IMAGE PROCESSING AND MULTIMEDIA SYSTEMS

UNIT OUTCOME

Students will be able to:

- ❖ understand the concept of image processing;
- ❖ differentiate image file format;
- ❖ recognize the function of image processing software;
- ❖ recognize interface layout of image processing software;
- ❖ edit images properly using image processing software.

5.1   OVERVIEW OF IMAGE PROCESSING

In this sub-unit, we will have an overview of image processing.

● Overview of Image Processing

An image can be the one generated by you on the computer screen or available using a scanner/camera. The field of *digital image processing* refers to processing digital images by means of a digital computer. A digital image is composed of a finite number of elements, each of which has a particular location and value. *Pixel* is the term used most widely to denote the elements of a digital image. Figure 5.1 shows a digital image in Photoshop CS5.

Fig. 5.1: A digital image

The fundamental steps in digital image processing are:

Image acquisition: It could be as simple as being given an image that is already in digital form. Generally, the image acquisition stage involves preprocessing, such as scaling.

Image enhancement: It is the process of manipulating an image so that the result is more suitable than the original for a specific application.

Image restoration: It is an area that also deals with improving the appearance of an image.

Color image processing: It is an area that has been gaining in importance because of the significant increase in the use of digital images over the Internet.

Wavelets: These are the foundation for representing images in various degrees of resolution.

Compression: It deals with techniques for reducing the storage required for saving an image, or the bandwidth required to transmit it.

Morphological processing: It deals with the tools for extracting image components that are useful in the representation and description of shape.

Segmentation: These are the procedures which partition an image into its constituent parts or objects.

Representation and description: These almost always follow the output of a segmentation stage, which usually is raw pixel data, constituting either the boundary of a region (*i.e.*, the set of pixels separating one image region from another) or all the points in the region itself.

Recognition: It is the process that assigns a label (*e.g.*, "My Image") to an object based on its descriptors.

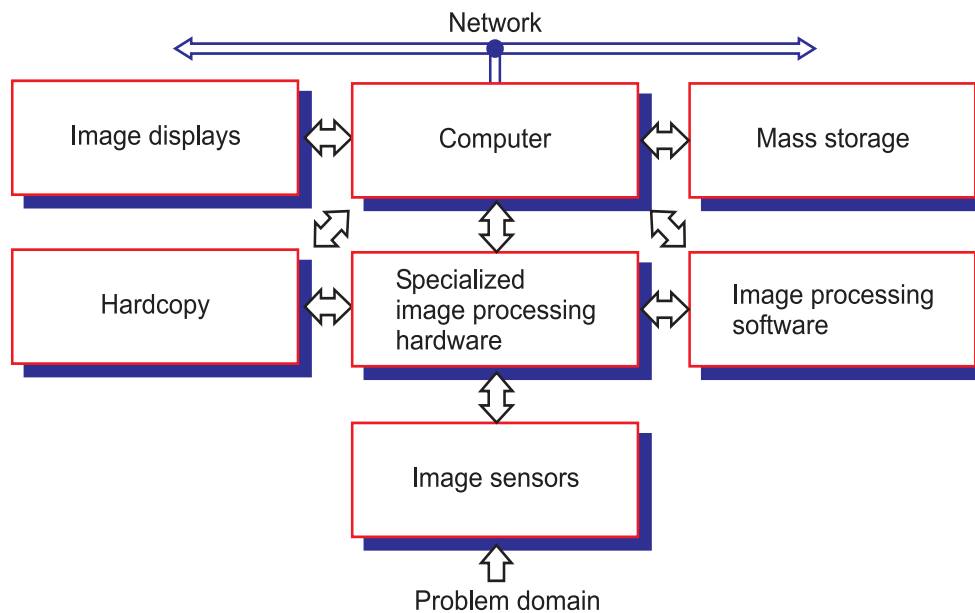Figure 5.2 shows the basic components of a typical general-purpose system used for digital image processing.

Fig. 5.2: Components of a general-purpose image processing system

• Definition of Image Processing

Image processing is the set of computational techniques for analyzing, enhancing, compressing, and reconstructing images, generally with a digital computer.

Its main components are importing, in which an image is captured through scanner or digital camera; analysis and manipulation of the image, accomplished using various specialized software applications; and output (*e.g.*, to a printer or monitor).

Image processing is used in many areas, for example, astronomy, medicine, industrial robotics, and remote sensing by satellites.

• Image Processing Software

Image processing software is used for organizing, retouching, and editing images that have been saved on CDs and DVDs, scanned in, or transferred directly from the camera to PC. This software allows you to edit and crop out unwanted "strangers", remove the red-eye effect, or put one person's head on another person's body. Some of the useful image processing software programs are:

(*i*) Dxo Optics Pro   (*ii*)   MS-Paint   (*iii*) Capture One Pro

(*iv*) Photo Styler   (*v*)   Bibble   (*vi*)   Photo Explosion

(*vii*) Picture Windows Pro (*viii*) Picture Project   (*ix*)   Photo Editor

(*x*) Photoshop

Photoshop is a popular image processing software that provides numerous tools for editing an image.

> Image processing software allows you to retouch photographs, adjust the contrast and the colors and add special effects, such as shadows.

• Image File Format

The still images in print and multimedia programs are in digital format. There are two basic forms of computer graphics: *bitmaps* and *vector graphics*.

Bitmap images are formed from a matrix of pixels with different colors. These images have large file sizes that are determined by the image's dimensions in *pixels* and *color depth*. To reduce this problem, some graphic formats such as GIF and JPEG store the images in compressed format.

Vector graphics are really just a set of graphical objects such as lines, rectangles, ellipses, arcs, or curves, called *primitives* in the image. Draw programs, also called *vector graphics programs*, are a format widely used by computer-aided programs to create detailed engineering and design drawings, and have become popular in multimedia for 3D animation.

Some of the image file formats are:

(*i*) BMP (Bitmap)   (*ii*) GIF (Graphics Interchange Format)

(*iii*) JPEG (Joint Picture Experts Group) (*iv*) PNG (Portable Network Graphic)

(*v*) TIFF (Tagged Image File Format)   (*vi*) WMF (Windows Metafile)

ACTIVITY 5.1

LIST AND EXPLAIN THE DIFFERENT FILE FORMATS GIF, JPEG, BMP AND TIFF.

In small groups, the students will list and explain the different file formats GIF, JPEG, BMP and TIFF.

File Formats

We can use a variety of file formats in image processing and multimedia systems. Some of the more common formats are listed and explained below:

1. **GIF (Graphics Interchange Format):** It is pronounced "jif", supports upto 256 colours (8 bits per pixel). It is a compressed format that keeps file sizes smaller. This format is widely used on the Web since files can be sent faster than many other formats and groups of them can be animated. Files in this format have the extension *.gif*.

2. **JPEG (Joint Picture Experts Group):** It is pronounced "jay peg". It supports 16.7 million colors (24 bits per pixel). The images are in compressed format so file sizes are even smaller than GIF files. Files in this format have the extension *.jpg*.

3. **BMP (Bitmap):** It is a standard uncompressed format for Microsoft Windows and IBM OS/2. Stores files as a series of dots, or pixels. It has a maximum of 16.7 million colors (24 bits per pixel) and files have the extension *.bmp*.

4. **TIFF (Tagged Image File Format):** It stores compressed files with a flexible number of bits per pixel. It provides the highest quality but has large file sizes. This format supports 16.7 million colors (24 bits per pixel) and files have the extension *.tif*.

5.2   BASICS OF IMAGE PROCESSING

In this sub-unit, we will learn the basics of image processing:

● Getting Started

As mentioned earlier, to process images you need an image processing software. Adobe Photoshop is an image processing software which was developed in 1990. It is a leading product in its category, which is used by all serious photographers and publishers. Since, 2003 Photoshop CS and new releases integrate a complete suite of products to create and edit images or for designing and authoring a website. Think about something artistic and graphical, it can do it!

Among all advantages of Photoshop, it has the ability to manipulate layers, masks, contact sheets and blue prints, to merge them, separate images or align them with accuracy to enhance faint details or suppress artifacts.

Here, we will use *Adobe Photoshop CS5* software for image processing.

● Opening and Setting up a New document

To open Photoshop,

Click *Start → All Programs → Adobe Photoshop CS5*

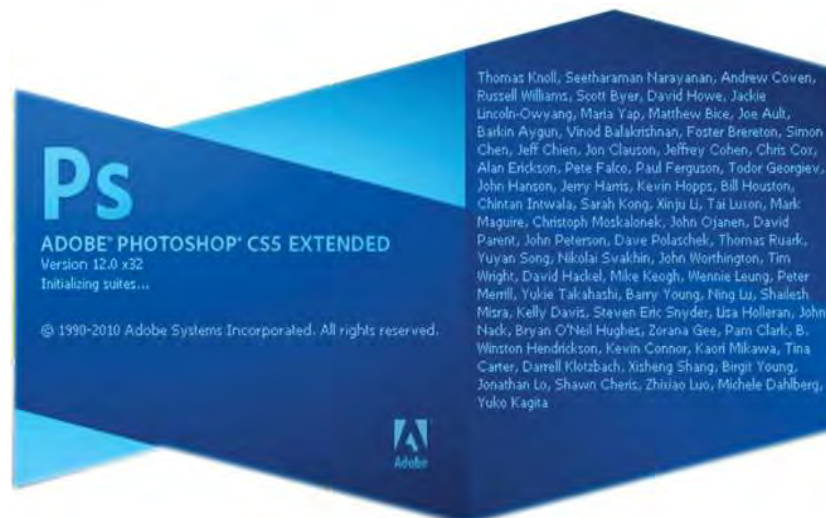The Photoshop opening screen will appear (see Fig. 5.3).

Fig. 5.3: Photoshop opening screen

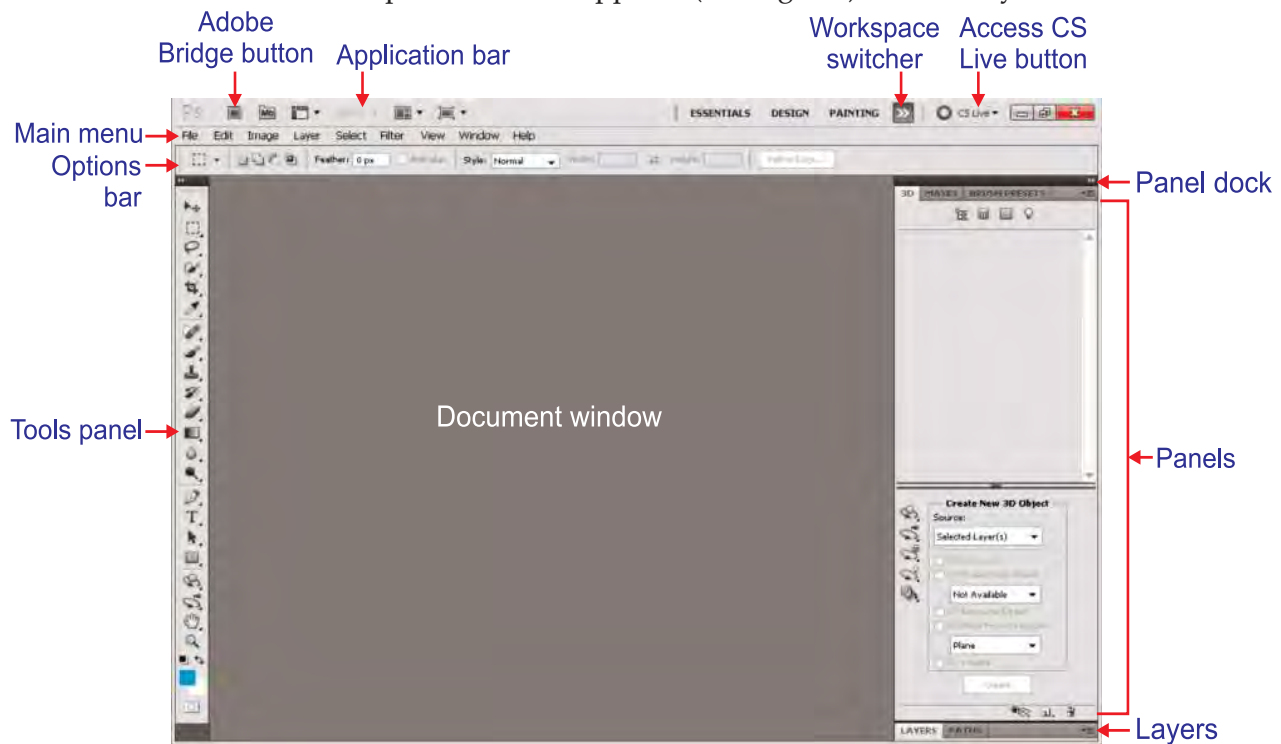In few moments the Photoshop main screen appears (see Fig. 5.4) on which you will have to work.

Fig. 5.4: Photoshop CS5 main screen

The main screen displays on top a menu and an option bar (which parameters adapt dynamically according to your selection), a toolbox at left (including tools like selector, lasso, magic wand, paint bucker, eraser, brush, blur, clone, move, text, colors, etc, themselves often subdivided in several tools), and palettes at right (last actions, layers, colors, styles, masks, etc). In-between lies the image window. Most tools are associated to a shortcut key (lasso with L-key, etc).

Useful Tip

You can enlarge the right-hand panes by dragging the separator bar between the panes and the main content area.

To open and setup a new document, perform the following steps:

1. Click *File → New*. It will open the *New* dialog box (see Fig. 5.5).
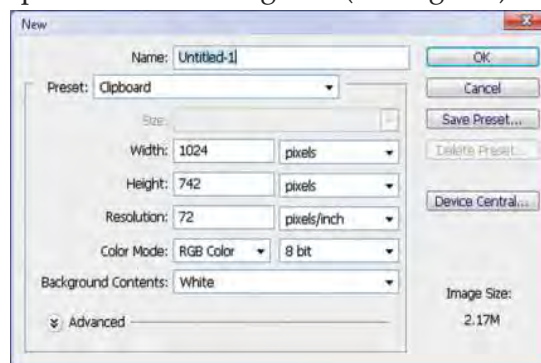

Fig. 5.5: New dialog box

2. Choose a desired option from *Preset* such as Default Photoshop Size, U.S Paper Photo, and Web etc. Set the Size of Preset as your need. Here, we have selected *Photo* Preset and set the Photo *Size* to "Landscape 5" × 7" (see Fig. 5.6).
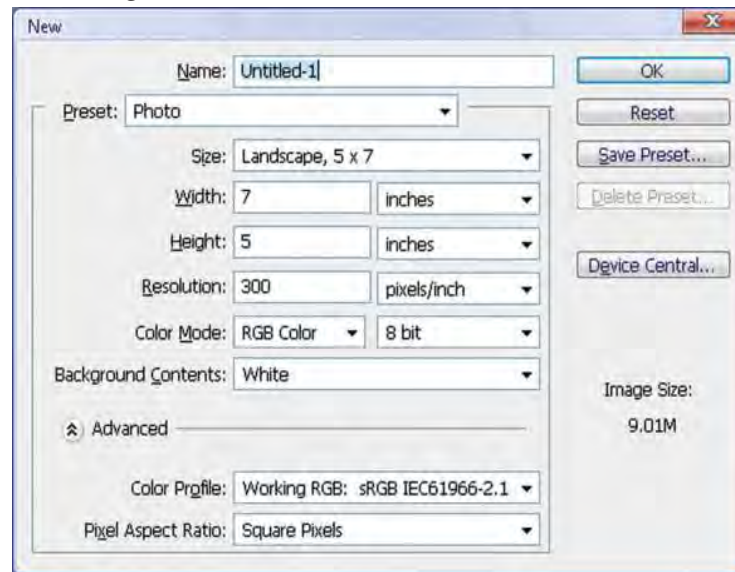

Fig. 5.6: Selecting Preset and Background contents

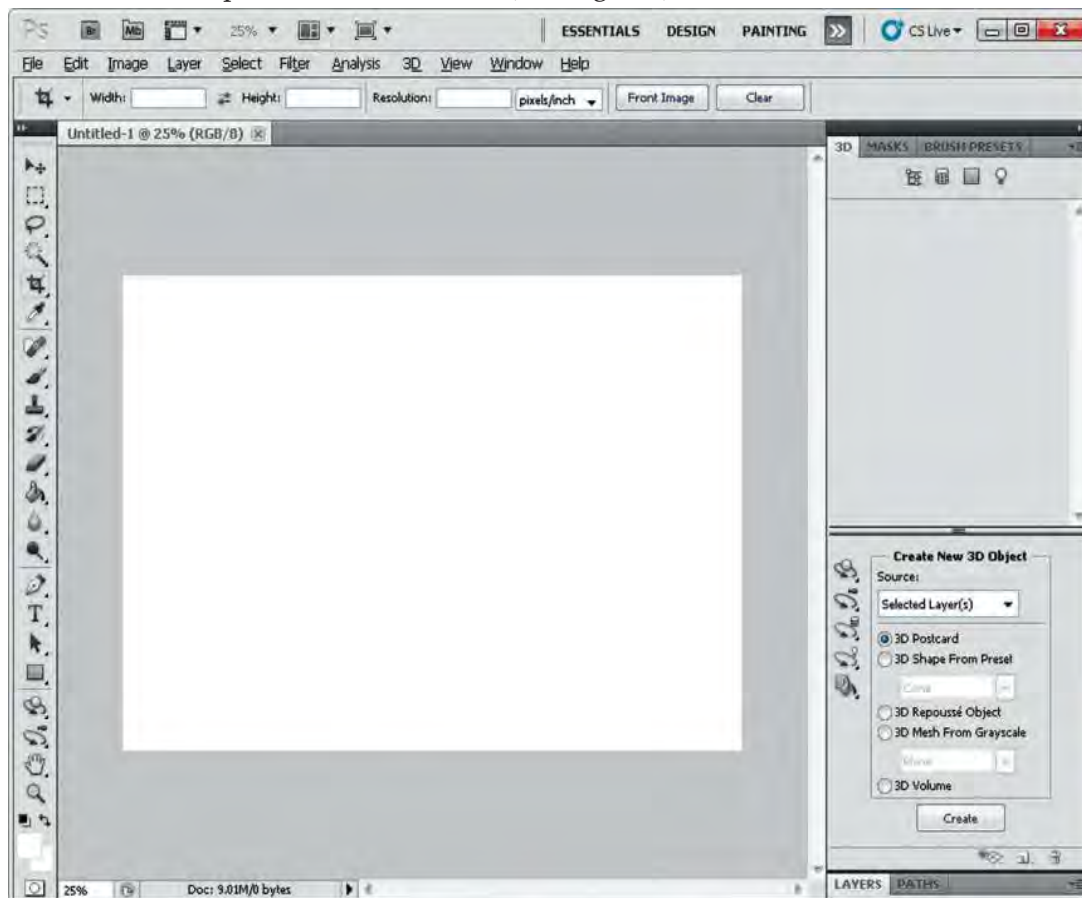3. Click *OK*. It will setup the new document (see Fig. 5.7).

Fig. 5.7: A newly setup document

Now, you can add graphics and text in the document as per your need.

notes

1. You can manage files with Adobe Bridge. If you are asked whether to start Bridge at login, then click *No*.
2. Adobe Community Help is constantly updated. Download it, if you want.

● Creating an Image

Let us discuss some drawing tools before creating an image:

Brush Tool: It is used for free hand drawing and is available in the toolbar (see Fig. 5.8).
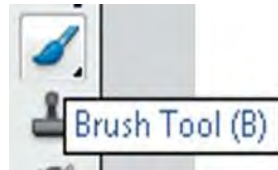

Fig. 5.8: Brush Tool

Horizontal Type Tool: It is used to enter the text in the image and is available in the toolbar (see Fig. 5.9).

Fig. 5.9: Horizontal Type Tool

Rectangle Tool: It is used to draw various shapes in image and is available in the toolbar (see Fig. 5.10).

Fig. 5.10: Rectangle Tool

To create an image, perform the following steps:

1. In the recently opened new document, click on the *Brush Tool*.

2. Hold the mouse button on the work area and make the text or drawing you want.

3. Click on the *Horizontal Type Tool* button from the tool bar (see Fig. 5.11) and make a text box on the image area. Enter the shape text you want.

Fig. 5.11: Text toolbar

You can also format the text like changing the font, Alignment of text; Size and Color of text from the text tool bar placed horizontally on the top of work area.

4. Click on the *Rectangle Tool* button in the shape toolbar (see Fig. 5.12).

Fig. 5.12: Shape toolbar

Draw the shape you want. You can also select other shapes like Round, Rectangle, Ellipse, Line and Custom shape from the toolbar on top of work area.

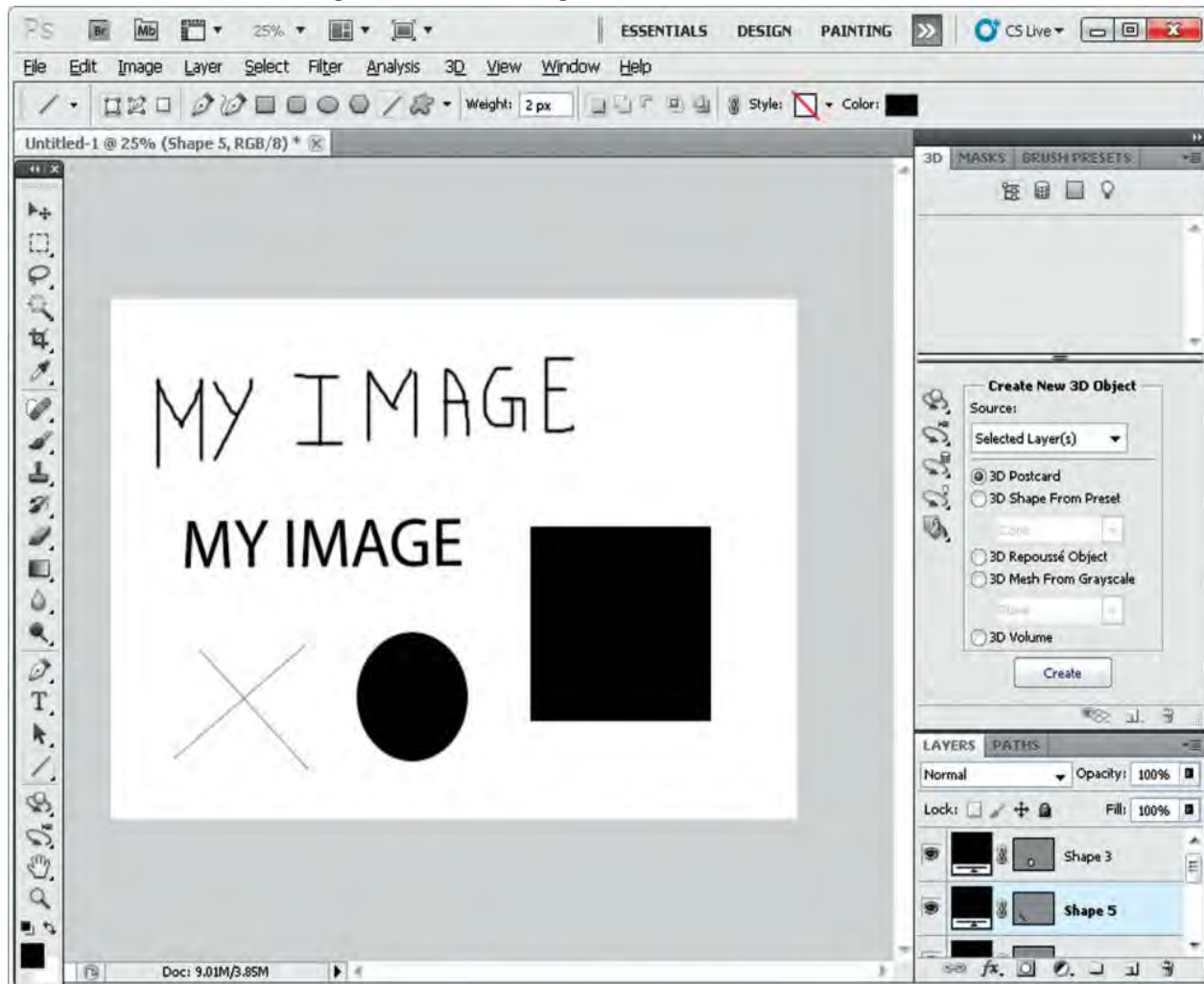We have drawn the image as shown in Fig. 5.13.

Fig. 5.13: A drawn image

● Saving Image Document

To save the image document, perform the following steps:

1. Click *File → Save*

   or

   Press *Ctrl + S*

   The *Save As* dialog box will appear.

2. Set the file type to image format such as .jpg, .bmp.

3. Type the file name and click on *Save* button (see Fig. 5.14).

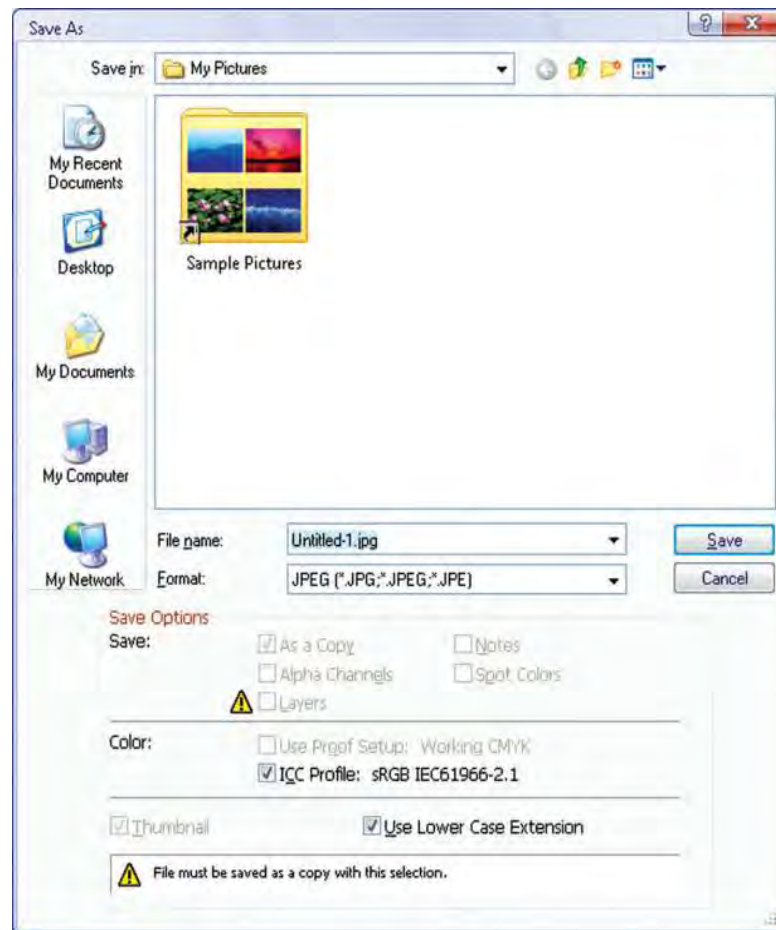**Fig. 5.14: Save as dialog box**

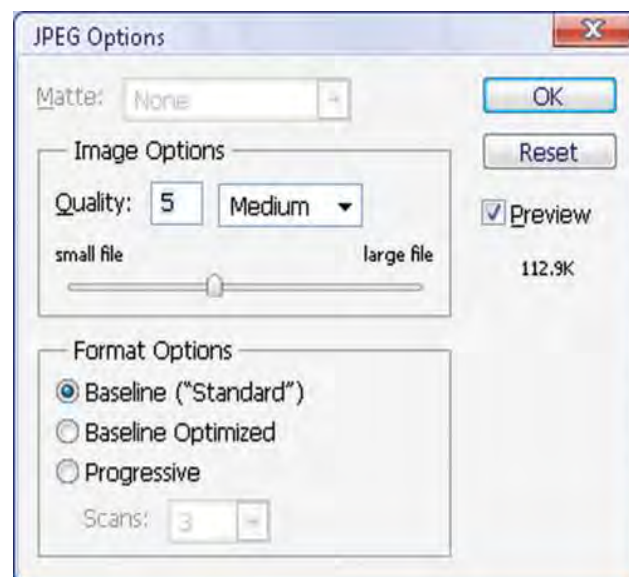4. It will open the *JPEG Options* dialog box. Set the *Quality* in *Image Options* and click *OK* (see Fig. 5.15).

Fig. 5.15: JPEG Options dialog box

The image file will be saved in the selected directory.

● Interface Layout

The Adobe Photoshop workspace includes the command menus at the top of your screen and a variety of tools and panels for editing and adding elements to your image. You can also add commands and filters to the menus by installing a third-party software known as *plug-in modules*.

Photoshop works with bitmapped, digitized images (that is, continuous-tone images that have been converted into a series of small squares, or picture elements, called *pixels*). You can also work with vector graphics, which are drawings, made of smooth lines that retain their crispness when scaled. You can create original artwork in Photoshop, and you can import images into the program from many sources, such as:

(*i*) Photographs from a digital camera

(*ii*) Commercial CDs of digital images

(*iii*) Scans of photographs, transparencies, negatives, graphics, or other documents

(*iv*) Captured video images

(*v*) Artwork created in drawing programs

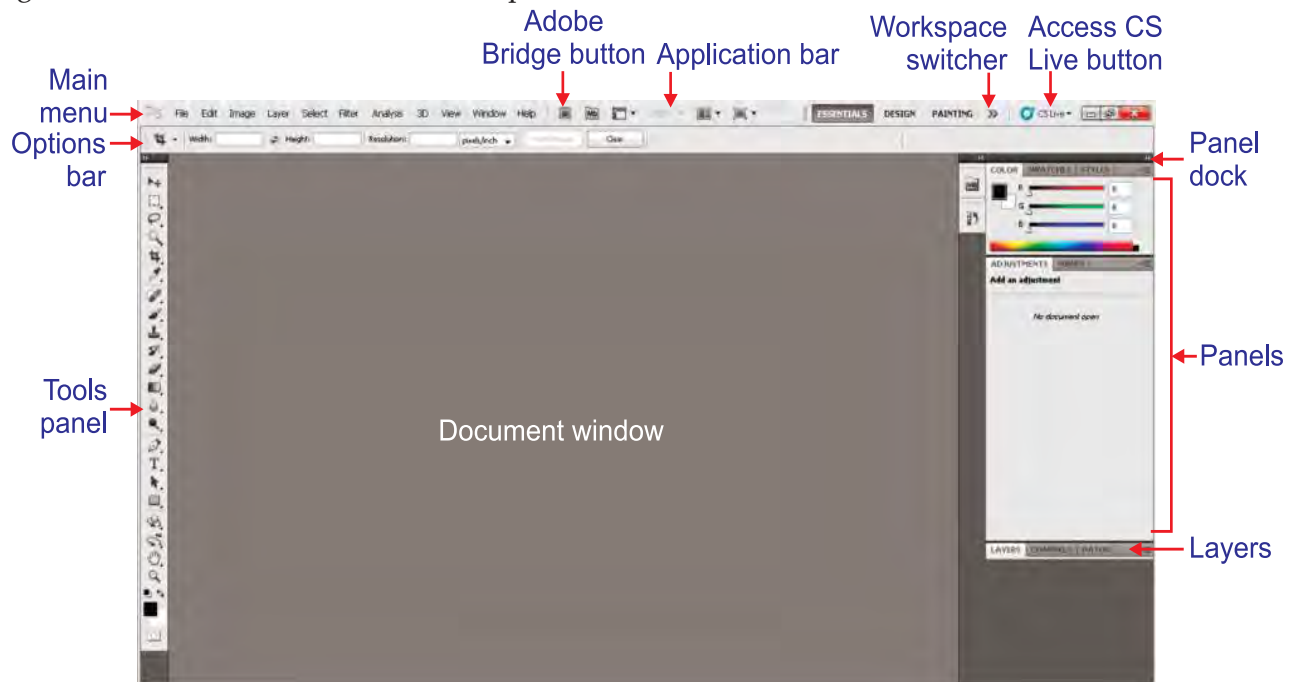Figure 5.16 shows the Adobe Photoshop CS5 interface.

Fig. 5.16: Adobe Photoshop CS5 interface

Application bar is displayed at the top of the screen. In the Application bar are the Photoshop application icon, the main menu (Windows only), application controls, View controls, the workspace switcher, and a button to access CS Live. Below the Application bar is the *Options bar*, with the Tools panel on the left, panels, and one or more document windows that are opened separately.

The *main menu* across the bottom of the Application bar organizes commands in individual menus.

The *Options bar* displays options for the currently selected tool.

The *document window* displays the file you are working on.

The *Tools panel* contains tools for creating and editing images, artwork, page elements, and so on. Related tools are grouped together.

Panels help you monitor and modify your work. An example is the Layers panel.

Certain panels are displayed by default, but you can add any panel by selecting it from the *Window* menu. Many panels have menus with panel-specific options. You can separate, group, stack, and dock panels into your preferred layout.

1. Drag the panel group by the title bar, rather than by the tab.
2. To demonstrate the live workspace feature, switch to My workspace and rearrange the panels. Then switch between Essentials and My workspace; switch to the Essentials workspace when finished.

● Inserting Image from a File or Other Device

We can insert image from a file or other devices such as scanner, webcam or digital camera.

To insert an image from file, perform the following steps:

1. Click *File → Open*.
2. The *Open* dialog box will appear. Select the image you want to open and click *Open* button (see Fig. 5.17).
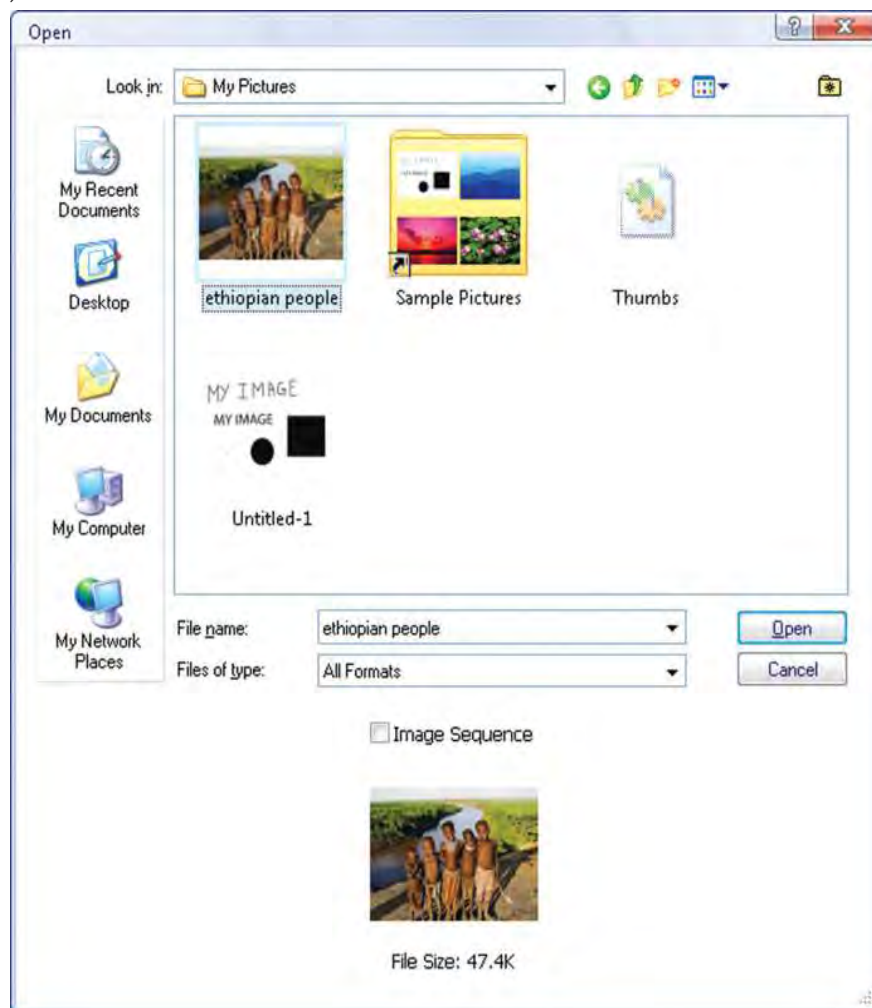

Fig. 5.17: Open dialog box

The selected image will be inserted in the document window (see Fig. 5.18).

Fig. 5.18: Inserted image from a file

For inserting image from other devices click *File → Import → Sony Webcam*. The picture will be inserted in the document window.

Useful Tip

Press Ctrl + + (Ctrl + plus sign) to zoom in and press Ctrl + – (Ctrl + minus sign) to zoom out.

5.3 BASIC IMAGE EDITING (CROPPING, RESIZING, CORRECTING, SHARPENING/SOFTENING)

In this sub-unit, we will learn basic image editing.

● Basic Image Editing

The basic image editing techniques are useful when working with digital scans of images. We can apply these basic techniques in a wide variety of image editing situations.

The basic image editing involves the following:

(i) Adjusting tonality, the black, grey and white *Levels* in an image.

(ii) Adjusting the range of colors within an image, its *Color Balance.*

(*iii*) *Cropping* an image, creating a new file containing only a portion of the original.

(*iv*) *Resizing* an image, creating a new file with different proportions than the original.

(*v*) *Saving* or *Undoing* changes you have made.

● Cropping

Cropping is the process of removing portions of an image to create focus or strengthen the composition. You can crop an image using the *Crop Tool* and the Crop command. You can also trim pixels using the Crop And Straighten and the Trim commands.

To crop an image, perform the following steps:

1. Open the image file you want to crop and click on the *Crop Tool* from Tools panel (see Fig. 5.19).

Fig. 5.19: Crop Tool

2. Click and drag the mouse button to make a crop box (see Fig. 5.20).

Fig. 5.20: Getting ready to crop an image

3. Press the *Enter* key to crop the image. The selected area of image will be cropped (see Fig. 5.21).

Fig. 5.21: A cropped image
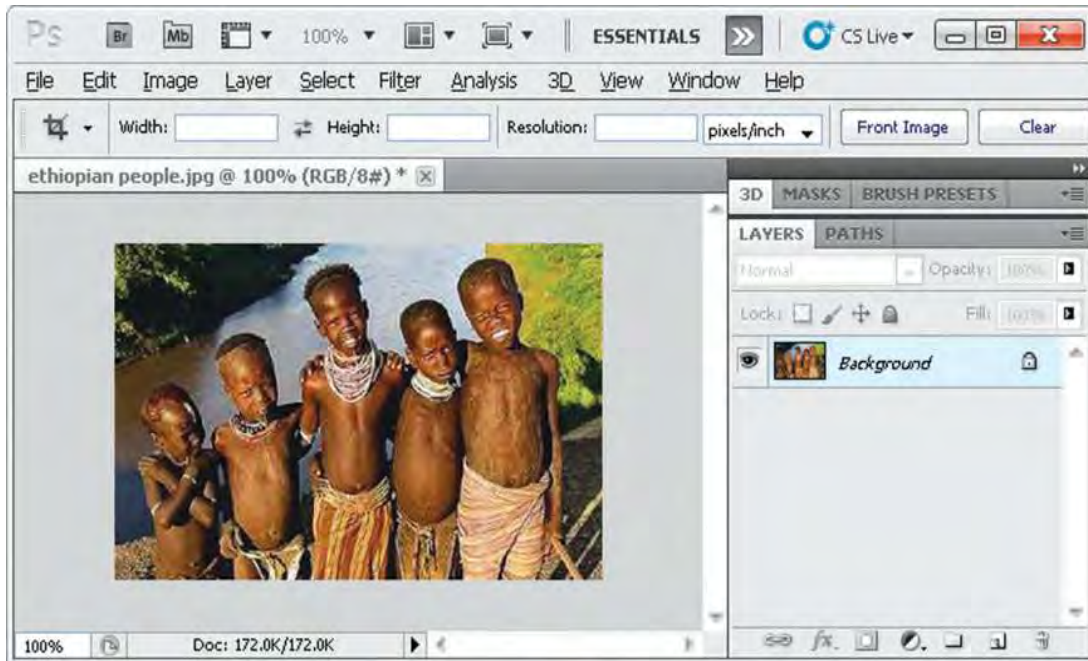
● Resizing

There will be times when you need to make an object bigger or smaller as you copy it from one picture to another.

To resize an image, perform the following steps:

1. Open the image file you want to resize.
2. Click *Image* from the *Menu bar* and then select *Image Size….*

It will open *Image Size* dialog box (see Fig. 5.22).
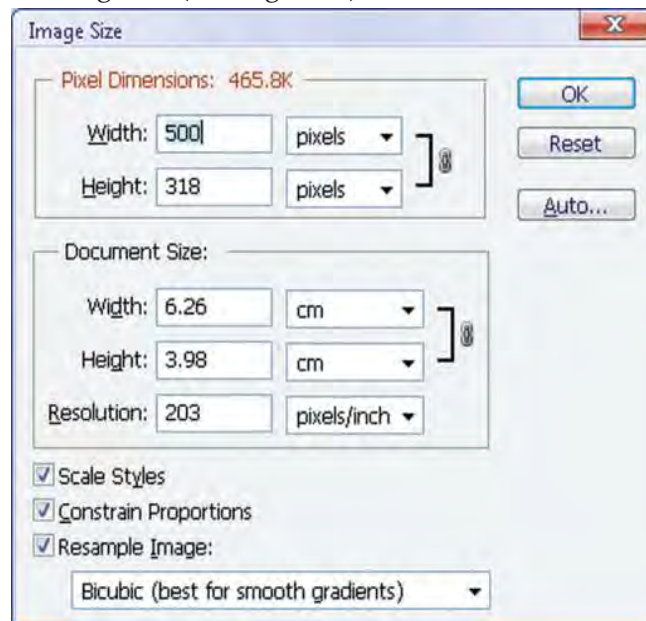
Fig. 5.22: Image Size dialog box

3. Set new image size using *Pixel Dimensions* or *Document Size* and click *OK.*

The image will resize as per your entered dimensions (see Fig. 5.23)
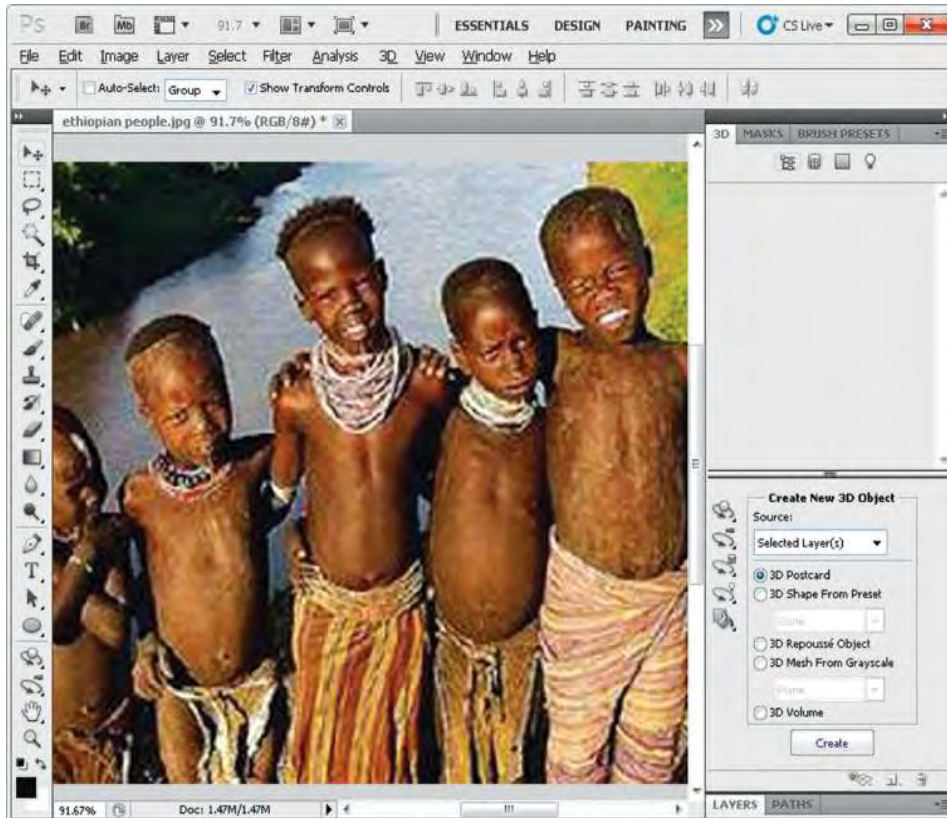
Fig. 5.23: A resized image

● Correcting

Adjusting proper intensity, contrast range, and color balance is very easy using image processing programs. Suppose, we want the color adjustment.

To adjust the color balance, perform the following steps:

1. Open the image file.
2. Click *Image* from the *Menu bar* → *Adjustments* → *Color Balance.*

It will open *Color Balance* dialog box (see Fig. 5.24).
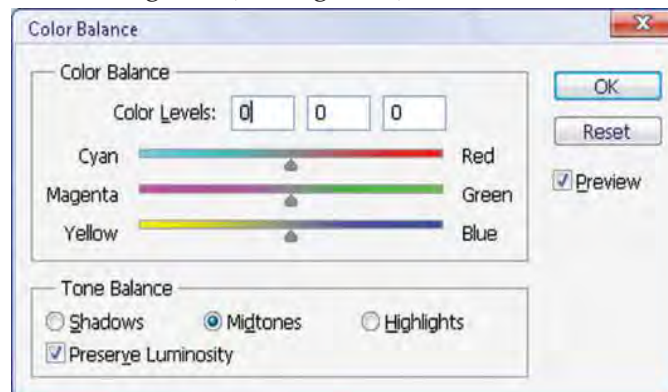
Fig. 5.24: Setting the color balance

3. Set your desired color balance and click *OK*.

After setting color balance the image will look as shown in Fig. 5.25.
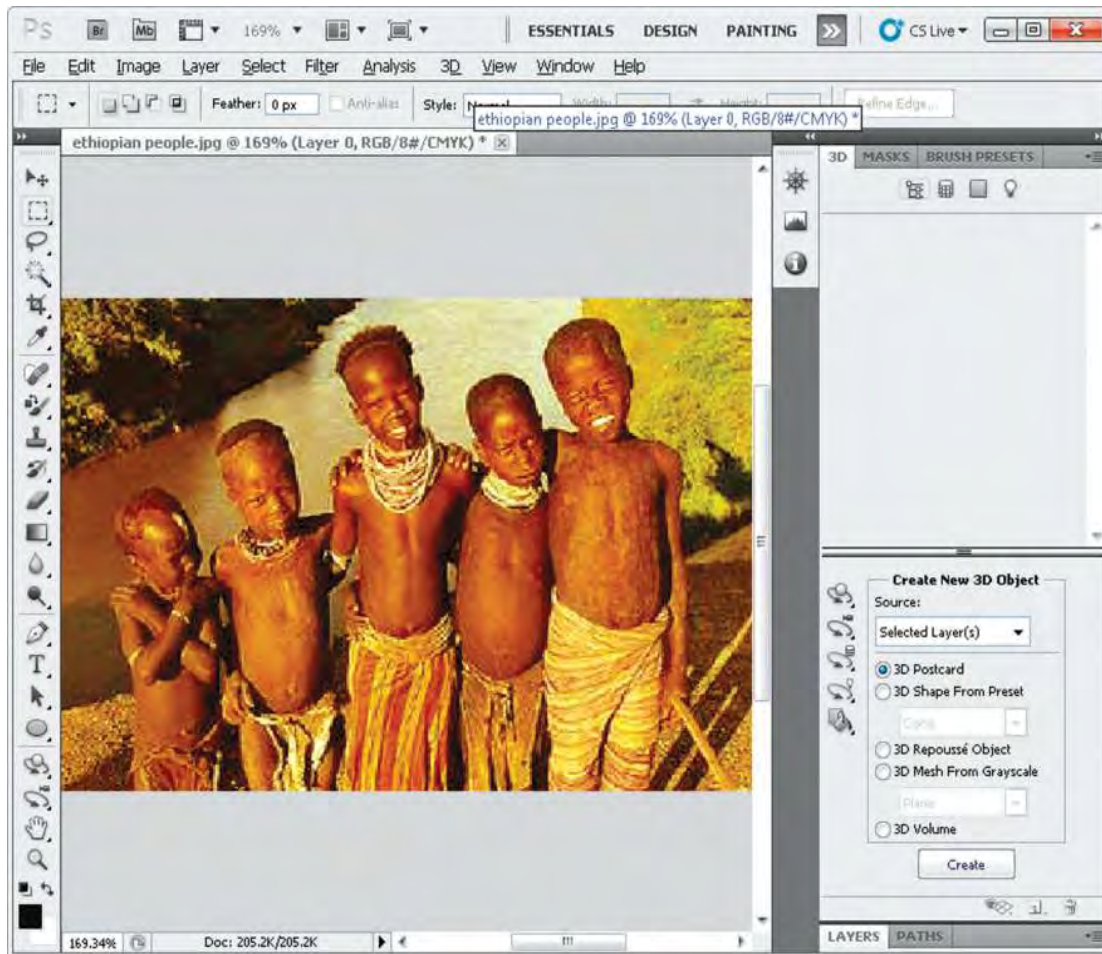
Fig. 5.25: Image after setting color balance

● Sharpening/Softening

Generally, a scanned image is not as sharp as you might wish. Sometimes you may get very sharp image. So, you may require sharpening/softening of the image. First of all open the document having the image to sharpen/soften.

For sharpening an image,

Click *Filter* from the *Menu bar → Sharpen*.

The options available are: *Sharpen, Sharpen Edges, Sharpen More, Smart Sharpen* and *Unsharp Masks*.

Select the desired option. The image will sharpen.

For softening an image,

Click *Filter* from the *Menu bar → Blur*.

The options available are: *Average, Blur, Blur More, Box Blur, Gaussian Blur, Lens Blur, Motion Blur, Radial Blur, Shape Blur, Smart Blur* and *Surface Blur*.

Select the desired option. The image will soften.

ACTIVITY 5.2

SCAN A PHOTOGRAPH AND EDIT IN THE DESIRED SIZE AND COLOR

Students will scan a photograph and edit in the desired size and color.

1. First of all, you will have to scan an image through a scanner.

   To scan an image in Photoshop,

   Click *File → Import → HP Scanner*.

   It will scan the image placed in the scanner and display it in document.

2. Now resize the image to a standard photo size (7x5) and adjust its color balance (see Fig. 5.26).
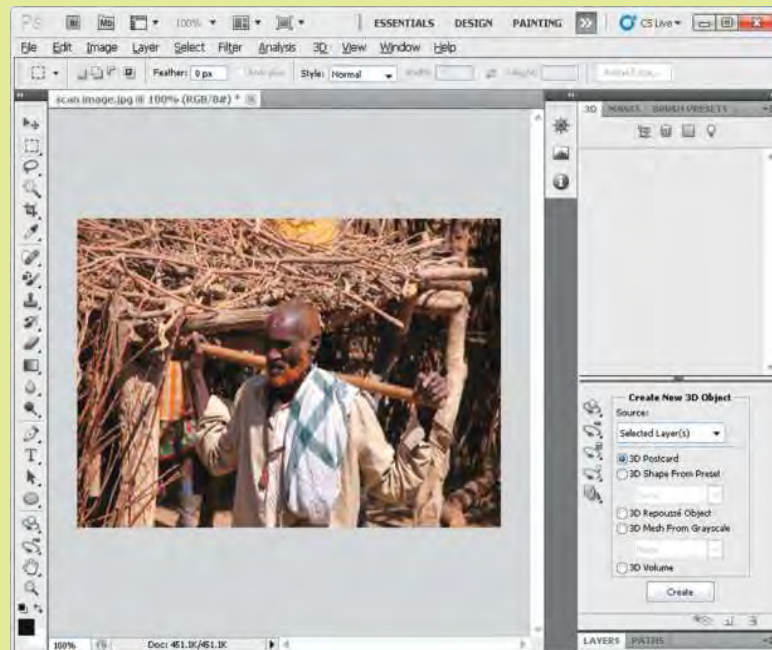
Fig. 5.26: Editing a scanned image

3. You can also balance the Selective Color.

   To balance the selective color,

   Click *Image → Adjustments → Selective Color....* The *Selective Color* dialog box opens (see Fig. 5.27).
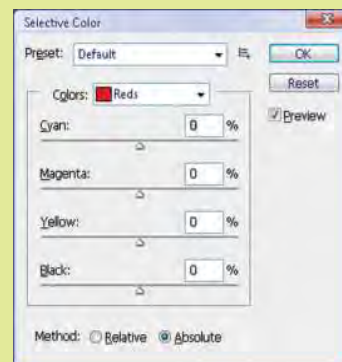
Fig. 5.27: Selective Color dialog box

Set the color balance and click *OK*.

After adjusting size and color, the scanned image will look as shown in Fig. 5.28.
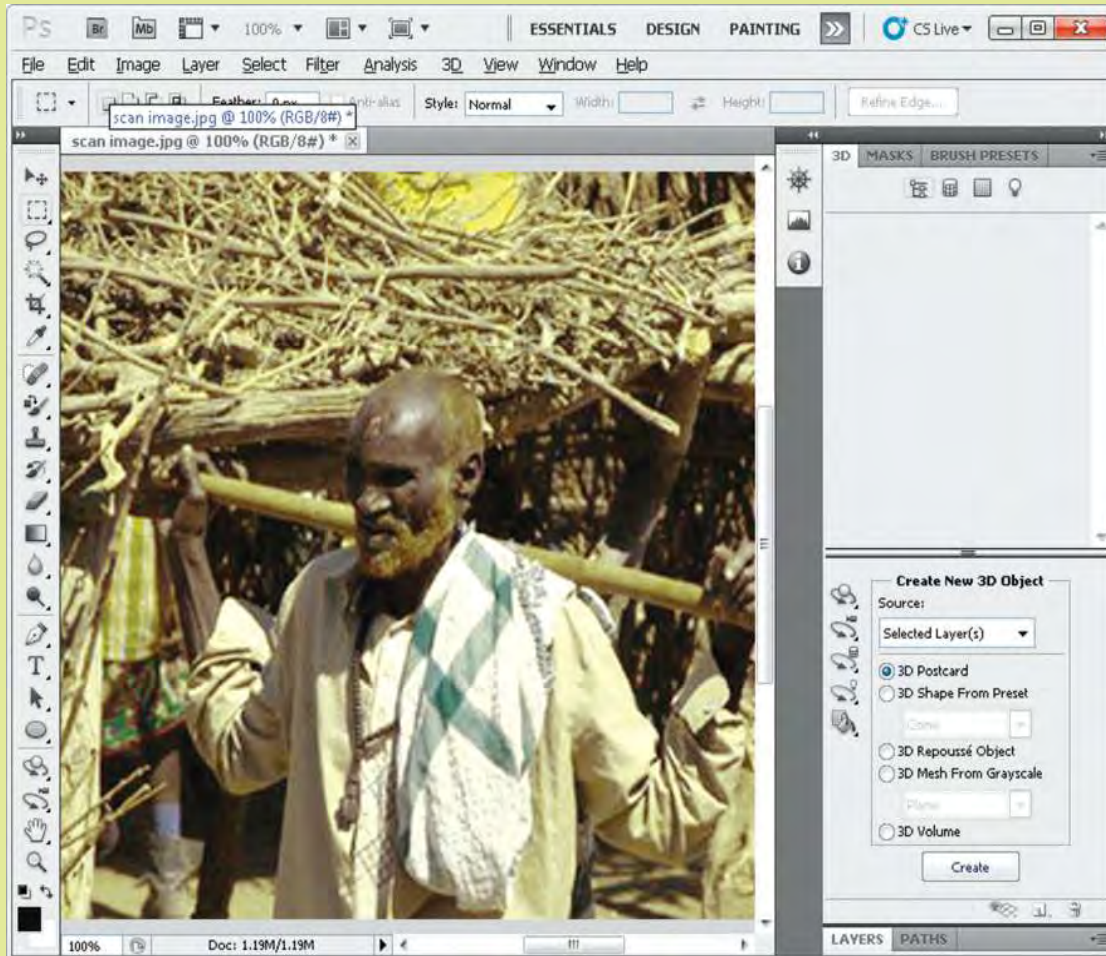
Fig. 5.28: Image after balancing the Selective Color

4. To balance the Brightness/Contrast,

   Click *Image → Adjustments → Brightness/Contrast.*

   The *Brightness/Contrast* dialog box opens.

   Set the Brightness/Contrast and click *OK* (see Fig. 5.29).
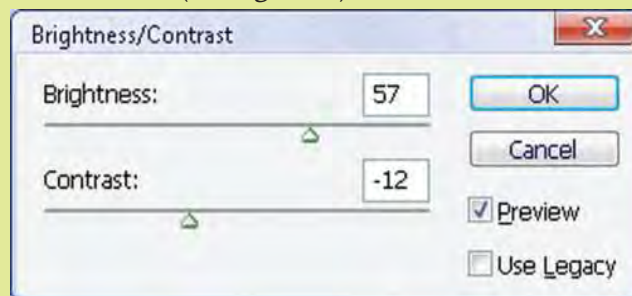
Fig. 5.29: Setting the Brightness/Contrast

The image will look as shown in Fig. 5.30.
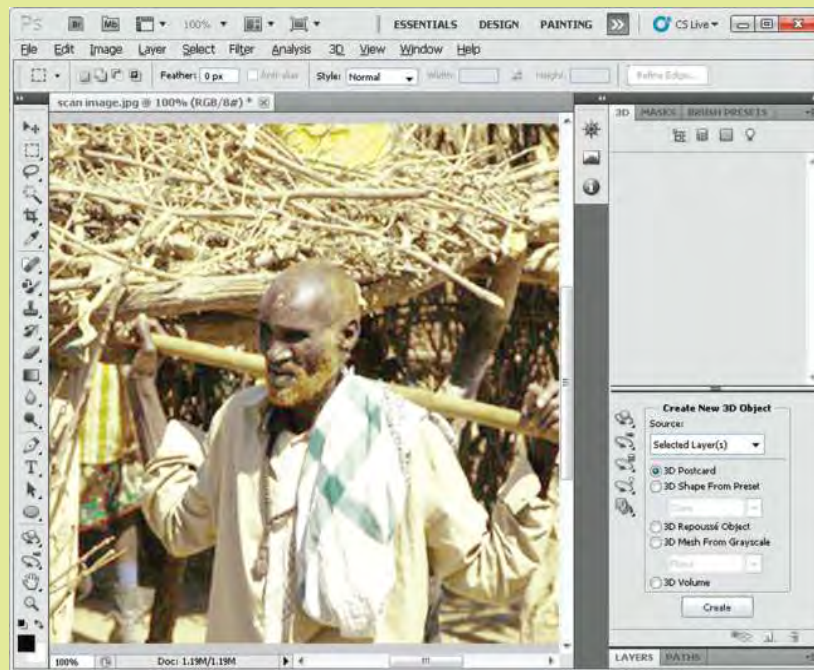
Fig. 5.30: Image after balancing Brightness/Contrast

KEY CONCEPTS

➢ Pixel is the term used most widely to denote the elements of a digital image.

➢ *Image processing* is the set of computational techniques for analyzing, enhancing, compressing, and reconstructing images, generally with a digital computer.

➢ Photoshop is a popular image processing software that provides numerous tools for editing an image.

➢ The basic image editing techniques are useful when working with digital scans of images. We can apply these basic techniques in a wide variety of image editing situations.

➢ Cropping is the process of removing portions of an image to create focus or strengthen the composition.

REVIEW QUESTIONS

Fill in the Blanks

1. The field of .... refers to processing digital images by means of a digital computer.

2. .... software is used for organizing, retouching, and editing images that have been saved on CDs and DVDs, scanned in, or transferred directly from the camera to PC.

3. .... is the process of removing portions of an image to create, focus or strengthen the composition.

4. .... is the process of making an object bigger or smaller.

State Whether True or False

1. Image enhancement is the process of manipulating an image so that the result is more suitable than the original for a specific application.

2. Adobe Photoshop is not a popular image processing software.

3. In Photoshop, Brush Tool is used for free hand drawing and is available in the toolbar.

4. We cannot resize an image using image processing software.

Multiple Choice Questions

1. Which of the following area(s) use image processing?
   (*a*) Astronomy   (*b*) Medicine   (*c*) Industrial robotics (*d*) All of these

2. Which of the following image processing software can be used to retouch photographs, adjust the contrast and the colors and add special effects, such as shadows?
   (*a*) Photoshop   (*b*) MS-Paint   (*c*) Photo Editor   (*d*) All of these

3. Which of the following is not an image file format?
   (*a*) GIF   (*b*) JPEG   (*c*) DOCX   (*d*) TIFF

4. Which of the following is/are free hand drawing tool(s) available in Adobe Photoshop CS5?
   (*a*) Brush Tool   (*b*) Horizontal Type Tool
   (*c*) Rectangle Tool   (*d*) All of these

Match the Following

Column A	Column B
1. Pixel	(*a*) Correcting
2. Basic image editing technique	(*b*) Basic term used most widely to denote the elements of a digital image
3. BMP	(*c*) An image processing software
4. Photo Styler	(*d*) An image file format

Answer the Following

1. Define image processing. List and explain different types of image file formats.

2. How will you open and setup a new document in Photoshop? Also give the steps to save an image document.

3. List and explain common interface layout of image processing software, *e.g.*, Photoshop.

4. How will you edit an image in a desired way?

Suggested Activities

1. Give a brief explanation of image processing.
2. Describe about image processing software and its function.
3. Demonstrate and explain the properties to be set in a document.
4. Set up a document like Page size and orientation, Resolution, Colour mode and Background content.
5. Edit image with cropping like Cropping with the crop tool, Cropping to a specific size, and Cropping with the marquee tool.
6. Resize image like Resizing to a specific size, Resizing Digital photo and Enlarging.
7. Correct image like Red Eye Removal, Hot Spot Removal, Adding Flash, and Colour Adjustment.
8. Scan your photograph and edit it in the desired size and colour.
   - *Resources*: Computer, Image Processing Software, Scanner, Digital Camera.

Field Trip

Organize a field trip to various business houses and publications around you to get useful information about Image Processing and Multimedia Systems being used currently and present it in the class.

GLOSSARY

A

Absolute Reference: Commonly used in spreadsheet applications, it is a formulated cell reference that will not adjust when used to calculate the sum of specific cells.

Address Book: In e-mail, list of regular contacts' addresses held in the e-mail software.

AI (Artificial Intelligence): It is the branch of computer science concerned with making computers behave like humans.

Animation: The display of a sequence of images in a computer program or on a Webpage to give the impression of movement.

Application Software: A program that is designed to perform specific tasks.

B

Backup: To copy files or data to a second source or media so as to safeguard it.

Binary: A basic numbering system consisting of 1s and 0s.

BIT (Binary DigIT): It is the smallest unit of processing of computerized data in terms of 1s or 0s.

Blog: (Slang term for a Weblog) A blog is a personal journal that can be accessed publicly and allow people to comment on the previously posted comments.

BMP (Bitmap): It is a standard uncompressed format for Microsoft Windows and IBM OS/2.

Browser: Software program that allows the user to find and read encoded information in a form suitable for display especially on World Wide Web.

Byte: A combination of 8 bits to represent computer data transfer or data storage measurement.

C

CD-ROM (Compact Disc Read-Only Memory): A durable and low cost circular optical storage device widely used to store large amounts of information.

Clipart or Clip Art: A collection of image files that can be embedded or inserted into Web pages, word-processed documents, PowerPoint presentations, etc.

Compiler: A type of system software that translates a source program usually written in a high level language into a machine language.

Computer Program: A set of instructions that the computer carries out to perform a given task.

Cropping: The process of removing portions of an image to create focus or strengthen the composition.

D

Data: A collection of raw facts and figures or a raw input which when processed or arranged makes meaningful output.

Database: A structured collection of data that can be used for a variety of purposes.

Defragmenter Utility Program: It finds all the scattered files on the hard disk and reorganizes them as contiguous files.

Desktop Publishing (DTP): Application software for laying out text, graphics and pictures in order to produce a professional-looking publication.

Digital Device: A device that works with discrete numbers or digits.

Disk Fragmentation: The scattering of portions of files about the disk in nonadjacent areas, thus greatly slowing access to the files.

Disk Cleanup Utility: It can search for and remove unnecessary files such as temporary files, or "temp files".

DSS (Decision Support System): A computer-based information system that provides a flexible tool for analysis and helps managers focus on the future.

DVD: Digital Versatile Disc or Digital Video Disc.

E

E-Commerce: Buying and selling or business transaction conducted on the Internet.

Electro Static Discharge (ESD): The release of static electricity when two objects come into contact.

EPROM: Erasable Programmable Read-Only Memory ("ee-prom"). It is a memory chip whose contents can be erased by a mechanism using ultraviolet light and reprogrammed for other purposes.

Ergonomics: The study of the interaction between people and machines.

ESS (Executive Support System): An easy-to-use Decision Support System made especially for top managers; it specifically supports strategic decision making.

F

Forms: Used to provide an easy to use interface for user to enter, view and modify data in a table.

Format Painter: Helps to copy the format that has been applied to text and apply it to another.

FTP (File Transfer Protocol): A software protocol for exchanging information between computers over a network.

G

GIF (Graphics Interchange Format): It is pronounced "jif", supports upto 256 colours (8 bits per pixel).

Gigabyte (GB): 2 to the 30th power (1,073,741,824) bytes. One gigabyte is equal to 1,024 megabytes.

GUI (Graphical User Interface): A program interface that takes advantage of the computer's graphics capabilities to make the program easier to use. Well-designed graphical user interfaces can free the user from learning complex command languages.

H

Hacker: A person who spends his/her time trying to gain access to information stored on other people's computers all around the world.

Hardcopy or Hard Copy: Printed output from a computer, as opposed to output on screen.

Home Page: The initial page of a site on the World Wide Web.

I

Icon: A picture or symbol to represent a command on a computer screen.

Image Processing: The set of computational techniques for analyzing, enhancing, compressing, and reconstructing images, generally with a digital computer.

Information: Meaningfully organized data.

Information System: A system that provides information to people in an organization.

Internet Explorer: A browser produced by the Microsoft Corporation and supplied together with the Windows operating system.

Internet: The Internet is a network of networks all of which use the same set of communications protocols.

ISP (Internet Service Provider): A company that provides access to the Internet.

J

JAVA: A high-level programming language developed by Sun Microsystems.

Joystick: A device that looks a bit like a gear lever in a car. This is connected to a computer and is used mainly for controlling the cursor in fast action games.

JPEG (Jont Picture Experts Group): It is pronounced "jay peg". It supports 16.7 million colors (24 bits per pixel).

K

Keyboard: An input device which is used to enter information which the computer displays or processes.

Kilobyte (KB): This is about a thousand bytes of space. In reality, it is two to the 10th power or 1,024 bytes.

L

LAN (Local Area Network): A network that links together computers and peripheral equipment within a limited area, such as a building or a group of buildings.

Login: To attach to a computer using the user's ID.

M

Megabyte (MB): About a million bytes of space. Actually it is 2 raised to the 20th power or 1,048,576 bytes of space.

Memory: Internal storage areas in the computer.

MIS (Management Information System): A computer-based information system that uses data recorded by Transaction Processing System as input into programs that produce routine reports as output.

MPEG (Motion Picture Experts Group): A format to make, view, and transfer both digital audio and digital video files.

MS-Access: Database application software, provided by Microsoft.

MS-Excel: Spreadsheet application software, provided by Microsoft.

MS-PowerPoint: Presentation software, provided by Microsoft.

MS-Word: Word processing application software, provided by Microsoft.

Multimedia: The integration of two or more types of information (text, images, audio, video, animation, etc.) in a single application.

N

Navigation: It is the process of finding the way, *i.e.*, navigating, around a series of menus within a computer program or finding the way around the World Wide Web by means of a browser.

Netiquette: The rules of etiquette that apply when communicating over computer networks, especially the Internet.

Node: In networks, a processing location. A node can be a computer or some other device, such as a printer.

O

OAS (Office Automation System): It combines various technologies to reduce the manual labour required in operating and efficient office environment.

Offline: Not connected to a computer or network of computers.

Online: Connected to a computer or network of computers, especially the World Wide Web.

P

PDF (Portable Document Format): A technology developed by Adobe and was designed to capture all of the elements of a printed document and place it in a single image file.

Pixel: The smallest element of an image that can be individually processed in a video display system.

Plotter: A computer output device that draws images on paper using a pen.

Podcasts: Online broadcasts that can be downloaded to portable devices.

Portal: A Webpage, website or service that acts as link or entrance to other websites on the Internet.

Printout: Anything produced on a printer after being processed by a computer program.

Primary Key: A set of one or more values in a database that uniquely identifies a record in a table.

Protocol: A set of rules governing the format of messages that are exchanged between computers.

Public Domain: Material that is copyright free, whose copyright has expired, or which cannot be copyrighted.

Q

Query: Used to retrieve information on a certain condition from a database.

R

RAM (Random Access Memory): A volatile computer memory available to the user for the temporary storage and manipulation of data.

Relative Reference: The default reference in a spreadsheet package.

Resolution: A measure of the number of pixels or small dots displayed on a computer display screen, printer or scanner.

ROM (Read-Only Memory): A memory in which program instructions, operating procedures, or other data are permanently stored, generally on electronic chips during manufacture, and that ordinarily cannot be changed by the user or when power is switched off.

S

Scanner: A device used to convert hard copy, *e.g.*, a printed page, photograph or photographic negative, into a form that can be stored on a computer.

Search Engines: A computer program that searches documents, especially on the World Wide Web, for a specified word or words and provides a list of documents in which they are found.

Sheet Tab: In spreadsheet applications, this refers to a tab at the bottom of a worksheet that acts as a means to identify or access different sheets within a workbook.

Slide Show: Used to display the slides in a desired sequence.

Software: The set of instructions used to direct the operation of a computer, as well a documentation giving instructions on how to use them.

Social Networking: The grouping of individuals or organizations into specific groups.

Source Code: Program code written in a high level language.

Source data: Data for which the chart is prepared.

Spreadsheet: A document which helps to organize data in rows and columns that intersect to form cells.

System: Collection of related components that interact to perform a task in order to accomplish a goal.

System Software: It is a set of master programs that keeps the computer system working.

T

Task bar: The bar that contains the start button and appears by default at the bottom of the desktop.

Terabyte (TB): 2 to the 40th power (1,099,511,627,776) bytes.

TIFF (Tagged Image File Format): It stores compressed files with a flexible number of bits per pixel.

TPS (Transaction Processing System): A computer-based information system that tracks the transactions needed to conduct business.

Toolbar: A row or rows of buttons on a display screen that are clicked on to select various functions in a software application or web browser.

Topology: In networking, this refers to the physical or logical arrangement of a network.

Trojan: A type of computer virus that is loaded into an unsuspecting users system via a host program such as a free game.

U

Uploading: It means transmitting data from a local computer to a remote computer, as from your PC to a website you are constructing.

UPS (Uninterruptible Power Supply): It is a backup power unit that provides continuous power when the normal power supply is interrupted.

URL (Uniform Resource Locator): A protocol for specifying addresses on the Internet. It is an address that identifies a particular file on the Internet, usually consisting of the protocol as http, followed by the domain name.

User-friendly: Mainly used to describe software. Software that is easy to use and offers guidance if the user does silly things is described as user-friendly.

Utility Program: A program developed to run within an Operating System to perform a specific service.

V

Videoconferencing or Video Conferencing: A computer-based communications system that allows a group of computer users at different locations to conduct a "virtual conference" in which the participants can see and hear one another as if they were in the same room participating in a real conference.

Virus: A program or piece of code that is loaded onto your computer without your knowledge and runs against your wishes.

W

W3C (World Wide Web Consortium): An international non-profit organization which acts as a resource centre for the World Wide Web, and is active in setting technical standards.

WAV: Stands for WAVeform sound format. Microsoft's format for encoding sound files.

Webcam: A camera connected to a computer and linking it to the Internet.

Web server: A computer that runs specific software to serve web pages to the Internet.

Web site: A connected group of pages on the World Wide Web regarded as a single entity, usually maintained by one person or organization and developed to a single topic or several closely related topics.

Wizard: A utility that provides guided sequence to perform complex task easily and quickly.

Wikis: Webpages that can be viewed and modified by anyone with a Web browser and Internet access.

Word Processor: Software that processes textual matter and creates organized documents.

Workstation: The computer attached to the Internet.

WWW (World Wide Web): Series of servers or computers that are interconnected through hypertext.

WYSIWYG: What You Say Is What You Get.

X

XML (eXtensible Markup Language): It is a markup language, not limited to Web documents.

Y

YouTube: A website to which we can upload our own video clips and view video clips uploaded by others: http://www.youtube.com.

Z

Zip Disks: The disks with a special high-quality magnetic coating that have a capacity of 100, 250 or 750 megabytes.