

# Chapter One

## INTRODUCTION

Disability is a form of impairment which could either be physical, sensory or cognitive which can cause human incapable resulting to different limitations.

### **1.1 Types of Disabilities:**

There are more than one type of disability including Visual Impairment , Hearing Impairment

Physical Impairment and Mental health disabilities.

### **1.2 Visual impairment:**

Visual impairment is the consequence of a functional loss of vision, rather than the eye disorder itself. Eye disorders which can lead to visual impairments can include retinal degeneration, albinism, cataracts, glaucoma, muscular problems that result in visual disturbances, corneal disorders, diabetic retinopathy, congenital disorders, and infection

### **1.3 Visual impairment Forms:**

There are three type of Visual impairment:

- Blindness.
- Low vision.
- Color blindness.

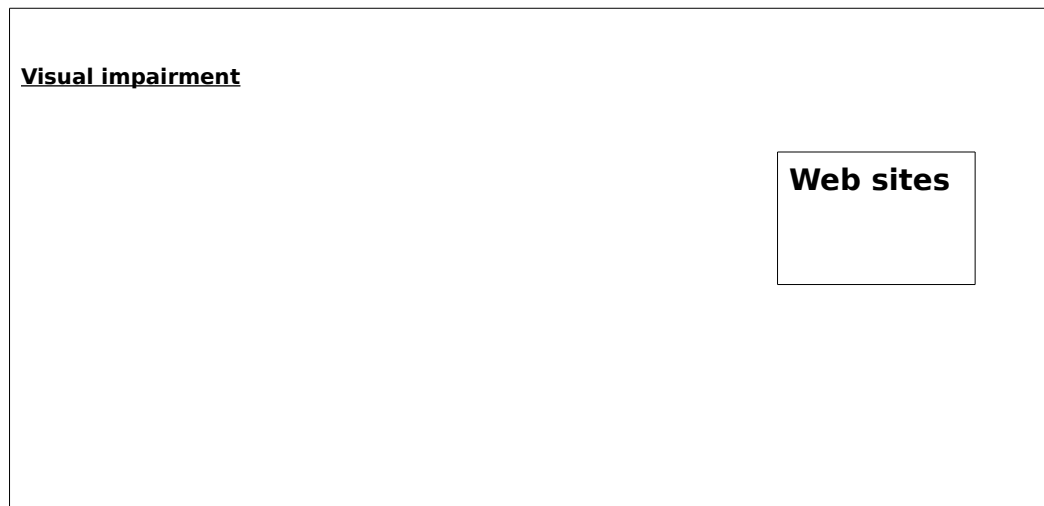
### **1.4 People with Visual impairment & web Technologies:**

The software (web application) is an increasingly important resource in many aspects of life: education, employment, government, commerce, health care, recreation, and more. It is essential that the Web be accessible in order to provide equal access and equal opportunity to people with disabilities. An accessible Web can also help people with Visual impairment more actively participate in society.

The Web offers the possibility of unprecedented access to information and interaction for many people with Visual impairment. That is, the accessibility barriers to print, audio, and visual media can be much more easily overcome through Web technologies.

### 1.5. **Scope of the research:**

Internet and mechanisms used by the visually impaired and the challenges they face disabled in browsing web sites when they use external software.



**Figure 1.1: Scope of the research**

### 1.6. **Problem Statement:**

- The inability of the People with blindness to use the Internet and the lack of vision for web sites GUI.
- Inability of the people with color blindness from using the Internet and lack of sensitivity to certain colors in web sites of GUI.

- Create mechanisms to measure the efficiency of software for the visually impaired, such as Microsoft narrator, NVIDIA, Screen Readers.

### **1.7 Questions:**

- How quickly does the web application respond for Visual disable?
- Are the external costly software (in price and training for use) is the best solution for the use of Web technology for visually impaired?
- Does the Software utilize resources efficiently?
- Does the Visual disable comprehend how to use the web easily?
- Can the Visual disable learn to use the software easily?
- Can the Visual disable use the software without much effort?

### **1.8. Objectives:**

1. Develop web application for people with visual impairment.
  - Web application for Users with blindness.
  - Web application for Users with color blindness.
  - Web application for Users with Low Vision.
2. Develop internet Browsers for people with Visual impairment.
3. Measuring the efficiency of the software used by the visually impaired and compare it with the alternative solutions.

### **1.9 Methodology and Tools:**

Blindness and Low vision Bowering & interact with internet via speech of the disabled and hearing to audio buttons, using software component (COM technologies TTS, SR and VC).

Comparison between the effectiveness of our solutions (web applications and Browsers) and other software for Visual disabilities in browsing web sites (Microsoft narrator, NVIDIA, Screen Readers) we are Using Software standard measured like ISO model.

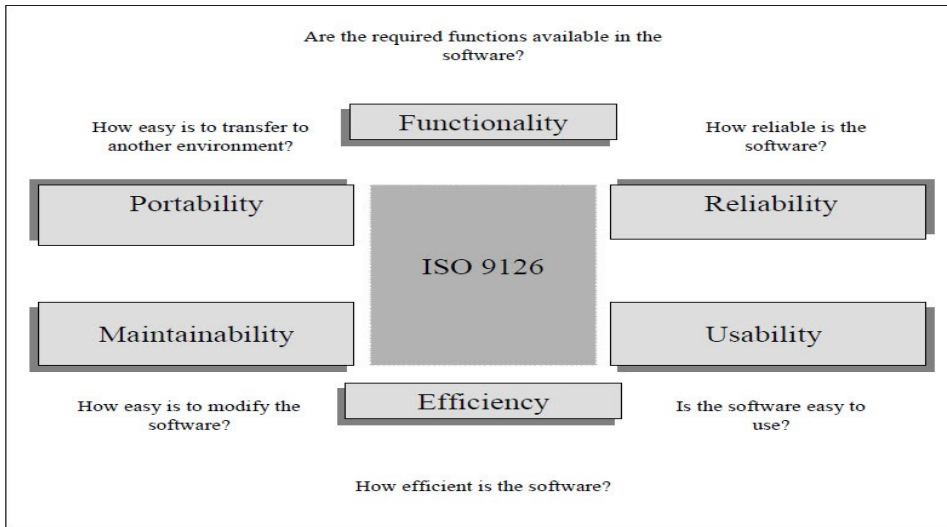
Development and evaluation of the software depends on the some of Internet users who are visually impaired.

#### **19.1 The ISO 9126 model:**

The International Organization for Standardization (ISO) was founded in 1946 in order to facilitate international trade, international coordination and unification of industrial standards by providing a single set of standards that would be recognized and respected (Praxiom Research Group). ISO 9126 was originally developed in 1991 to provide a framework for evaluating software

quality and then refined over a further ten year period (Abran et al. 2003). Many studies criticise ISO 9126 for not prescribing specific quality requirements, but instead defining a general framework for the evaluation of software quality (Valenti 2002). We believe that this is in fact one of its strengths as it is more adaptable and can be used across many systems, including Software systems. The original model defined six product characteristics Figure below.

These six characteristics are further subdivided into a number of sub



characteristics.

**Figure 1.2: (Source: ISO 1991)**

### **1.10. Chapters Organization:**

The remaining part of the dissertation is organized as follows. Chapter Two presents Literature Review and related Work. Chapter Three Methodology and Tools use to develop systems.

Chapter Four Designing Software Solutions & Product the Packages. Chapter Five Results and Discussions.

## **Chapter Two**

### **LITERAURE REVIEW & RELATED WORK**

#### **2.1. Literature Review:**

##### **2.1.1. The disability:**

Disability is a form of impairment which could either be physical, sensory or cognitive which can cause human incapable resulting to different limitations

##### **2.1.2. Types of Disabilities:**

There are more than one type of disability Visual Impairment, Hearing Impairment , Physical Impairment, Speech Impairment , Dyslexia Impairment , Autism and Mental health disabilities

##### **2.1.3 Visual impairment**

Visual impairment is the consequence of a functional loss of vision, rather than the eye disorder itself. Eye disorders which can lead to visual impairments can include retinal degeneration, albinism, cataracts, and glaucoma, muscular problems that result in visual disturbances, corneal disorders, diabetic retinopathy, congenital disorders and infection

##### **2.1.3.1. Visual impairment Forms:**

There are three type of Visual impairment: Blindness, Low vision and Color blindness.

##### **2.1.2.1.1. Blindness**

Blindness is the condition of lacking visual perception due to physiological or neurological factor

Various scales have been developed to describe the extent of vision loss and define blindness. Total blindness is the complete lack of form and visual light perception and is clinically recorded as NLP, an abbreviation for "no light perception." Blindness is frequently used to describe severe visual impairment with residual vision. Those described as having only light perception have no more sight than the ability to tell light from dark and the general direction of a light source.

##### **2.1.2.1.2. Low vision**

Low vision is a term that denotes a level of vision that is 20/70 or worse and cannot be fully corrected with conventional glasses. Low vision is not the same as blindness. Unlike a person who is blind, a person with low vision has some useful sight. However, low vision usually interferes with the performance of daily activities, such as reading or driving. A person with low vision may not recognize images at a distance or be able to differentiate colors of similar tones

### **2.1.2.1.3. Color blindness**

Color blindness is a lack of sensitivity to certain colors. Common forms of color blindness include difficulty distinguishing between red and green, or between yellow and blue. Sometimes color blindness results in the inability to perceive any color.

## **2.2. Related Work**

It is not difficult for a sighted person to imagine how being blind or visually impaired could make using a computer difficult. Just close your eyes and you will instantly experience that even processing text is impossible – or impossible without additional software at least. Now a range of software is available that can help to make using a computer an easier, more enjoyable and more productive experience for blind or visually impaired users.

### **2.1. Essential Software: A Screen Reader**

A **screen reader** is an essential piece of software for a blind or visually impaired person. Simply put, a screen reader transmits whatever text is displayed on the computer screen into a form that a visually impaired user can process (usually tactile, auditory or a combination of both). While the most basic screen readers will not help blind users navigate a computer, those with additional features can give people with visual impairment much more independence.

Whilst most screen readers work by having a synthetic voice that reads text aloud, others can also communicate data via a refreshable braille display. Such screen readers make use of crystals that can expand when exposed to particular voltage levels (thanks to a phenomenon known as the [Piezo Effect](#)), allowing visually impaired users to use their fingers to read the text that is displayed on screen. But while screen-reading software can be affordable, such hardware is usually very expensive.

## **2.2. Free Software Makes ‘Universal’ Access a Reality**

### **2.2.1. Software for people with Blindness:**

#### **2.2.1.1. NVDA (Windows)**

NVDA has been designed by a blind software engineering graduate, James Teh, for use with Windows computers. This free and open source screen reader has a synthetic voice that reads whatever the cursor hovers over, and can be used directly from a USB stick, making it ideal for students.

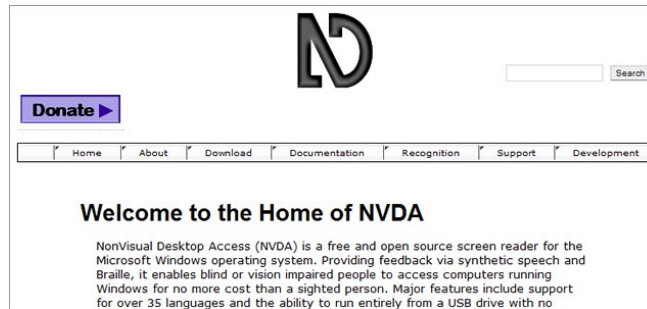


Figure 2.1 :**NVDA** (Windows)

#### 2.2.1.2. [Serotek System Access](#) (Windows)

This downloadable and complete screen reader can be used even outside your browser, thus making it one of the quickest ways of getting a screen reader up and running on your system. Serotek offers extended versions for a fee, although it is much cheaper than other screen readers.



Figure 2.2 :**Serotek System Access**

#### 2.2.1.3. [Apple Voiceover](#) (OS X): **Blindness**

Apple Voiceover includes options to magnify, keyboard control and verbal descriptions in English to describe what is happening on screen. It also reads aloud file content as well as web pages, E-mail messages and word processing files whilst providing a relatively accurate narrative of the user's workspace. This covers a wide array of keyboard commands that enable user navigation of the Mac OS X interface.

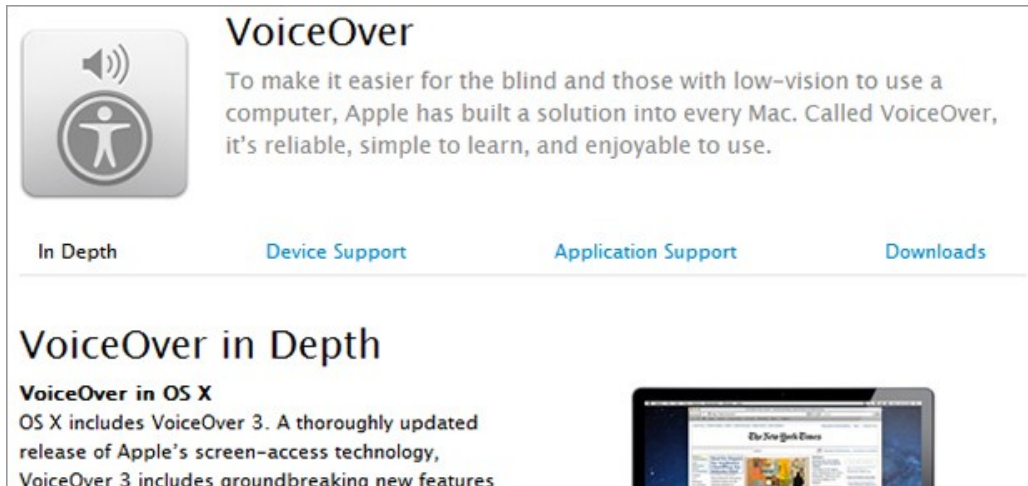


Figure 2.3 :Apple Voiceover

#### 2.2.1.4. [ORCA](#) (Linux) **Blindness**

ORCA is a Linux based screen reader which has also been evolving for the past number of years. Although it is not the sole Linux-based screen reader, ORCA is definitely the most popular. Recently it has been included with the Ubuntu installation CD, and with a couple of initial key presses it allows blind people to have audible interaction during the installation process.

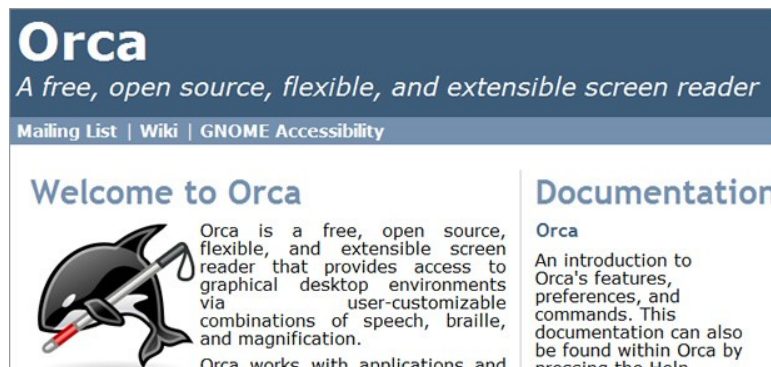


Figure 2.4 :ORCA



### 2.2.1.5. [Emacspeak](#) (Linux)

Emacspeak is a free speech interface and that allows visually impaired users to interact independently and efficiently with the computer. Its technology enables it to produce rich aural representation of electronic information. Emacspeak offers audible interface of the different aspects of the Internet such as browsing and messaging as well as local and remote information via a consistent and well-integrated user interface.



Figure 2.5 :[Emacspeak](#)

### 2.2.1.6. [ChromeVox](#) (Google Chrome) Blindness

Google ChromeVox is a Google Chrome screen reader extension for visually impaired users.

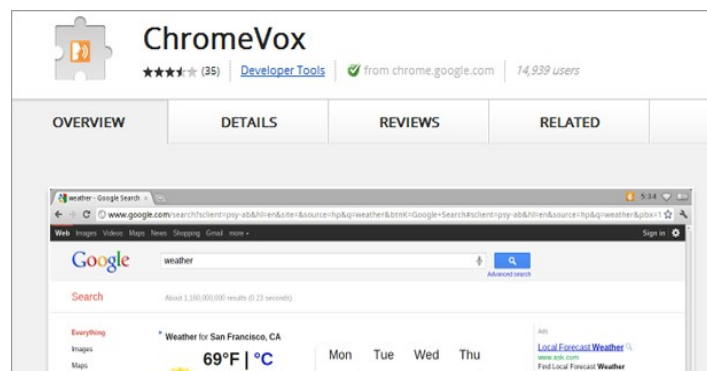


Figure 2.6 :[ChromeVox](#)

2.2.1.7. [Web Anywhere](#) (All OSs, Web browsers) **Blindness**

Web Anywhere is a web-based screen reader for the web. It requires no special software to be installed on the client machine and, therefore, enables blind people to access the web from any computer they happen to have access to that has a sound card



Figure 2.7 : [Web Anywhere](#)

Visual impairment software	Technical feasibility		Operational feasibility	
	learn to use the software easily	use the web easily	Supporting open and close O.S	use by all Visual impairment Forms
<b>NVDA</b>	✓	✗	✗	✓
<u>Serotek System Access</u>	✓	✗	✗	✗
<u>Web Anywhere</u>	✗	✓	✓	✗
Our software package	✓	✓	✓	✓

Table 2.1: Feasibility Study

## **2.2.2. Software for people with Color Blindness:**

### 2.2.2.1 [BRLTTY](#) (Linux) **Color blindness**

BRLTTY is a background process (daemon) which provides access to the Linux/Unix console (when in text mode) for a blind person using a refreshable braille display. It drives the braille display, and provides complete screen review functionality. Some speech capability has also been incorporated.

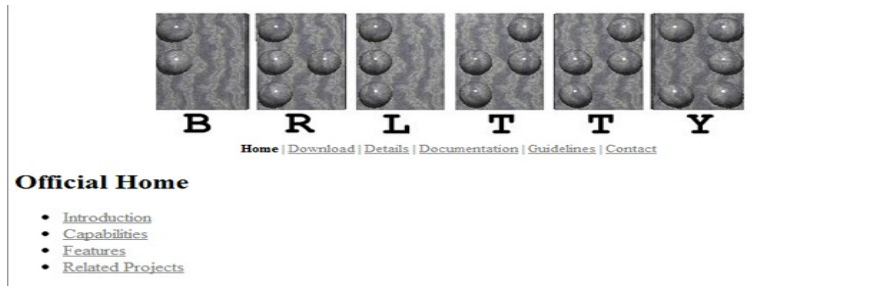


Figure 2.8 BRLTTY

### 2.2.10 ChromeVis (Google Chrome) **Color blindness**

Google ChromeVis is a Google Chrome extension that magnifies any selected text on a webpage. The magnified text is displayed inside of a separate lens and preserves the original page layout. Users can change both the lens text color and the lens background color.

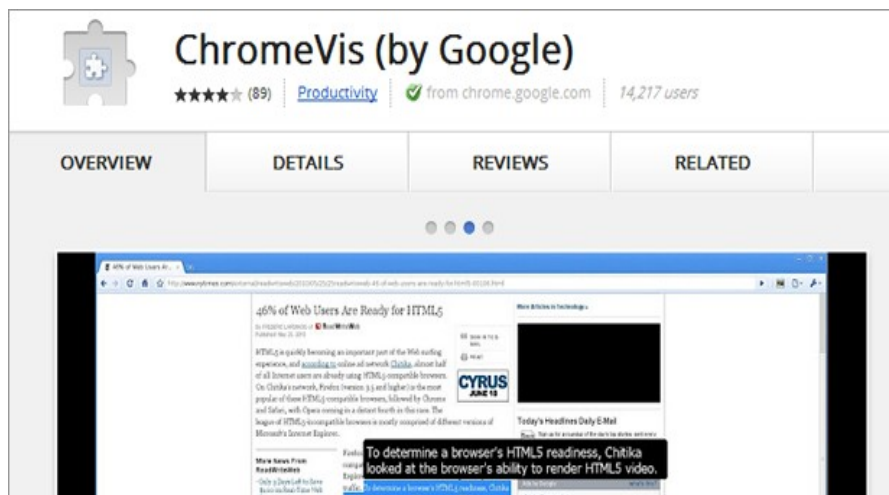


Figure 2.9 ChromeVis

### 2.2.3. Software for people with Low vision:

#### 2.2.3.1. Spoken Web (Internet Explorer) **Low vision**

Spoken-Web is a Web portal, managing a wide range of online data-intensive content like news updates, weather, travel and business articles for computer users who are blind or visually impaired. The site provides a simple, easy-to-use interface for navigating between the different sections and articles. Using the keyboard to navigate, a person who is blind or who has a visual impairment can hear the full range of an article content provided in a logical, clear, and understandable manner.



Figure 2.10 Spoken Web

Visual impairment software	Technical feasibility		Operational feasibility	
	learn to use the software easily	use the web easily	Supporting open and close <b>O.S</b>	use by all Visual impairment Forms
<u>BRLTTY</u>	✓	✗	✗	✗

<u>ChromeVis</u>	✓	✓	✗	✗
<u>Spoken Web</u>	✗	✓	✗	✗
Our software package	✓	✓	✓	✓

Table2-2: Feasibility study

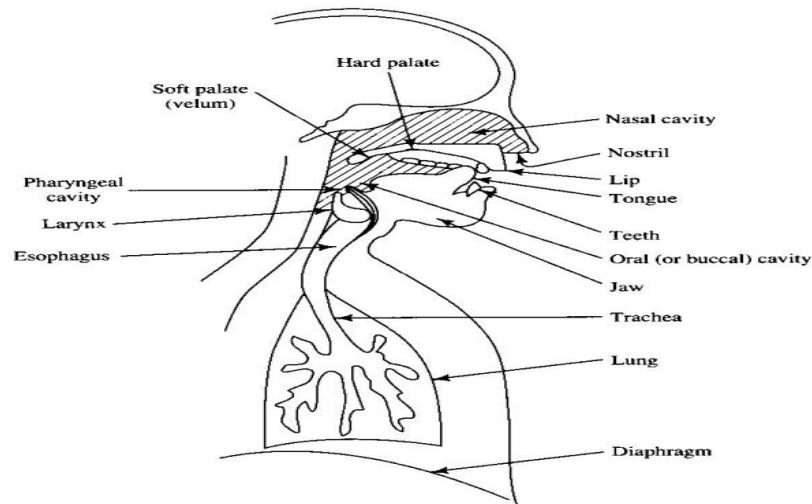
## Chapter Three

### METHODOLOGY AND TOOLS

Speech is the vocalized form of human communication. It is based upon the syntactic combination of lexical and names that are drawn from very large (usually >10,000 different words) vocabularies. Each spoken word is created out of the phonetic combination of a limited set of vowel and consonant speech sound units. These vocabularies, the syntax which structures them, and their set of speech sound units, differ creating the existence of many thousands of different types of mutually unintelligible human languages. Human speakers (polyglots) are often able to communicate in two or more of them.

#### **3.1.1 Speech mechanism:**

The human speech mechanism consist three main parts it the pharynx; Nose & mouth and any part from those include branch parts.



**Figure 3.1 Speech mechanism**

### **3.1.2. Processes of Speech Production:**

#### **3.1.2.1. Conceptual:**

The speaker must decide on the message to be conveyed. Very little is known about this stage. The end point is a stage at which the message itself has been decided but it has no linguistic form. It is also called the preverbal message or the message level of representation.

#### **3.1.2.2. Formulation:**

The speaker must convert their message into a linguistic form. This stage involves

- Lexical: Selecting the appropriate word
- Syntactic planning: Putting the words in the right order and adding grammatical elements

### **3.1.2.3 Articulation / Execution:**

The speaker must plan the motor movements needed to convey the message

Conceptual

Formulation

Articulation

Syntactic Planning

Lexical

**Figure 3.2 Speech Production**

### **3.2 Speech Recognition:**

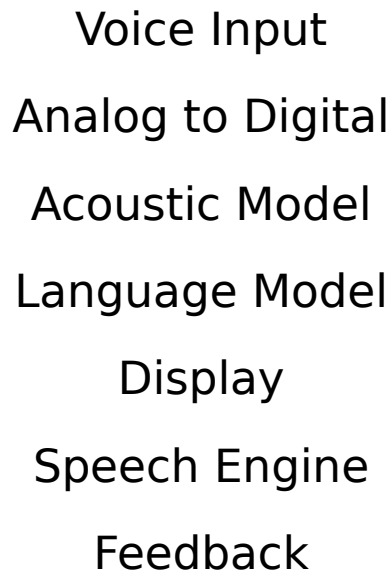
Speech recognition (also known as automatic speech recognition or computer speech recognition) converts spoken words to text. The term "voice recognition" is sometimes used to refer to recognition systems that must be trained to a particular speaker—as is the case for most desktop recognition software. Recognizing the speaker can simplify the task of translating speech.

Speech recognition is a broader solution which refers to technology that can recognize speech without being targeted at single speaker—such as a call center system that can recognize arbitrary voices

#### **3.2.1 .Speech Recognition work:**



Speech Recognition technique depend on Recognition, Training, Correction and Command/Control



**Figure 3.3 Speech Recognition**

### **3.3. Text-to-speech:**

Text-to-speech (TTS) is a type of speech synthesis application that is used to create a spoken sound version of the text in a computer document, such as a help file or a Web page. TTS can enable the reading of computer display information for the visually challenged person, or may simply be used to augment the reading of a text message. Current TTS applications include voice-enabled e-mail and spoken prompts in voice response systems. TTS is often used with voice recognition programs. There are numerous TTS products available, including Read Please 2000, Proverb Speech Unit, and Next Up Technology's Text Aloud. Lucent, Élan, and AT&T each have products called "Text-to-Speech."

In addition to TTS software, a number of vendors offer products involving hardware, including the Quick Link Pen from WizCom Technologies, a pen-shaped device that can scan and read words, the Road Runner from Ostrich Software, a handheld device that reads ASCII text; and Destalk TTS from Digital Equipment, an external hardware device that substitutes for a sound card and which includes an internal software device that works in conjunction with the PC's own sound card.

### **3.4. Hyperlink:**

Hyperlink (or link) is a reference to a document that the reader can directly follow, or that is followed automatically. A hyperlink points to a whole document or to a specific element within a document. Hypertext is text with hyperlinks, and is commonly viewed with a computer. A software system for viewing and creating hypertext is a hypertext system, and to create a hyperlink is to hyperlink (or simply to link). A user following hyperlinks is said to navigate or browse the hypertext

A hyperlink has an anchor, which is the location within a document from which the hyperlink can be followed; the document containing a hyperlink is known as its source document. The target of a hyperlink is the document, or location within a document, to which the hyperlink leads. Users can activate and follow the link when its anchor is shown, usually by touching or clicking on the anchor with a pointing device. Following the link has the effect of displaying its target, often with its context

In some hypertext, hyperlinks can be bidirectional: they can be followed in two directions, so both ends act as anchors and as targets. More complex arrangements exist, such as many-to-many links

The most common example of hypertext today is the World Wide Web: webpages contain hyperlinks to WebPages. Many words and terms in the text are hyperlinked to definitions of those terms. Hyperlinks are often used to implement reference mechanisms, such as tables of contents, footnotes, bibliographies, indexes and glossaries

The effect of following a hyperlink may vary with the hypertext system and sometimes on the link itself; for instance, on the World Wide Web, most hyperlinks cause the target document to replace the document being displayed, but some are marked to cause the target document to open in a new window. Another possibility is transclusion, for which the link target is a document fragment that replaces the link anchor within the source document. Not only persons browsing the document follow hyperlinks; they may also be followed automatically by programs. A program that traverses the hypertext, following each hyperlink and gathering all the retrieved documents is known as a Web spider or crawling

#### **3.5.1 Hypertext:**

Hypertext is a text which contains links to other texts.

### **3.5.1.1 Hypertext Navigation:**

Hypertext Navigation Traversal through pages of hypertext is therefore usually non-linear.

### **3.5.2. Hypermedia:**

Hypermedia is not constrained to be text-based. It can include other media, e.g., graphics, images, and especially the continuous media – sound and video.

### **3.6. User interface:**

A user interface in reference to computers refers to a system that allows humans to interact or carry out tasks either by using machines or computers. Therefore a user interface is everything the user hears, sees, touches etc.

### **3.7. Uniform Resource Locator (URL):**

Uniform Resource Locator (URL) is a Uniform Resource Identifier (URI) that specifies where an identified resource is available and the mechanism for retrieving it. In popular usage and in many technical documents and verbal discussions it is often incorrectly used as a synonym for URI. The best-known example of the use of URLs is for the addresses of web pages on the World Wide Web, such as <http://www.badawy.co.nf/>

### **3.8 Web browser**

Web browser or Internet browser is a software application for retrieving, presenting, and traversing information resources on the World Wide Web. An information resource is identified by a Uniform Resource Identifier (URI) and may be a web page, image, video, or other piece of content. Hyperlinks present in resources enable users to easily navigate their browsers to related resources.

The primary purpose of a web browser is to bring information resources to the user. This process begins when the user inputs a Uniform Resource Identifier (URI), for example <http://www.badawy.co.nf/>, into the browser. The prefix of the URI determines how the URI will be interpreted. The most commonly used kind of URI starts with http: and identifies a resource to be retrieved over the Hypertext Transfer Protocol (HTTP). Many browsers also support a variety of other prefixes, such as https: for HTTPS, ftp: for the File Transfer Protocol, and file: for local files. Prefixes that the web browser cannot directly handle are often handed off to another application entirely. For example, mailto: URIs is usually passed to the

user's default e-mail application and news: URIs is passed to the user's default newsgroup reader

In the case of http, https, file, and others, once the resource has been retrieved the web browser will display it. HTML is passed to the browser's layout engine to be transformed from markup to an interactive document. Aside from HTML, web browsers can generally display any kind of content that can be part of a web page. Most browsers can display images, audio, video, and XML files, and often have plug-ins to support Flash applications and Java applets. Upon encountering a file of an unsupported type or a file that is set up to be downloaded rather than displayed, the browser prompts the user to save the file to disk

Interactivity in a web page can also be supplied by JavaScript, which usually does not require a plug-in. JavaScript can be used along with other technologies to allow "live" interaction with the web page's server via Ajax

Information resources may contain hyperlinks to other information resources. Each link contains the URI of a resource to go to. When a link is clicked, the browser navigates to the resource indicated by the link's target URI, and the process of bringing content to the user begins again

### **3.9 Web browser engine:**

A web browser engine, (sometimes called layout engine or rendering engine), is a software component that takes marked up content (such as HTML, XML, image files, etc.) and formatting information (such as CSS, XSL, etc.) and displays the formatted content on the screen. It "paints" on the content area of a window, which is displayed on a monitor or a printer. A web browser engine is typically embedded in web browsers, e-mail clients, on-line help systems or other applications that require the displaying (and editing) of web content

### **3.10 Web browsers User interface:**

Most major web browsers have these user interface elements in common:

- *Back* and *forward* buttons to go back to the previous resource and forward again.
- A history list, showing resources previously visited in a list (typically, the list is not visible all the time and has to be summoned)
- A *refresh* or *reload* button to reload the current resource.
- A *stop* button to cancel loading the resource. In some browsers, the stop button is merged with the reload button.
- A *home* button to return to the user's home page
- An address bar to input the Uniform Resource Identifier (URI) of the desired resource and display it.
- A search bar to input terms into a search engine
- A status bar to display progress in loading the resource and also the URI of links when the cursor hovers over them, and page zooming capability.

Major browsers also possess incremental find features to search within a web page.