dictionaries and encyclopedias	https://en.wiktionary.org ....
Websites for publishing information about companies and institutions	http://www.kalamandalam.org ....
Websites of individuals to publish their creations and activities	....

Table 7.3 - Different types of websites

Plethora of websites, information galore !

Fig. 7.5 Tim Berners-Lee The Founder of the World Wide Web

At present there are websites that can discuss anything in the universe. We have learned how we can collect information and images given in such websites if we are permitted. Given below are the two ways of sharing information.

1. To share videos that we created

YouTube, Vimeo, etc. are sites for sharing videos that we create. These sites have thousands of movies shared by different people. If permitted, we can download and reuse them.

2. To publish our writings

There are people among us who desire to write and publish stories, poems and articles. Blogs are websites

where such works could be published.

- www.wordpress.com
- www.blogger.com
- ....
- ....

These are some of the sites that allow you to start blogs free of cost.

Who owns the Internet?

Based on the discussion we had so far, could you say who owns the Internet? It does not belong to anyone in particular. We can also say that it belongs to everyone who creates websites and adds information to them. Can something, which is thus not owned by anyone, exist for long? If there are no directives, won't it result in utter chaos? The answer is that there are some organisations, though not very formal, for a systemic supervision of all these things. They are :

The Internet Society: For the overall supervision of the structure of the Internet policies and other common matters.

The Internet Engineering Task Force (IETF): This committee manages the technical structure of the Internet and makes arrangements for the stability and safety of the Internet, etc. Further, it examines and accords recognition to the revision of the Internet protocols.

The Internet Corporation for Assigned Names and Numbers (ICANN): The Domain Name System (DNS) we discussed earlier works under the supervision of this committee. It is ICANN that ensures that all Internet addresses reach their proper IP addresses.

E-Mail

We have seen that letters can be exchanged using the global computer network. Such letters are called email. When email became a possibility through the Internet, many service providers came forward to provide email service to the people. For example,

1. www.gmail.com   2. www.yahoo.co.in

3. ....
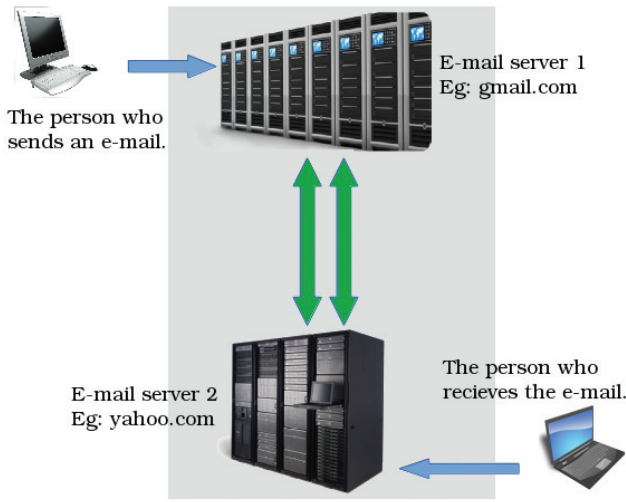
are email service providers.

Social Media

Fig. 7.6 Diagram of E-mail service

When flood hit our state, many people who lived abroad were anxious about the security of their families and relatives. Members of Facebook, a social media on the Internet, had created groups and reached help to the flood victims.

The concept of a medium to exchange news, information, ideas and jokes and to share pictures and videos emerged with the growth of the Internet. These media are called social media in general.

Some of the well known social media are

1. Facebook   2. Twitter

3. Diaspora   4. Whatsapp

Of these, Diaspora is an open source communication system.

The social media have become part of our lives now. Sometimes a well-constructed page in the social media, its design and contents are even used to assess the cultural status of a person.

Social media also help to maintain friendships, irrespective of time and place. At times, beyond friendships and jokes, social groups can even become influential in framing the policies of a nation. The generous flow of help rendered at the time of natural disasters in Kerala and Tamil Nadu is the result of such an intervention.

Even when we are making use of technological excellence for our progress, the tendency for misusing

technology is also on the rise. Therefore, we have to self impose certain restrictions and stipulations while using these media.

Things to remember while using social media

- What has been posted once cannot be taken back later on a second thought. Even before that is withdrawn, many people would have downloaded it or shared it with a number of people.

- Keep your personal information quite private. If anyone prompts you to share your personal pictures or other information, never yield to it.

- If any disaster happens in our locality we are not supposed to share any fearful or fake messages regarding them. It is offensive to create and forward fake messages. Strictly follow the instructions given by the Government through various media.

- Making vulgar messages and bullying are crimes as per law. Don't get into such friendships.

- Bear in mind that those who commit cyber crimes cannot remain hidden for ever. They don't get noticed in this huge network for a brief period only. If anyone reports such activities, the cyber police can easily track them down.

- Profiles that are put up in social media may sometimes be stolen. Someone else may use your profile to hide his/her identity. It could also be used to defame someone. If something like this comes to your notice, you can inform the police through your teacher and get them removed.

What arrangements can be made for the safe use of social media?

- Make maximum use of the safety systems in them and definitely configure privacy measures.

- Do not add as friends anyone you don't know personally or trust. Remember what they reveal through the social media may not be their real self or character.

The Decent and The Obscene

We have seen that the Internet is a medium that works independently. We also know that many people are using its facilities for communication. A vast majority of them give correct and decent information. But it has misleading and obscene information too. Some countries, like India, restrict or ban such websites. All these controls have technological limitations. Therefore,

- Decide what our needs are before connecting to the Internet. Think about the keywords that you want to search. Do not search the Internet without any specific needs.

- Websites containing obscene information have many traps to attract and cheat us. Take care not to open such sites.

E-banking

E-banking means conducting the transactions of a bank account through a website specifically built for the purpose.

To obtain online transaction facility for a bank account, we have to submit a filled-up form to the bank. After that, we have to get the user name, password, etc. for the account before starting to use it (Fig.7.7).

Once the system is enabled,

- We can find out the details of the account from any place at any time (without going to the bank).

- We can examine our recent transactions in a similar manner.

- We can transfer money to another account.

- Pay for things or services that we have bought. For example,
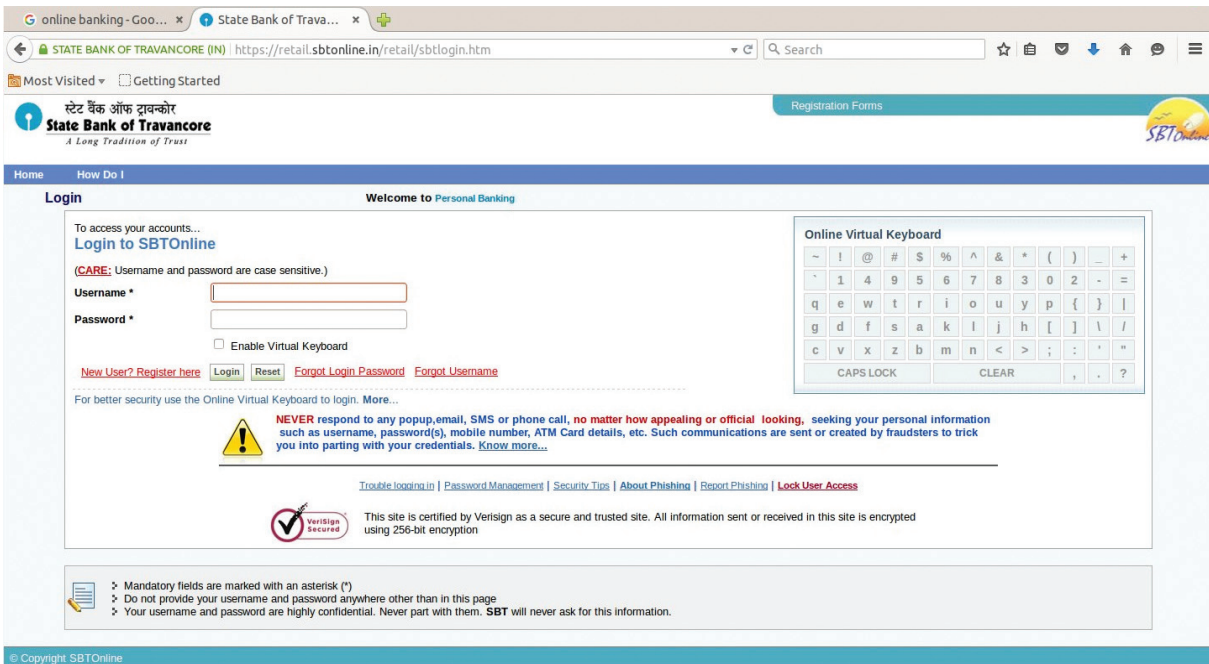
  - Telephone bills   • Electricity bills

Fig. 7.7 An e-banking site

E-Governance

We often have to go to many offices like Village and Grama Panchayat, offices of electricity and drinking water distribution to avail of various services.

Security system called OTP

How can we ensure that our online transactions are secure? OTP (One Time Password) is a system for this. When our bank accounts are configured for online transactions, we have to give our mobile phone number also. Each time an online transaction is carried out, a password that can be used only for that transaction is sent to our mobile phone. The transaction can be completed only with this password.

If we have a bank account with online facility, we can pay electricity bills, telephone bills, etc. Shown in Fig. 7.8 is the online site of BSNL to pay the telephone charges.

You know that the procedure for getting admission for higher studies after class X is carried out through the
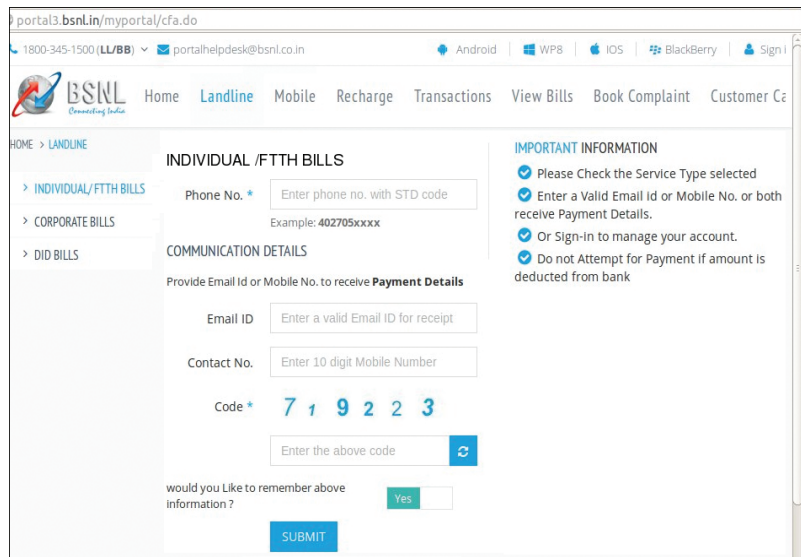
Fig. 7.8 Website to pay BSNL Telephone bill

online system. Fig. 7.9 shows the online site, hscap (http://www.hscap.kerala.gov.in) for securing admissions for higher secondary education.
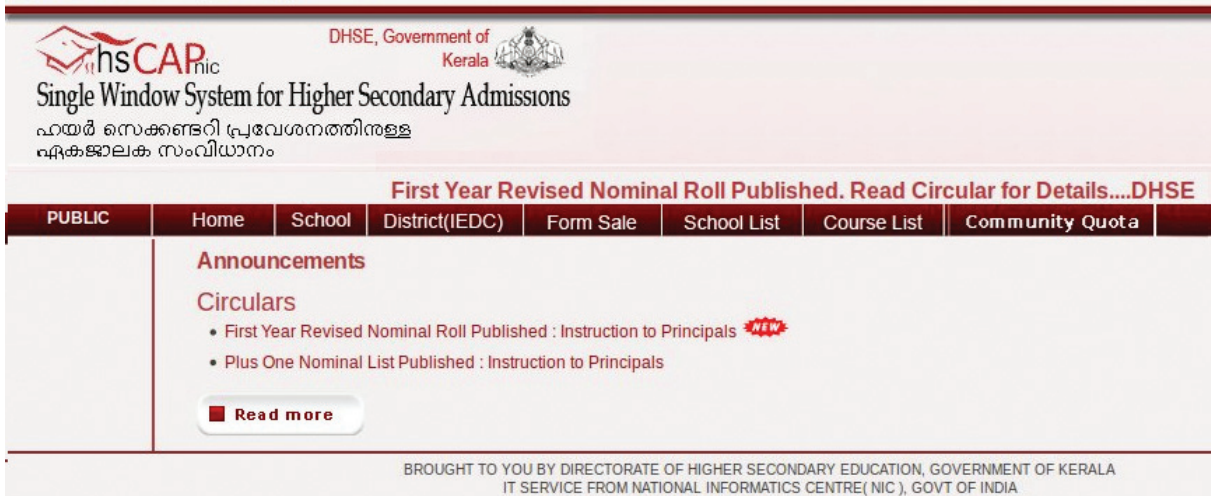

Fig. 7.9 HSCAP Homepage

Job opportunities on the Internet

Many services like communication, trade, education and the like are carried out based on the Internet. There are plenty of job opportunities for those who can make multi purpose websites in the most attractive fashion. There is a vast scope for the production of advertisements and short films to be published on the Internet.

Consolidation of data on how an Internet user searches and the pages that he visits will be a vital piece of information. Analysing such data and reaching them through

advertisements suitable for their various services is a major business strategy of the Internet. To evaluate the tendency of consumerism and thereby arrange the services in accordance with the same creates a lot of job opportunities.

Let's evaluate

1. Which among the following is an email service provider?

   a) Wikipedia   b) Twitter   c) Gmail   d) Diaspora

Extended activities

1. Given below is a story related to how the excessive use of social media results in the distancing of individuals and breakups in relationships.

   "My smart phone developed some problem the other day. Since there was no other work, I sat and talked to my family members. Nice people.

   I didn't recognise my sister initially. My mother introduced her. She has changed a lot. They said that, my younger brother had gone abroad. Wonder when he had left!

   ....

   Anyway, it was a good experience.

   I will get my phone repaired tomorrow."

   What should we do in order to avoid a situation like this?

❁ ❁ ❁

Chapter 8

Database - An Introduction

Thomas, the teacher in charge of the school library, is searching for the books which Mini required. The issue register and the book shelves have been checked. Now he has to find out if they are in the stack.

"When I went to the district library with my father, they could quickly locate the books that we asked for."

Mini's voice disturbed Thomas from his thoughts.

"District Library? That is computerised, child. There it can be done easily."

"In that case, why not computerise this library also?"

You must have understood the condition of the library of the school where Mini studied. Does your school library look like that? Now imagine your school library getting computerised. What will be the benefits? Discuss with your friends and expand the list given.

- We can quickly find out if a book is available.

- Catalogues of different kinds of books like fiction, poetry, history, etc. can be created.

- A list of issued books can be prepared.

- Find out the members who haven't taken any books.

- ....

To computerise your school library like this, what are the preparations to be made?

- Collect the data of books.

- Collect the data of library members.

- Set up a computer and related devices.

- Prepare a suitable software.

- ....

Suppose the data of all the books in the library are collected for this purpose. What data can we obtain about each book?

- Title of the book

- Author

- Year of publication

- Price

- ....

- ....

There will be several bits of information about a book. The library will have a stock register in which all the data will be recorded. Instead of keeping them in the stock register, what about making tables of this data and storing them in the computer? The details about the books in the library can be shown in a table. This is called the

Database

You may have heard about a sytem called "Sampoorna" that contains all the information about the students in our public schools. The data regarding lakhs of students have been compiled systematically. Such systematic collection of data are called databases. The data is recorded in one or more tables in databases. In a database, it is possible to :

♦ store data securely

♦ add new data

♦ remove unwanted data

♦ take and use data as needed, and

♦ make suitable changes

in databases.

How many tables can be included in a database?

database of the school library. Similarly, if the table contains data regarding the students of your school, then it will be a database of your school. What other data can you prepare about the school?

- Data of teachers

- Data of furniture

- Data of laboratory equipment

- Data of students who get scholarships

- ....

A school database becomes complete when all these get added. What happens if all these data are entered in a single table? Won't it be difficult to handle them? Instead, won't it be convenient if we include the data of teachers in one table, and the data of lab equipment in another? Like this, it is possible to enter data in several tables within a single database.

Visit your school library and find out the other possible tables that can be made in connection with the library database and complete the list.

- Data of books

- Data of library members

- ....

Data Base Management System (DBMS)

Don't we have to add the details of the new books purchased to the database of the library? Similarly, we will have to remove the books that are too old to be circulated. Find out what we have to do with the database and tabulate.

- Adding new data

- Removing unnecessary data

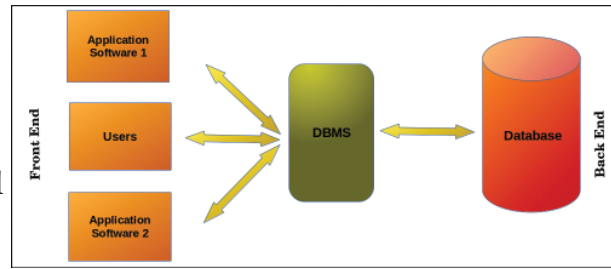- Analysis of data as and when required

- Preparing reports

- ....

- ....

Fig. 8.1 Data Base Management System - Structure

A software that makes it convenient to do such activities with a database is called a Data Base Management System (DBMS). DBMS helps us create databases and use them securely. Here, the user does not directly handle the database, but uses it through an application software (Fig. 8.1). That is, DBMS acts as a link between the user and the database. MySQL, Microsoft SQL Server, Oracle, etc. are wellknown database management systems. There are DBMS applications that come as part of office packages, such as LibreOffice Base, Microsoft Access, etc.

Try to read the diary of Mini who is going ahead with the challenges of preparing a library software.

> Wonder why this application software is also included along with a database!

January 25, Monday

Reached school early today. Discussed the possibility of computerising the library with Rabiya Teacher who is in charge of IT. She was very much interested when she heard the idea. I got a clear idea about it only when the teacher explained the preparations needed for getting the software ready. We have to study in detail the field of computerisation and learn about the on-going work there. This is apparently known as System Analysis. The teacher also told me that it is based on this that the new system is designed. The teacher also indicated the need for a database management system that can handle all the data in the present library. So I decided then and there to go to the library tomorrow itself and learn about all the activities going on there and collect the required information with the help of Thomas Sir.

Database and application software

We use different application software for painting, listening music, etc. Similarly, we need a specifically designed application to prepare reports on a database and add data to it. It is possible to obtain data from a single database for various application packages. The data from the database of the school containing the details of all the students are often used in the applications prepared for the school youth festival and for the distribution of scholarships to the students.

Activity 8.1 - Building the database

Hope you have listened to what Mini had to say about the different stages of software building. As mentioned in the note, a DBMS that can store data and use them as required is an integral part of any software. We can make use of the application LibreOffice Base for this activity. See how one can open LibreOffice Base, create a new file and save it.

- Click the *Select Database* option you see when Libre Office Base opens.

- Select *Create a new database* and click the *Next* button (Fig. 8.2).
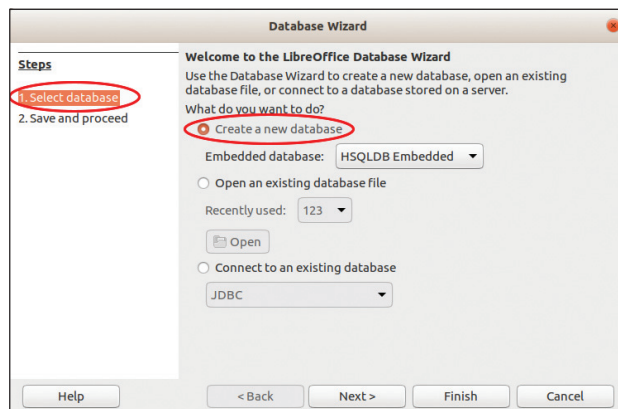
Fig. 8.2 Create database file

- When you click the *Finish* button of the window that opens, the window to save file will appear.

- Save the file with a proper name in your folder.

Activity 8.2 - Building table of books in the library

You know that data are included in a database in the form of tables. Let us see how we can add data in the form of tables to the database we have just created. What Mini is trying to make is a table containing data of all the books in the library. As indicated in the note of her diary, the number of the book, title, author, price and date of purchase should be included as part of system analysis.

You should discuss what other data should be included in the table that you prepare.

When you open the database file that you have created, you will see a window with three panels (Fig. 8.3). They are 1) the **Database panel** for selecting table, query, form or report, 2) **Task panel** and 3) **Work area** - the panel where the table or query that we create will appear.
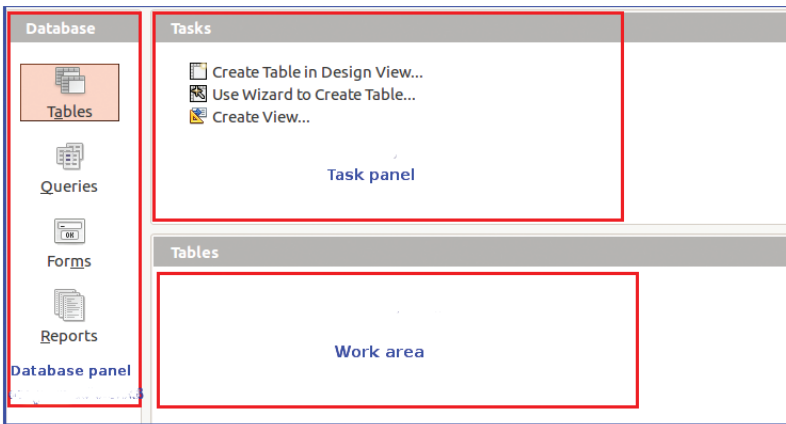
How can we include a table in the database?

Fig. 8.3 LibreOffice Base Main window

In order to create a table,

- Select **Tables** from the **Database panel**

- Select **Create Table in Design View** from the **Task panel**

A window will open where you can define the field name and the field type of the data to be added (Fig. 8.4). Now you can add necessary fields.

The term 'Book_No.' entered here is a field in the table. 'Book_Name' and 'Author' are the other fields. We can say that what are recorded in columns in the database table are fields. As you know, 'Book_No.' is data in numerical format and 'Book_Name' in text format. Defining the type of data of each field in a table is very

Fig. 8.4 Windows for defining fields

helpful in the analysis of data. Complete the table after finding out how the field type is defined when you record fields in LibreOffice Base.

Apart from numbers and text, we can include different kinds of data such as date, images, video etc. in the database. You have to simply select the appropriate field type, that's all.

Fields	Data Type	Field Type to choose
Book_No	Numeric	Number [NUMERIC]
Book_Name	Text	Text[VARCHAR]
Author		
Book_Price	Currency	Decimal[DECIMAL]
Date_of_Purchase	Date	
Category		Text[VARCHAR]
Cover_Image	Image	

Table 8.1 Field types in the database

See the book *Ramanan* by Changampuzha in Table 8.2 which contains the data of library books. The database considers this as a record. Each row of the table represents a record. In this manner, the table will have as many records as the number of books.

Can we include the cover picture of the book in the database?

The library may have purchased the same book during different years. There may be several books by the same author too. How can the DBMS distinguish them? The problem can be solved by giving values for one field in such a manner that it doesn't get repeated. For this, one field is defined as the primary key. Once it is defined, we can give only unique values to that field for different records. In other words, the value of the primary key in a record will be unique. The database recognises the records based on the primary key.
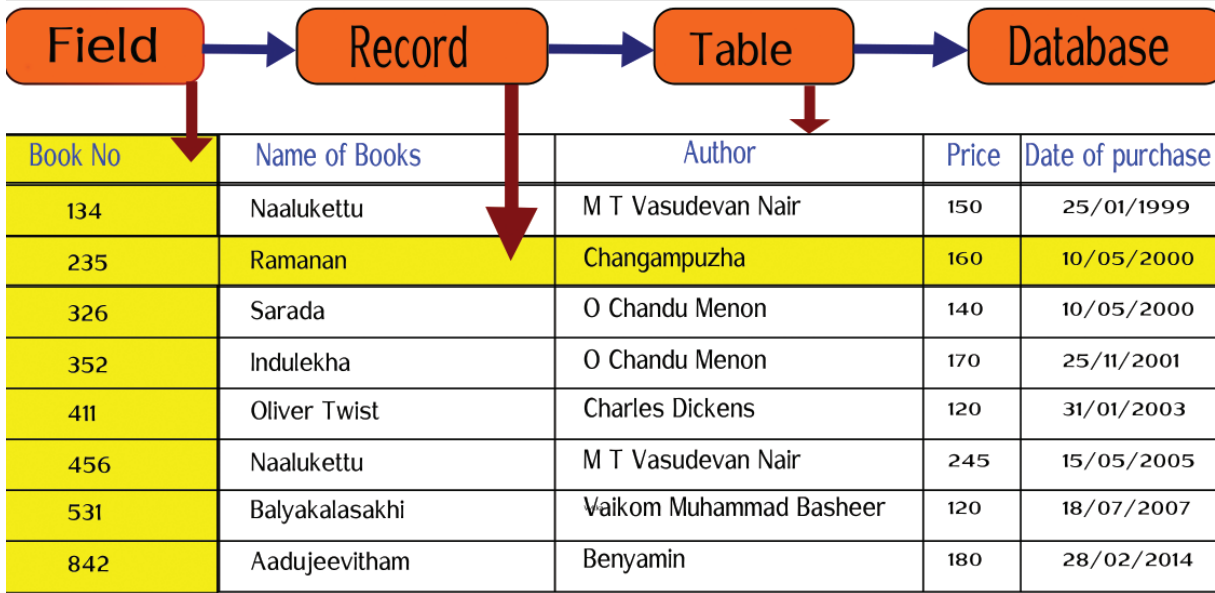
Book No	Name of Books	Author	Price	Date of purchase
134	Naalukettu	M T Vasudevan Nair	150	25/01/1999
235	Ramanan	Changampuzha	160	10/05/2000
326	Sarada	O Chandu Menon	140	10/05/2000
352	Indulekha	O Chandu Menon	170	25/11/2001
411	Oliver Twist	Charles Dickens	120	31/01/2003
456	Naalukettu	M T Vasudevan Nair	245	15/05/2005
531	Balyakalasakhi	Vaikom Muhammad Basheer	120	18/07/2007
842	Aadujeevitham	Benyamin	180	28/02/2014

Table 8.2 The details of books

Which field in the database of the library is to be defined as the primary key? Fields like 'Book_Name', 'Author', 'Book_Price', and 'Date_of_Purchase' may have to be repeated. But 'Book_No.' is one field that can be given a value that is unique. So, isn't it logical to define 'Book_No.' as the *Primary key*? For this, right click on the left hand side of the 'Book_No.' field in the window where fields are defined and select *Primary Key* (Fig. 8.5). Now a tiny image of a key appears there. This helps us to identify the *Primary key* in the table. Now save the table.

We have now defined the table to record the data of library books. What other tables will have to be included in a library database? Distribution of books is an important activity of a library. What fields will be required in a table that contains this information? Similarly, there should be a table for the members of the library. Expand your database by adding such tables.

Activity 8.3 - Data into tables

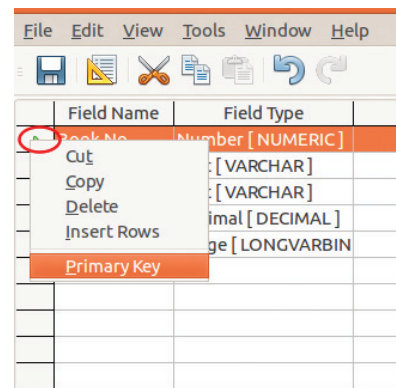One method is to directly enter the data in the table.

There are two editions of Naalukettu, and many novels by MT. Wonder how the database will distinguish between them

Fig. 8.5 To define primary key

Is it safe to do so? While entering, the chances of errors in the database are comparatively high. Using an appropriate application software to enter data in the tables is better than directly entering them, which can be quite unsafe and incorrect. There is also the method of entering data using *Form* technology incorporated in the database management systems. Let's see how we can create forms and enter data in LibreOffice Base.

> Tables are ready. Now how will I enter the data?

- Open the Database file that you saved in your folder.

- Click on *Forms* in the Database panel of the window that opens.

- Select *Use Wizard to create Form* from the *Task panel*.

- Select the table that has been created from the *Tables or queries* combo box (Fig. 8.6).
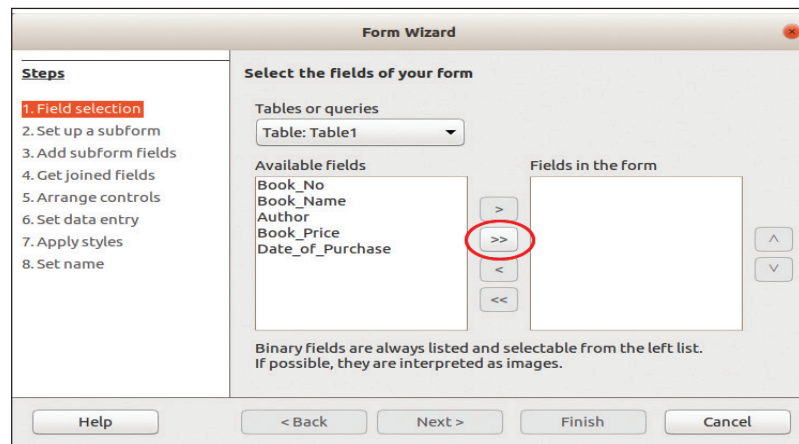
Fig. 8.6 Window to select fields in the form

- You can see under *Available fields* the fields we have selected.

- Use the arrow button to include the required fields under *Fields in the form* in the form that we are creating (Fig. 8.6).

- You can move to the next stages using the *Next* button.

- If you want to give the form a different layout, you can do so by selecting a suitable layout from *Arrange controls* (Fig. 8.7).

- Select a suitable style from *Apply styles*.

- Give a suitable name for the form from *Set name* and click the *Finish* button.

The form we created now appears in the *Work area*.

Activity 8.4 - Data Entry

You can open from the *Work area* the form that you have created and enter the data. You can move from one field to the other by pressing the *Tab key*. Does the cursor reach the box where the cover page of the book has to be entered? How can we add the image to the *form*?

Fig. 8.7 Windows for selecting form layout

Images saved in the computer can be added to the database by double-clicking on the image field or by right-clicking it to open the same (Fig. 8.8). Mini has plans to add data of all the books in the library with the help of her friends. Similarly, add data of all the books in your library to the database.

What should be taken care of while entering the data?

- Accuracy of data

- Speed

- ....

Activity 8.5 - Queries to Communicate with the database

Several occasions are there, when we want to get

Fig. 8.8 Model of a form

some specific data from a large database. Such data can be obtained from the database only by specifying the conditions of the data. Queries are the means by which such data that comply with certain conditions will be made available. Queries can also be used to make basic changes in the database such as combining records, removing data, modifying records, etc. Languages used to communicate with the databases are called Query Languages. Structured Query Language (SQL) and My Structured Query Language (MySQL) are examples.

Let's see how queries are configured in LibreOffice Base.

Suppose we want a list of books by Charles Dickens only. To get this,

- Click **Queries** in the database panel.

- Select *Use Wizard to Create Query* from the *Task panel.*

- In the window that appears, select the fields to be included in the query and specify the order in which the records are to be sorted (Fig. 8.9).

- In the next window, specify the search conditions to obtain the data we require and save (Fig. 8.10).

When you open the new query from the *Work area*, LibreOffice Base will display a table of books by Charles Dickens alone.

Asking questions to a database?
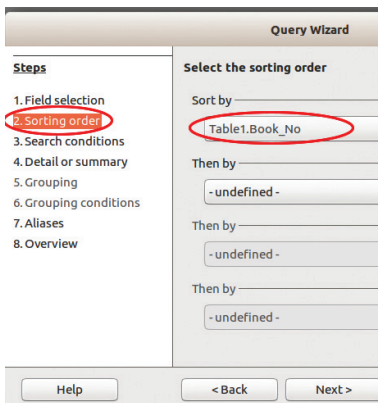
Fig. 8.9 Query Wizard window
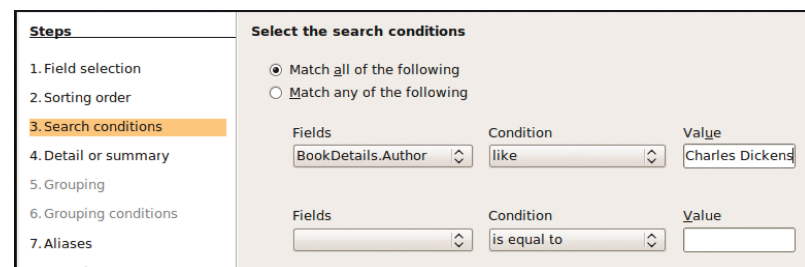
Fig. 8.10 Window to add conditions to a query

Such queries can be used for preparing reports or in application software.

Activity 8.6 - Preparing Reports

The biggest advantage of database management systems is that we can make reports of the kind we want. Let's see how we can create reports in LibreOffice Base. For this,

- Click on the *Report* button in the *Database pane*l.

- Click on the *Use Wizard to Create Report* seen in the *Task panel*.

- In the window that opens, select table or query from the combo box depending on what you would like the report to be based upon.

- Include the fields you want in the report in *Fields in report* (Fig. 8.11).
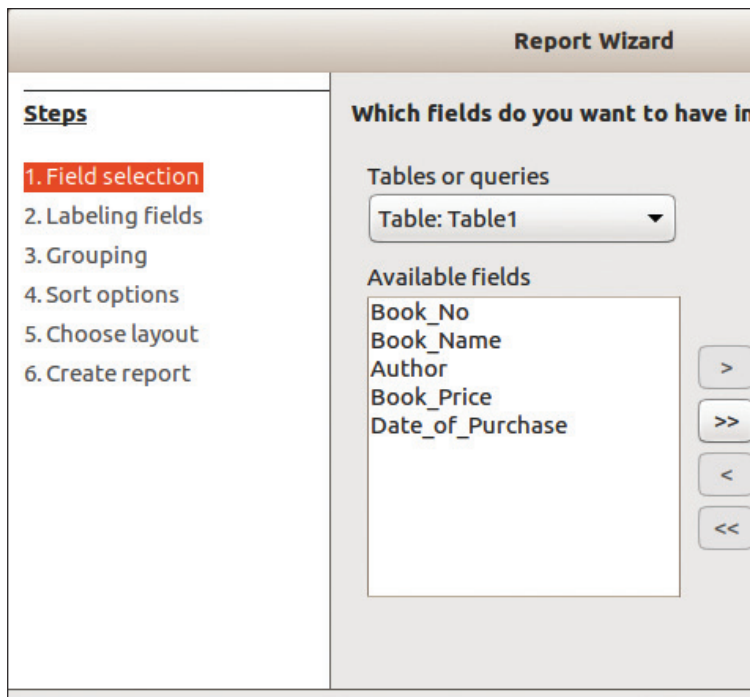
Fig. 8.11 Window to include necessary fields in the report.

- Go to succeeding windows by clicking *Next* button.

- Select suitable layout (Fig. 8.12).

Library Management System (LMS)

Several Library Management Systems are available now which can handle everything from buying books for the library to the members selecting the books online. Koha, OPALS, L4U, Evergreen, Alexandria etc. are examples. When we use such applications, we have to customise them to suit our needs. There are also LMS applications like Insignia Software, Libramatic, WorldShare, OCLC and Alma that make use of cloud technology.
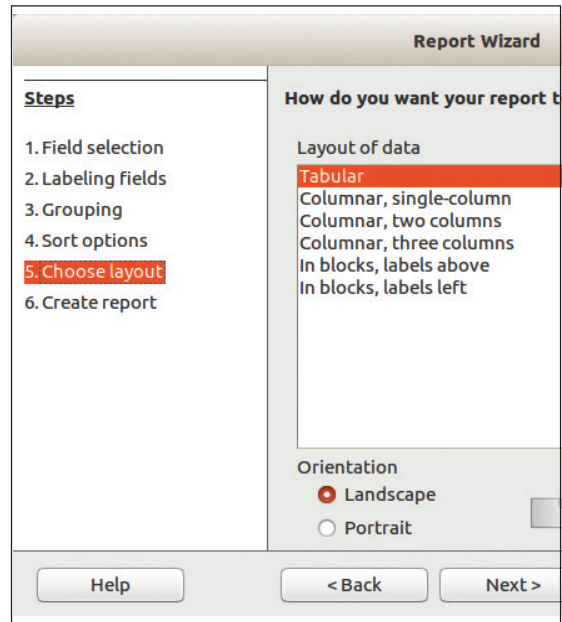
Fig. 8.12 Window for selecting report layout.

- Give a name in *Title of Report* and click *Finish* button.

You can open the newly created report from the *Work area*. In this manner, practise by making more reports that are suitable for the tables and queries you have created.

Three tables are mainly included in a Library Management System. They contain

- Basic data on books

- Data about library members

- Data on book circulation

Needed queries and reports are generated based on this. Now you too can prepare a Library Management System.
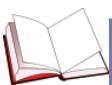
Big Data

You must have received your Aadhaar card. What kind of data do you find in it? It has your name, date of birth, photograph, biometric information and so on. How big will be the database of all the people of India! Such a database is called Big Data.

They are much bigger and more complex than the database that we handle using normal data processing technology. Collecting, sharing, analysing, exchanging, etc. are all challenging tasks. It is said that the text and images stored in Wikipedia come to several terrabytes. If all the images and videos handled by Whatsapp used by crores of people are put together, how huge it will be! Hadoop, Apache Spark, etc. are examples of software used for handling big data.

Let's evaluate

1. Given below is a report containing the details of policy holders in an insurance company.

Policy No.	Name	Age	Male/ Female	Date of start of policy	Premium amount
3456134676	Avtar Singh	55	Male	28/10/1993	2331.00
7843211234	Pramila C. Mitra	43	Male	10/05/2000	3548.00
2678906756	Pranav Mukherjee	28	Male	23/12/2009	567.00
4256674542	Avtar Singh	37	Male	25/11/2001	1232.00
7834512398	Malini Bhattacharya	43	Female	28/10/1993	567.00

- What fields in the company's database have been included in this report?
- Can the field Premium amount of this database be defined as the primary key? Why?
- Which field of this database could be defined as the primary key? Justify your answer.
- Can you guess data of how many records are included in this report?

Extended activities

1. Collect the following data from the students of your class.

    Roll No., Name, Date of birth, Address, Digital photograph, Height (in metres), Weight (in kilograms).

    Now build a database in LibreOffice and

- Design a table with Roll No. as the primary key.
- Prepare a form and add the data to the table.
- Prepare a query to find out the children with height above 1.5 m.
- Prepare a report based on the query you have made.

❀ ❀ ❀

Chapter 9

Moving Images

"Teacher, this notebook is full of stories written by Vipin", Jomon told the class teacher, handing over to her the notebook.

"Clever boy! The story is good. This short story can be made into an animation film."

Vipin's face brightened when he heard the teacher's comment after reading his story.

Did you read the synopsis of Vipin's story?

What about developing the story into an animation film? How can we create an animation film?

We know the different stages of making a movie. Making an animation film also goes through more or less the same stages. The only thing is that a computer is to be used. Just as in the case of a movie, animation film also needs considerable preparation.

Summary of Vipin's story

"Mother had left early in the morning. She used to get back to the nest before noon. The sun has reached the western horizon and will soon vanish into the sea. The baby bird started worrying.

"If only father were here.."

....

....

The baby bird remembered as if in a dream the time when she would wake up to her mother and father's loving embrace. As she listened to the brave story of how her mother rescued father from the rocks of the valley, her eyes fell on a big star moving to and fro among all others in the sky."

Design of characters

Character designing is an important stage in the making of an animation film. It means bringing characters to life with humanity and personality. This has a huge role in giving life to the story.

Characters have to be designed very carefully. It would be good to take into consideration the following things also.

- The appearance of the characters.
- Selecting suitable colours for the images.
- A drawing style that could be easily modified.

Activity 9.1 - Producing an animation film: Stages

What are the different stages of producing an animation film? Discuss with your friends and complete the following list.

- Finding a story
- Designing characters
- Preparing a storyboard
- ....

Did you complete tabulating the different stages of making an animation movie?

Animation

Animation is an illusion created by displaying still images in a fast and continuous manner. This is a technology that depends on the persistence of vision. Anything that we see persists in our vision for a short time (1/16th of a second) even after it is removed. Because of this, when some images appear continuously one after the other in front of our eyes, the images appear to move.

In the early days, animation films used to be made using plastic films on which the images were painted. With the arrival of computers and animation software, it became much easier. Synfig Studio, Tupi: Open 2D Magic, Pencil (Free Software) Adobe Flash, Toon Boom, Anime Studio (Proprietary software) are some of the important applications of animation.
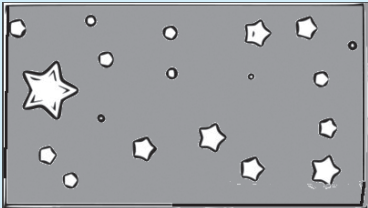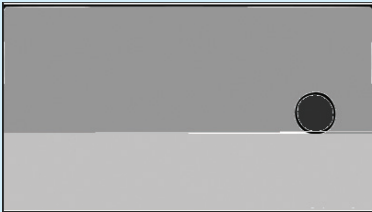
Which characters should be included in the animation film of the baby bird's story? Based on the note, discuss with your friends how characters should be framed.

You have finalised the characters needed for the animation film and their traits. The next stage is the preparation of the storyboard.

We have learned many ways of preparing storyboards when we made multimedia presentations. A detailed storyboard like this is important for the preparation or making of an animation film also.

See Table 9.1. Using the hints given, complete the storyboard containing the details of animation that you are going to do.

Activity 9.2 Let's complete the storyboard

Title: Sanathan		Page:...
Scene.1-Stellar movements	Scene. 2 -..................	Scene 8: Sunrise
	....	
Characters: Sky, small and big stars	Characters:.........................	Characters: Sun, Sky
Action: A big star moves towards both sides.	Action:...............................	Action: The Sun rises
Sound: Background music	Sound:...............................	Sound: Background music
Time: 5 seconds	Time:	Time: 5 sec
Remarks:	Remarks:...........................	Remarks:...........................

Table 9.1 Sample storyboard

The storyboard is ready. We have shown the happiness of the little bird through the stars and the movement of one of them. The storyboard here has been written in such a way

Synfig Studio

Synfig Studio is a Free 2-dimensional animation application. This software was created by Robert B. Quattlebaum. This application is used to create animations by giving movement to the cartoon images in a 2D canvas. It has versions that can run in GNU/Linux, Microsoft Windows and Apple Mac OSX.

that the story starts with the happiness of the bird indicated by the movement of the stars.

The next stage is to prepare the animation based on this storyboard. Let's try doing this using the Synfig Studio included in IT@School GNU/Linux.

Let's understand the application

Open Synfig Studio in your computer. Get acquainted with the main window, tools and other facilities of the application with the help of Figs. 9.1 and 9.2.
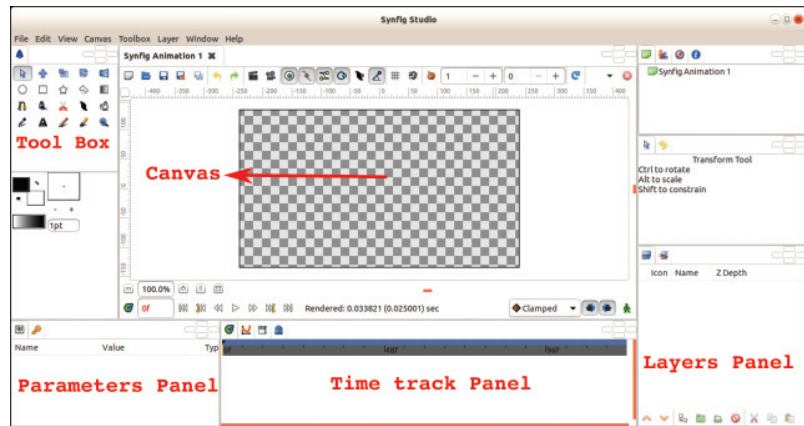
Fig. 9.1 Synfig Studio window

Observe the Synfig Studio *Tool window*. Move the cursor on the top of each tool and learn its name.

Some of these tools look similar to those of GIMP.....!

Fig. 9.2
Synfig Tool window

Fig. 9.3
Gimp Tool window

Activity 9.3 Let's see the tools in Synfig Studio

Some of the important tools in Synfig Studio are given in the table below. Find out their names and usage and complete the table. Remember the use of the tools in the GIMP software that we studied.

Tool	Name	Use
	Transform	To select an object and to control its handles
	....	To create a square object
	Circle	
	Fill	....
	....	....
	Star	To mix two or more colours
	Smooth move	....

Table 9.2 Some of the tools in Synfig and their uses

We have understood that animation is created by displaying images in a continuous and fast manner. These still images are known technically as frames. We can create an impression of motion by changing the position, shape and expression of the characters in each frame. The naturality of the movements is determined by the number of frames exhibited per second (Frames Per Second, FPS).

We can decide in advance the FPS of our movie and the duration of each scene. What should be the FPS of the movie you make? Discuss with your friends.

The default settings in Synfig Studio is to create a video that lasts for 5 seconds at the rate of 24 frames per
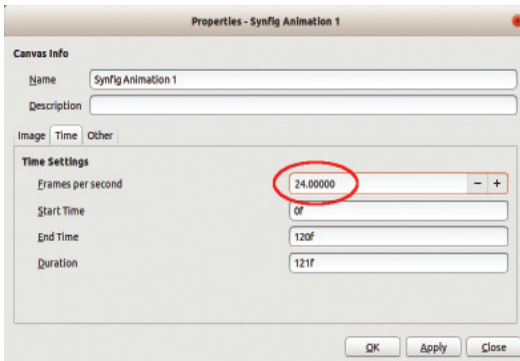
Fig. 9.4 Time settings in the Canvas properties window

second. If you want to change this setting, you can open *Canvas → Properties → Time* and change the time and *fps* as desired (Fig. 9.4).

Animation: Scene 1

Examine once again the animation we have to do in the first scene as per our storyboard. Isn't it the animation of a big star moving to and fro among the stars in the sky?

We have to draw many stars to prepare this animation. Simple things like stars can be drawn using the tools in Synfig itself. If you need more complex images, you have to use some other piece of software. Since it is possible to use vector images directly in Synfig, it is possible to create such images in applications like Inkscape that we are familiar with and import them to Synfig.

Draw the images required for animation and save them with the help of the following activities.

Activity 9.4 Let's draw the sky and stars

Draw a night sky and stars in it with suitable colours. For this,

- Open Synfig Studio software.

- In order to prepare the night sky in the background, use the *Rectangle* Tool, drag and draw a rectangle that fills the entire canvas.

- Give a suitable colour to the rectangle using the *Fill* Tool.

The *Star* Tool can be used to draw stars. The *Fill* Tool will be having the colour given to the sky, which won't be suitable for the stars. So don't forget to change the colour to suit the stars (Fig. 9.5).

Each picture created in Synfig is called an *Object*. Each object that we draw will be included in a separate layer. What is the advantage of each object being included in a separate layer like this? Discuss with your friends and make a list. Remember what we have learned about the layer facility in GIMP.

Fig. 9.5 Sky and Stars

- It is possible to give separate animation for each object.

- If any object is to be discarded, it is possible to remove that layer alone without disturbing other objects.

- ....

- ....

Note that as you draw the rectangle layer that contains the sky, separate layers for the stars will start appearing in the layers panel (Fig. 9.6).

- Shouldn't the stars be scattered all over the sky? For this, click on the *Transform* Tool ( ).

- With the *handle* you get now ( ), you can change the position, size and shape of the star.

Hope you have saved. The next stage is to make the big star move.

Layers Panel

We have seen what layers are, when we studied the application GIMP. These are displayed in the *Layers Panel*. Each object appears in this panel in the order in which it is built (Fig. 9.6). It is possible through this panel to change the order of the layers, group them, copy them or delete them.

Activity 9.5 - Moving the star

Suppose we are going to prepare an animation for a duration of 5 seconds at 24 FPS. The total number of frames required for this animation will be 120 (24 x 5).

Icon	Name	Z Depth
☑ ★	Star004	0.000000
☑ ★	Star003	1.000000
☑ ★	Star002	2.000000
☑ ★	Star001	3.000000
☑ ■	Rectangle001	4.000000

Fig. 9.6 Layers of Sky and Stars

Let's save

We have completed drawing the sky and the shining stars. Animations like this often take a lot of time to complete. Therefore, we don't get the final form of our work very quickly. Instead, let us save our daily work as project files. Save this project in your folder with a suitable name. Notice that the work done in Synfig is saved as project files with the extension *.sifz*.

Fig. 9.7 Keyframes

- The star should move from one side of the sky to the other and return in 5 seconds.

- The image we have prepared will be in the first frame (*0f* - zero frame). After half time (60 frames *60f*) the star has to move and reach the other side.

The movement of the star to one side has to be completed in 60 frames. In order to create this animation, 60 images have to be drawn. That is, 60 pictures of the same movement have to be drawn. Instead, if we fix the first frame where the movement starts and the 60th frame where the movement ends and if the software fills up the frames in-between, won't that be much easier? This is possible in the Synfig software that we are using. This technology is known as Tweening. This is made possible by means of the mathematical process of interpolation.

When we do tweening like this, shouldn't the software be able to judge the movement of the object? That is, we have to show some of the important positions related to the movement of the object. The frames that represent important positions are called Keyframes. Here, we can consider the first frame of the movement of the stars (*0f*), the middle frame where the direction changes (*60f*) and the last frame where the movement comes back to the original position (*120f*) can be considered as the Keyframes.

Prepare the animation of the star with the help of the given activities.

- For the animation to start from the first frame, ensure that Current Time is 0f. This is our first key frame.
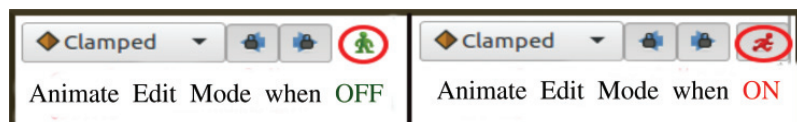

Fig. 9.8 Animate Edit window

- Now we can start editing the animation.

- For that, activate *animate editing mode* (Fig. 9.8).

    Now, we have to fix the 60th frame as the next key frame. For that,

- Enter *60f* in Current Time. Then we can see the play-back head in Time track move to the 60th frame.

- Click on *Keyframes* 🔑 in the *Parameters panel* and make it active.

- Next, click *Add New Keyframe* ➕ in the same panel and configure the 60th frame as a key frame (Fig. 9.9).
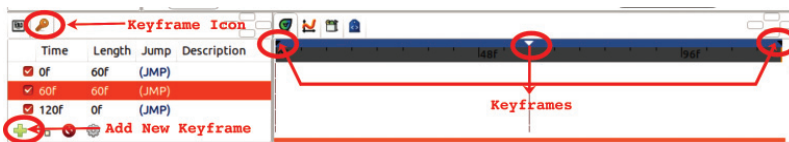

Fig. 9.9 Keyframe making

- Now move the position of the star to the right end of the canvas.

- Click *animate editing mode* button and end editing.

- Press the ▷ *Play* button and examine the animation we have created. If it is not satisfactory, modify it.

- Save the animation.

Activity 9.6 - Movement in the opposite direction

In Activity 9.5 we completed the movement of the star in one direction taking only half the time. Now what remains is taking the star back to its original position. Let's make arrangements for that.

- Activate *animate editing mode*.

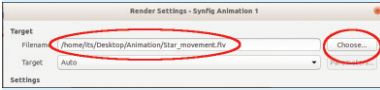- Enter *120f* in *Current time*.

To convert into video file

Fig. 9.10 Render settings window

In order to save an animation file created in Synfig as a video file, it is enough to select *Render* option from the *File* menu and specify the location and format (Fig. 9.10). You know that, *flv, mpeg, mp4,* etc. are video formats. We can export our project into any of these formats. Small animations can be exported to *gif* format also.
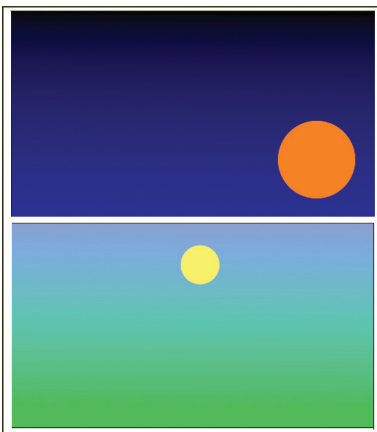

Fig. 9.11 Sunrise - first and last frames - a sample

• ....

• ....

With this, the small animation work is complete. Now what we need is the final product, the video. Based on the note given, export the scene we created as a video file. Save the video in your folder.

Animation: Scene 8, Sunrise

The scene in which the star moves is ready. Sunrise and sunset are the scenes that we have to create like this. Imagine that Scene 8 shows sunrise. Let's create it.

Here the first frame should have the image just before sunrise and the last frame should have that after sunrise. The first frame will always be the Keyframe. If the last frame is to be the Keyframe, we have to mark it as such.

Activity 9.7 - Let's create sunrise

Open a new project in Synfig and build the sky at the time of sunrise. For that, select suitable *Fill* and *Outline* colours and drag from top to bottom with the *Gradient* tool.

• Draw the Sun with a suitable colour using the *Circle* tool.

• Move the Sun to an appropriate place as shown in Fig.9.11 using the *Smooth Move* tool.

We will have this much in our first Keyframe.

Now let's create the next Keyframe. For that, activate the *animate edit mode*. This Keyframe has to be at *120f*.

How should this frame be? It should be set where the Sun would have been after it has risen, with suitable size and colours. The Sun should defenitely have become

much brighter, shouldn't it? The sunrise and the sunset become beautiful because of the colours in the sky. Therefore, the gradient layer representing the sky also needs changes (Fig. 9.11).

To bring about those changes, try the following activities in a sequence.

- At *120f*, select the gradient layer from the *Layers panel*.

- Click on the colour value against the *Gradient* in the *Parameters panel* (Fig.9.12).

- Change the colour suitably.

- Arrange the position of the Sun and its colour suitably in the prepared sky. Select colours from the *RGB* option in the *Gradient Editor*, you can configure the colours at the top and thereafter, by clicking on the small black mark in the red circle in the figure (Fig. 9.13), the colours at the bottom also.

- After arranging colours thus, click on the *animate edit mode* button to end editing.

Run the animation and if it is satisfactory, save it in the folder. Finally you can *Render* the video and save that also in the same folder.

Fig. 9.12 Value arrangements of Gradients in the Parameters panel

Animation: Scene 16, The bird flying towards the branch of a tree.

We have completed the animation scene showing sunrise. Our next attempt is to create the scene showing the bird flying to its nest. For this, we have to draw the background and the bird's still image. Some drawings like this are stored in the folder for Class X inside *School_Resources*. We can import them into Synfig and use.
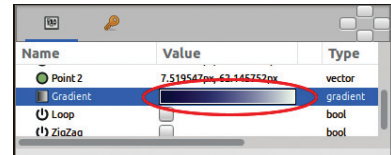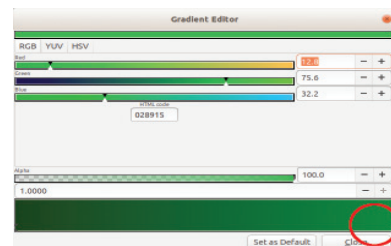

Fig. 9.13 Gradient Editor window

Activity 9.8 Bird flying towards the branch of a tree..!

It won't be difficult to complete the following activities and build the animation.

- Open a new project and bring the background image onto the canvas (*File → Import*).

- Click on the image.

- Drag the *handles* on the rectangle you get and resize the background (See what is marked with red circle in Fig. 9.14.).
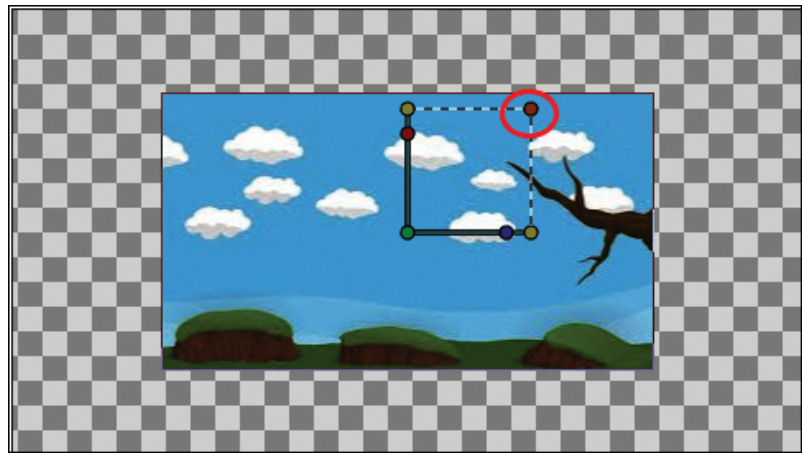

Fig. 9.14 Selection Handles

Synfig Wiki

Synfig Studio has many features that help us create animations according to our imagination. You will find much to learn if you visit the Synfig Wiki page (http://wiki.synfig.org/). If you are interested, you can learn the activities.

Along with your friends, find out the use of other buttons with different colours in the handles.

- Import the bird's image into the same canvas.

- Click on the image of the bird to adjust the size and position of the image.

The first frame is ready. Now let's make the bird move. The animation techniques that we have learned in the earlier activities are quite sufficient, aren't they?

In the last frame, before moving the bird to the branch of the tree, don't forget to activate *animate editing mode*.....!

In order to give the illusion of the bird coming closer, its size can be increased in the last frame. Along with that, the background layer can be selected and made bigger in the last frame.

What we have done is only familiarizing with some of the techniques needed for creating animation films. You should create each scene in your storyboard like this and save them in your folder.

The next step is to build a movie from several bits of animation that we have created at different stages. If the animation movie needs background music and dialogues, they should be created and edited using **Audacity**. You have already learned in earlier classes how to combine video and audio using **OpenShot Video Editor,** give titles and make it into a movie.

You can exhibit your own movie in the school with the help of your teacher. An animation film festival can be organised under the auspices of the School Little KITEs Club.

Making the bird flap its wings

How to make the bird flap its wings? We can draw its body, wings, etc. separately, import them and put them together in the canvas. We can group layers when needed. We can select the layer with the wings or body alone, rotate them, change their position and size and create the feeling of flying. It will be sufficient to take a copy of the first wing to create the second one. The flapping of the wings can be repeated by adding *time loop layer*.

ANIMATION - World of Opportunities

Animation is a vocation suitable for people who possess drawing skills as well as an artistic aptitude. Today, animation experts work in sectors such as industry, entertainment, education, television, publication and web designing. The job catogories in animation are designing of animation characters, creating special visual effects, video game production and production of advertisement. Animation is a job that requires art and technology in equal proportion. People who possess the ability to draw and sketch, have a sense of humour, imagination and observation skills can perform better in this field. The multitude of television channels and the growth of advertisement in the film-entertainment sectors have changed animation field in to an area of plentiful job opportunities. The prominent multinational companies in the entertainment and industrial sectors of the world now depend on India for animation.

Let's evaluate

1. Which among the following is different from others?

   a) Toon Boom   b) Adobe Flash   c) Blender   d) Anime Studio

2. Which term among the following is related to the process in which the software, all by itself, generates the frames between the key frames?

   a) FPS   b) Tweening   c) Interpolation   d) Import

3. Prepare the animation of sunset using Synfig Studio. Export this as *gif* file and save it in your folder.

4. Check if the uses of the tools listed below are correct and correct them if they are not.

	To select an object and manipulate handles
	To draw squares
	To mix two or more colours
	Give colour to objects

Extended activities

1. Animate a leaf swinging from the branch of the tree on which the birds are sitting.

2. From the animation you have prepared earlier, prepare the animation of a bird, flying with its wings flapping .

3. Prepare a storyboard of the cartoon given in your English textbook and build an animation (see the picture).
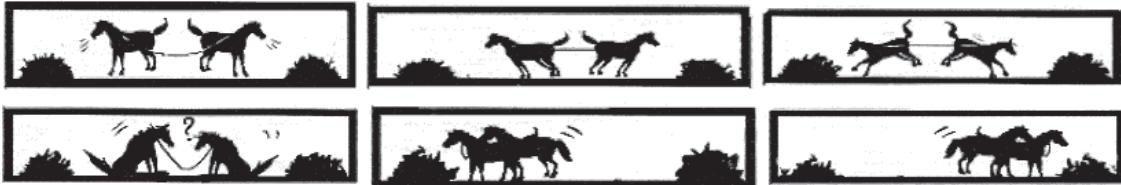
4. Do you remember the collision theory that you have studied in Chemistry? Prepare an animation showing the 'collision of reactants' and present it in your Chemistry class.

❀❀❀

Chapter 10

Operating Systems

Fig. 10.1 The Analytical Engine

The figure (Fig .10.1) shows the main part of the first computer called the Analytical Engine which Charles Babbage (1791-1871), who is regarded as the Father of computer, tried to build. It was meant to be operated using st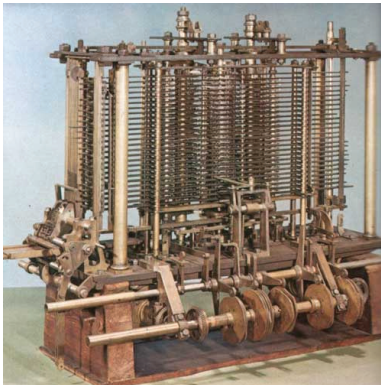eam. How different it is from the computers we use today! In spite of being very different from today's computers in structure and form, why is it called the first computer?

It is because the basic concepts related to a modern computer were envisaged for this machine, too. It even had a program. The famous mathematician, Ada Byron, had agreed to prepare it. But Babbage was not able to build a practical version of this. A working computer (ENIAC) integrating all these ideas could be built only after 120 years. The science of computers developed further. Computers came to be built for many purposes. It has now reached a stage where there is just one computer for many purposes.

Today, we use computers for multifarious purposes. There are a lot of software packages for accomplishing all these needs. Such software designed for specific purposes is called application software.

Activity 10.1 - Different activities using computer

Complete the table showing different activities that can be done using computers and their related applications.

Activity to be done using computer	Software to be used
Text processing	Abiword, OpenOffice Writer
Image editing	
Sound editing	
Animations	
Database handling	

Table 10.1 Application software

We have just listed down the application software. All of them can be found in the same computer. When the same computer is used for different purposes, we may have to make some additional facilities as shown below.

1. These applications are to be arranged in such a way that the user finds them easy to use.

2. The products created by an application may be stored as different files. A file system is needed to save them and retrieve them as required.

3. The data given through the keyboard in the text format can be prepared as we desire, using a text processing application. To this end, shouldn't the keyboard and application software work synchronously? In case we want to get it printed, then also the compatibility between these two devices is required.

4. ....

....

....

Different kinds of operating systems

We use the GNU/Linux operating system. But the computers in shops and other establishment need not have this. You may have noticed that the computers used by some people have more than one operating system installed.

Unix Operating System

Unix is an operating system that was built by Dennis Ritchie and Ken Thompson of Bell Laboratories in the United States of America. The work related to the production of it was started in 1969. They later transferred the ownership to many other companies. These versions came to be used later with a lot of modifications and additions in other operating systems made by Apple Corporation (Mac OSX), California University, Berkeley (BSD) and others. Many other operating systems that are in existence today have been developed or redesigned following the model of Unix.

Operating System

All the computers we use today have a general mode of operation to carry out the things we discussed above. GNU/Linux that is installed in the computers that we use today is an example of such a software. Such a working process is called an operating system.

Activity 10.2 - Let's be familiar with different operating systems

Complete the table of different operating systems (Table 10.2). The website https://en.wikipedia.org/wiki/List_of_operating_systems may be helpful.

Operating System	First Developers
Unix	
BSD (Berkeley Software Distribution)	
Mac OSX	Apple Inc.

Table 10.2 Different operating systems

What are the needs to be satisfied with the operating systems? Let's examine in detail what has been listed above.

1. Co-ordination of different application software packages

When there are several applications in a computer, they have to be properly arranged. The

operating system that facilitates this purpose is called *menu*.

Activity 10.3 - Operation using the command line

Examine the main menu of your computer's *Desktop* (Fig. 10.2). How is it organised?

Drag one item from it onto the *Desktop*.

You can see the launcher of the software created on the desktop. Then click on the right button and select *Properties*. The window shown in Fig.10.3 is related to the software *Scratch*. Double click on the launcher and Select *Trust and Launch* to use this application.

Menu is not essential for launching an application in our computer. It is enough to know the command to run the software. Examine from the figure the command for starting Scratch. What happens if we apply that command to a *Terminal*?

Many modern operating systems do not have any menu. Look at the mobile phone screen in Fig.10.4. Here, there are only icons instead of a menu. In some others, applications are activated by giving commands to a *Terminal*.

2. Co-ordination of hardware parts

Suppose we bought a printer to be used with our computer. Can we start using the printer as soon as it is connected to the computer? The answer is No.

If any hardware part of a computer has to work, it also requires a program (software) that specifies how it should work. This program is called the driver of that equipment. Normally, when you buy a printer, its manufacturers give a driver along with the printer. The
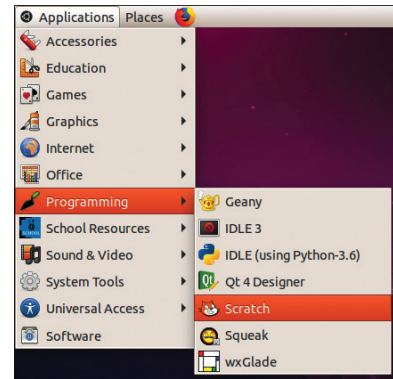

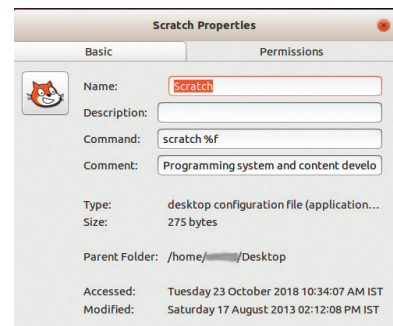**Fig. 10.2 Applications in IT@School GNU/Linux**

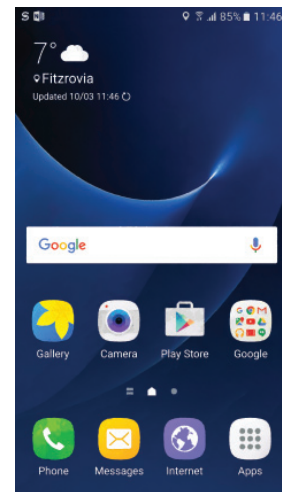**Fig. 10.3 Scratch properties window**

Fig. 10.4 Mobile phone screen

printer becomes operational when this driver is added to the operating system. From then onwards, it is the operating system that controls the printer.

3. System for storing files

When we save a file in the computer, the following information is also saved.

- Name of the file

- Location where it is saved

- Format of the file

- Size of the file

- ....

It is the operating system that sorts and saves the file. How does the operating system do it?

Files are normally saved in the hard disk of the computer. An operating system requires an address system to save files in the computer.

In order to know where the files are stored, the disk has to be divided into blocks, and these blocks also have

File systems	
Operating System	**The file system used**
GNU/Linux	Ext3, Ext4
Microsoft Windows	Fat 32, NTFS
Apple Mac OSX	HPFS, HPFS+

The manner in which each operating system formats the hard disk is known as its file system. Some important file systems are shown in the table.

Table 10.3 Different file systems

to be given addresses. This process is called formatting. Creating hard disc in the form of blocks like this and giving them addresses is done by each operating system in its own manner.

Activity 10.4 - What are hard disk partitions?

When you want to install different operating systems in one computer, you will have to create different kinds of file systems too. In such situations, you have to divide the hard disk into different parts. Dividing the hard disk into different parts is called partitioning. (The hard disk is sometimes partitioned to store files in an organised way). Find out the details of the partitions of your computer and complete the Table 10.4. You can use the application *Disks* (gnome-disks) for this.
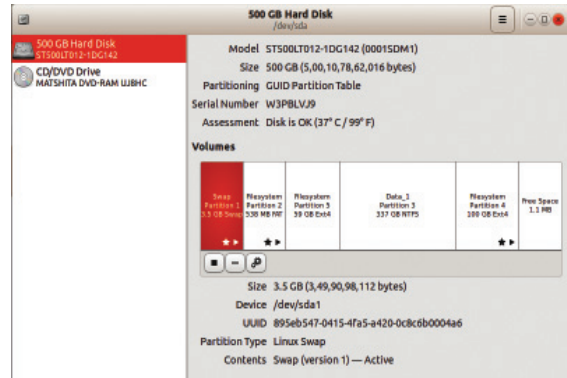
Fig. 10.5 Disks window

Partition	Address	File System (Ext3/Ext4/NTFS/Others)	Partition size
1			
2			
3			
4			
5			

Table 10.4 Details about hard disk partitions

You have found out the details of the partitions in the hard disk of your computer. You must have found more than one partition in the computer you use (GNU/Linux). Normally, a GNU/Linux file system requires three types of partitions, namely,

- *Root (/)* - for storing the programs of the operating system

- *Home (/home)* - for storing the files created by the user

- *Swap* the fast file system - for temporary storage.

But a GNU/Linux system can also function with just *Root* and *Swap* file systems.

Computer users

Normally, gadgets like smart phones are built for a single user. But computers are normally configured in such a way that more than one person can use it. GNU/Linux operating system also has the facility to register more than one user. Each person who uses the computer is called a *user*.

What are the benefits of registering as multiple users in a computer?

- We have stated that *Home* is the place in the hard disk where the files of the users are stored. When a *user* is registered, a folder is created in *Home* for this *user*.

- The operating system creates a *Desktop* for each user in the home folder of the *user*. Each *user* can configure the appearance of the computer as (s)he likes.

- Each user is able to keep his/her files separately from those of others.

- Users can protect their files, configurations and other data, using a password.
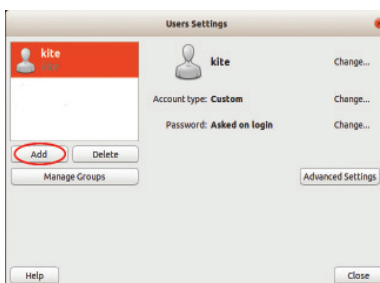
Activity 10.5 - Create a *user*

Create a user with your name in your computer. Protect this user account with a good password. The following procedure can be used for this.

Fig. 10.6 Window for creating a user

- Open the window to create a new user in the order of *Applications→ System Tools→ Administration → Users and Groups* (Fig.10.6).

- Click the *Add* button in the window and create a new user.

- Creat a password for the user.

- Log out from the computer and login as the new user.

We have seen a new *home* folder created for the new user who has just registered. A *Desktop* is also created for the new *user*. *Right click* on the *Desktop* and change the wallpaper to something that you like.

The general structure of an operating system

Generally, a complete operating system will have two parts on the operational level. One is the *kernel*, which interacts with the hardware directly or through *drivers*. And the other consists of *Shell* and Systems that display software windows (Graphical User Interface - GUI). Given below are some of the well known operating systems and their kernels.

Location of a file

Imagine that a *user*, named binu, created a folder called *My_Works* on his *Desktop*. Also imagine that he has saved a file called *OS.odt* in that folder. In that case, the file should be in the folder *My_Works* in the *Desktop* folder inside the home folder that was created for him in the computer's *Home* folder. Correct? So, we can write this in this way: */home/ b i n u / D e s k t o p / My_Works/OS.odt*

Operating System	Kernel program
GNU/Linux	Linux
Microsoft Windows	Windows NT
Apple Mac OSX	XNU

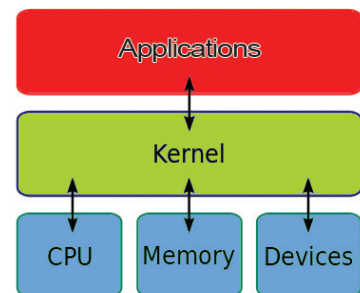**Table 10.5 Operating system and their kernels**

Fig. 10.7 Basic structure of an operating system

GNU - GNU is Not Unix

We know that Richard Stallman called upon the programming community of the world to build a new operating system. Hundreds of programmers came forward to co-operate. Many of them were employed in different organisations. It was not possible to get all of them together or explain the project to them. So he suggested that Unix, the then prominent system, be chosen as a model to build the new operating system. Whatever was there in Unix should be there in the new one also. But it should not have any program code of Unix. Thus those who co-operated with the program had re-written Unix without copying any code from it. This is what the name GNU signifies.

Free software and Proprietary software

Most of the computer programs during the early days were available free to copy and share. But, as software industry grew, we also saw the growth of competition among the monopoly practitioners that restricted the freedom to copy and share. The competition became really fierce when software was brought under Copyright Laws in the 1980s, following which even for academic purposes, the knowhow of a software was highly restricted and kept highly confidential. Such software is called proprietary software.

In order to find a solution to this problem, a computer programmer named Richard Mathew Stallman established the GNU project in 1983. The aim of the GNU project was to prepare an operating system that could be studied by anyone and modified and shared without any restriction. Almost the entire software for this project has been prepared voluntarily by thousands of programmers around the world.

Linux - The operating system 'Kernel' written by Linus Torvalds

We have learnt that an operating system has different parts. Kernel is one of the basic parts. The GNU project named the kernel part that they intended to build as GNU HURD. However, the kernal part was not ready when most of the other parts were ready in 1992.

Linus Torvalds, a student of Helsinki University in Finland started developing an operating system kernel in 1991 with the name Linux. People started using this kernel along with GNU components in 1992. Since then, the operating system having these two are known as GNU/Linux.

Activity 10.6 - Get familiar with free software

GNU/Linux is a Free operating system that works with the Linux kernel. What are the other free software operating systems? Complete the Table 10.6.
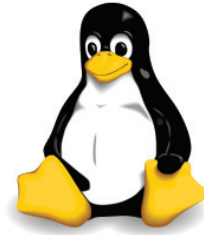
Operating System	Proprietary/Free	Kernel used
GNU/Linux		
Microsoft Windows		Windows NT
FreeBSD	Free	BSD
Mac OSX		

Table 10.6 License of different kernels

We saw that there are Free and Proprietary software packages. When does a software become free? Examine this based on the note given below.

- We have learned to write programs in Python language. We know that software is a collection of such programs. Program instructions in the written form is called "source code". Software works by converting this into a form that the computer can handle (object code). If something has to be added to a computer program or make some changes to it, the source code should be available.

- Free software makes its source code available to others, thus giving an opportunity to use it freely, study the program, make changes if needed and take copies. Everyone has the opportunity to revise it and make new ones.

- Proprietary software makes available only the object code to its users. It denies the users the right to read or study the source code.

GNU/Linux distributions

All the main software devices included in GNU/Linux are Free. Many people make use of this freedom to modify and re-distribute the software. Some of these distributions are listed below:

¨ Slackware Linux

¨ Debian - from Debian is made Ubuntu, from Ubuntu we have made the distribution IT@School GNU/Linux that we use.

¨ From Redhat, came Mandrake (Mandriva now).

Operating System for other appliances

We are familiar with devices that work based on the instructions given, apart from computers. Complete the following list.

- Mobile phones

- Automated Teller Machines (ATMs)

- Motor cars

- ....

- ....

Activity 10.7 - Let's be familiar with the mobile operating systems

We know that mobile phones and tablets have operating systems. Table 10.7 given below lists down such mobile operating systems.

Operating systems for wearable devices also

We have seen that the operating systems that are used in computers have reached smart phones and tablets. But today these are not the only devices that have operating systems and software. Look at the following.

Operating System	Company that brings it	Basic program
Android	Google	Linux
iOS	Apple Corp. Inc.	Unix
Windows 10 Mobile	Microsoft	Microsoft Windows
Tizon	Linux Foundation	Linux
Blackberry 10	Blackberry Ltd.	QNX

Table 10.7 Mobile operating systems and their basic programs.

Fig. 10.8 Wearable devices - spectacles and watches

- Smart watches having the facility to listen to music and make phone calls.

- Spectacles (glasses) that create life-like images and sounds.

- Wrist bands that constantly measure blood pressure and heart rate.

- Lockets that contain camera and sensors.

- Gadgets that control the flow of insulin for diabetics.

- Chips that are installed under the skin.

- ....

Such gadgets have started appearing in the market and they are generally called wearable devices.

Let's evaluate

1. Which among the following is a Free operating system?

    1. Microsoft Windows   2. Apple Mac OS X
    3. GNU/Linux   4. Blackberry 10

2. Which among the following is absolutely correct?

    1. GNU is the kernel program in GNU/Linux system.
    2. GNU is the shell program in GNU/Linux system.
    3. Linux is the kernel program in GNU/Linux system.
    4. Linux is the shell program in GNU/Linux system.

3. Which of the following is the most correct statement?

    1. GNU program was written by Richard Stallman.
    2. Linux program was written by Linus Torvalds.
    3. GNU program was written by Ken Thompson.
    4. GNU program was written by Dennis Ritchie.

Extended activities

1. Operating systems and various application software are installed in computers, smart phones, smart watches etc. However, is it essential to install an operating system and its applications in a computer which is connected to the Internet? If the operating system and all these applications are installed in an Internet server, won't it be sufficient for the users to use them? Such operating systems are known as cloud operating systems. Given below are some cloud operating systems. Find out more about them and list them down. For more information, visit https://en.wikipedia.org/wiki/Cloud_computing.

    • Chrome OS

    • EasyPC

    • ....

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Let's know about cyber safety

There is absolutely no need to mention the advantages of Internet and Social Networking sites. We have embraced their potential for communication, entertainment and information seeking.

But over the period, it is seen that a lot of teenagers are being harassed and fall prey to the abuse of Social Media. You can easily prevent yourself from being a victim, if you take a few precautionary measures while being online.

⇥ How Social Networking sites can be dangerous

- Sharing and posting too much of personal information such as phone number, address, location, photos, etc., can be misused.
- Trusting strangers believing their profile to be true can be dangerous, as they may not be the same as stated.
- Snapshots of chats, photos, videos, etc., are saved and will be used for blackmailing and threatening.
- Being cyber bullied by posting negative, derogatory comments, posts, photos, etc. to tarnish one's image.
- Lots of predators and adult criminals are lurking online to trap children.

⇥ Tips for safe Social Networking

- Always keep your personal information strictly personal.
- Customize your privacy settings so that others can see only the basic information.
- Just know about and manage your friends. Don't trust all the online friends.
- Let your friends know that you are uncomfortable if they post something inappropriate about you.
- Do not publish any information that reveals your identity.
- Always use strong passwords. Don't share them with others.
- Never share your pictures, photographs, email accounts, etc., with anyone.
- Keep your personal messages strictly personal. Once posted they are published for ever.
- If ever threatened or bullied seek the help of parents/teachers.

Helpline Phone Numbers

Crime Stopper: 1090
Cyber Cell (Tvm): 9497975998
Control Room: 100
Child Helpline: 1098 / 1517