Chapter 1

Introduction

1.1 Description

Dyslexia is a specific reading disability in word recognition, spelling and decoding. Students with dyslexia require special adjustments to the text and text environment to be able to read better. Software that support dyslexic students in reading are minimal. This discourages such students from using the computer.

1.2 Problem Formulation

Smart Reader is an application we plan to design to help students having reading disabilities read online articles and text files without any difficulty. Traditional text presentation requires physical interaction like zooming and scrolling while reading. Another glitch with traditional text presentation is that there is a need for squeezing a lot of information into a small area. The text is presented as smaller pages that fit the screen or as a long page which implies that the user has to scroll, thereby increasing the physical interaction with the device.

1.3 Motivation

There is a need to identify user-interface requirements for readability for students with dyslexia. The requirements are proper font style, font size, font color, background color and spacing. This is in line with results from several interviews conducted among educators in Dyslexia Titiwangsa Centre. The results showed that dyslexic students were able to read better and easier when using built-in user-interface requirements which motivated them to learn more and more through this software.

1.4 Proposed Solution

Our objective is to make a software that accepts the file the dyslexic person wants to read and display it in readable format for them. Every word can be shown slowly letter by letter or every sentence could be shown word by word according to their convenience, instead of the entire word or sentence being displayed at once. This will enable them to grasp and read properly, at their own pace. In this application the file containing text is streamed in a horizontal fashion. It allows users to set a standard speed whilst reading their documents. Thus users do not need to move their eyes from left to right and can instead focus on one particular point while the words stream from right to left. Users can gradually increase their reading speed once they get accustomed to the current speed. This application can also be used by old people who have problems in focusing and others whose minds get diverted easily.

1.5 Scope

This application is mainly aimed at any user who would wish to improve his comprehension skills. Being able to read fast and understand all the same is of utmost essence for students appearing for competitive examinations like CAT, GRE, and TOEFL etc. Candidates appearing for competitive exams would benefit greatly from the application. Also, it can be noted that more and more users are moving to reading books, articles on their hand held devices. The application can be used by voracious readers who prefer e-book readers over physical bound books. This helps them to refrain from carrying large bulky books and magazines and be able to read at their convenience. This application also focuses on users with reading disabilities and focusing problems.

CHAPTER 2

Review of Literature

The issue of identifying reading difficulties and disabilities in English language learners (ELLs) is a complex one. It is an area that draws on the diverse disciplines of first- and second-language acquisition, literacy, English language learning, and reading, including differences and disabilities research.

Specific LDs are intended to be a subcategory of all disabilities, which include, among others, autism, deafness, blindness, emotional disturbance, hearing impairments, language impairments, mental retardation, and visual impairments. Of course, any of these conditions are likely to lead to difficulties in learning.

The 1988 LD definition by the National Joint Committee on Learning Disabilities[1] (Hammill, 1990) provides more details regarding a view of an LD as a discrepant and exclusionary disorder from normal expectations of learning and achievement. It states:

"*Learning disabilities is a general term that refers to a heterogeneous group of disorders manifested by significant difficulties in the acquisition and use of listening, speaking, reading, writing, reasoning or mathematical abilities. These disorders are intrinsic to the individual, presumed to be due to central nervous system dysfunction, and may occur across the life span. Problems with self-regulatory behaviors, social perception, and 12 social interaction may exist with learning disabilities but do not by themselves constitute a learning disability. Although learning disabilities may occur concomitantly with other handicapping conditions (for example, sensory impairment, mental retardation, serious emotional disturbance) or with extrinsic influences (such as cultural differences, insufficient or inappropriate instruction), they are not a result of those conditions or influences.(p. 77)*"

This definition has led to identification techniques founded in discrepancies between aptitude and achievement, under the side conditions that no other likely, comorbid causes are known. Thus, individuals with other disability conditions or cultural differences or who were from inadequate schools were often excluded from being identified as learning disabled because

measurement techniques for distinguishing an intrinsic disorder from extrinsic influences were not easy to establish.

More recent definitions and policies seek to improve on this shortcoming. As stated in the most recent version of the Individuals With Disabilities in Education Act (IDEA), the phrase child with a learning disability means:

"*A child with a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, that may manifest itself in an imperfect ability to listen, think, speak, read, write, spell, or to do mathematical calculations, including conditions such as perceptual disabilities, brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia. (Individuals With Disabilities in Education Act [IDEA], 2004)*"

The new definition is an attempt to reduce the reliance on discrepancy and exclusionary identification methods in favor of a more criterion-based emphasis on failure to achieve, yet still maintaining the core assumption of an underlying, intrinsic psychological processing disorder. The new policy has continued to de-emphasize the use of the IQ-achievement discrepancy measure as a sole or primary criterion for identifying an individual as having LDs, a practice that empirical data has called into question [2](e.g., Stanovich & Siegel, 1994.)

The specific learning disabilities (SLD) classification remains the largest category of disabilities across the nation, and it has been estimated that about 80% of students with learning disabilities also show reading difficulties as a core symptom[3] (President's Commission on 13 Excellence in Special Education, 2002). That is, whether the more general learning disability is identified as a core component of reading difficulty (e.g., dyslexia) or some other psychological process, the result is a student with low reading achievement. Given the prevalence of learning disabilities that affect reading achievement and the fact that a great deal of research on acquisition and disability in reading and some regarding reading in ELLs has been conducted, our primary focus throughout this report will be on RDs in ELLs. It is important to note that language impairments are considered a distinct disorder, even though language disorders are likely causal to many specific learning disability symptoms[4] (see Catts, Fey, Tomblin, & Zhang, 2002; Catts, Hogan, & Fey, 2003). With the exception of language impairments, which have a large overlap with RDs, we do not attempt to cover issues such that they generalize to other specific disability

groups (e.g., blind, deaf, autistic, attention deficit). Thus, if we cite evidence concerning the role of phonemic awareness in reading acquisition, the reader should assume that these results may not generalize to individuals who are hearing impaired or blind, unless we otherwise cite specific studies conducted with these populations.5

Following the simple view conception of reading (Hoover & Tunmer, 1993), Fowler and Scarborough (1999) outlined key component deficits that commonly characterize RDs. These may include:

1. deficits in speed and/or accuracy of word recognition
2. deficits in language comprehension
3. oral-language difficulties in perception, retention, retrieval, analysis, and production of spoken words6

When individuals are not successful in attaining component proficiency even after receiving appropriate instruction targeting these skills, it is evidence of RDs. It is important to also point out that much of the research defining and addressing RDs has been done with children or high-achieving adult dyslexics (typically with college-level education). The focus on other populations, for example, non-college educated adults with RDs, has been relatively recent (e.g., Sabatini, 2002, 2003; Vogel, 1998), though the empirical base for including various additional populations is growing.

Learning disabilities in English language learners: Finally, this section concludes by beginning to frame and describe the issue of defining and identifying RDs in ELLs. Even among 14 native speakers, there is great deal of variation in the practice of identifying RDs. For ELLs, differing orthographic, cultural, social, and linguistic systems of their native languages further complicate the process of identifying RDs in acquiring English reading proficiency (Fowler & Scarborough, 1999; Hammill & Bryant, 1998; Shaywitz et al., 1990).

Regardless of language or country of origin, across varied cultural, social, and linguistic contexts, there are those individuals who experience difficulties learning to read when exposed to the regular literacy curriculum and those who are resistant to specific instructional interventions beyond the regular curriculum (Fowler & Scarborough, 1999; Taylor & Olson, 1995). Biobehavioral and genetic studies, along with behavioral research, converge in providing

evidence for the reality of individual differences in psychological processes that may impede the normally expected acquisition of proficient reading in response to exposure to typical instruction [5](see Olson, 2006; Sandak, Mencl, Frost, & Pugh, 2004).

During the National Symposium of Learning Disabilities in English Language Learners (2003), researchers reported that for successful readers, the neurobiological images and neurodevelopmental trajectories are likely to be similar between ELLs and monolingual individuals. For example, Pugh and colleagues (see National Symposium of Learning Disabilities in English Language Learners) showed promising results for identifying differences in response to initial reading instruction in patterns of brain activation (based on fMRI, or functional MRI techniques) of ELL and monolingual struggling readers. These differences suggest the eventuality of early identification methods of LDs and early intervention for ELLs identified as having RDs. Though promising, there are many details still to investigate. There is much we do know, however, and we hope to outline both the findings and the potential as we move forward with this issue.

CHAPTER 3

System Analysis

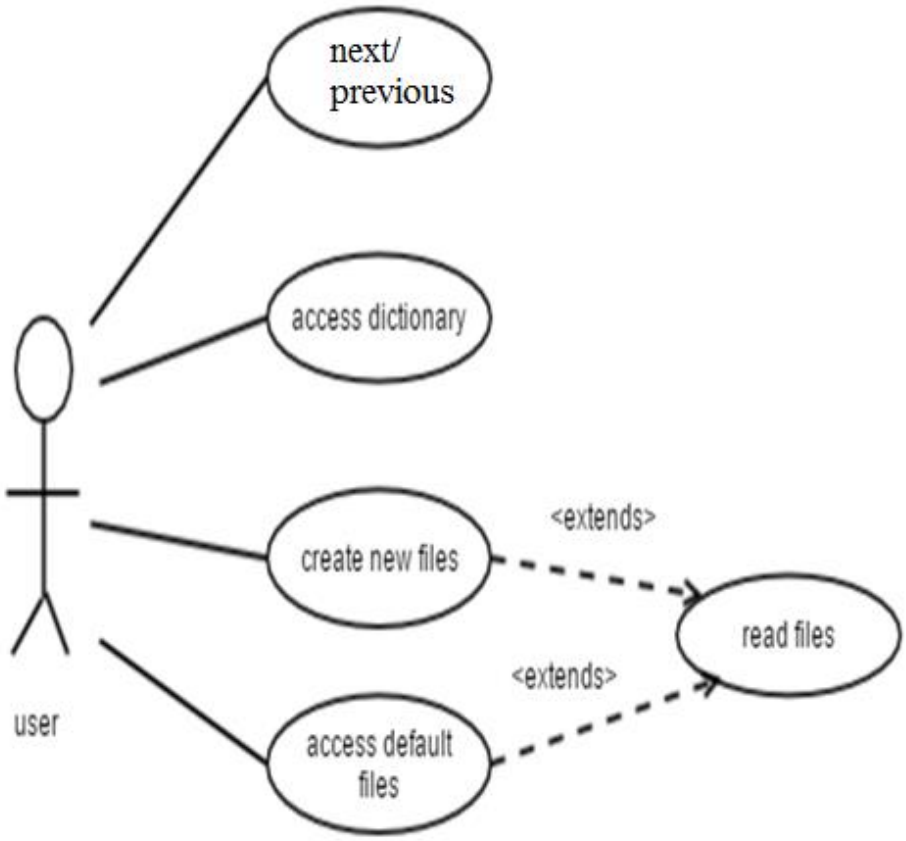
3.1 Functional Requirements

1) Importing a file: The software must accept, as input, a word file in the .docx format.
2) Dictionary: An important functional requirement is the dictionary of words, for the user's reference. Every word has it's corresponding meaning, and a small image to depict it as well, for users who may have troubling understanding.
3) Save option: It is crucial to include a 'Save' option. This helps the user keep track of the point in the file he had reached last, while reading it.
4) Interface: The system interface has to display each word in bold and a clear, crisp and readable format.
5) Font customization: The user is given the freedom of selecting the font size and color of his choice, to enhance comfort while reading.
6) Speed adjustment: The user is allowed to adjust the speed of the text as it appears on the screen, as per his comfort and wishes.

3.2 Non-functional Requirements

The non-functional requirements of the application are as shown below:
1) Smoothness: The interface and navigation from one file to another, or from a file to the menu and vice versa must be quick, smooth and hassle-free.
2) Recoverability: This is nothing but the ability of the software to allow the user to resume reading from the point where he had reached last.
3) Reliability: The software must not crash or force close at any point of time.
4) Usability: This software caters to the needs of special people. Thus, it is vital to ensure that a user-friendly GUI makes their lives simpler, and enhances the reading experience for them.

3.3 Use-case Diagram and description:



Use case diagram is a representation of a user's interaction with the system that shows the relationship between the user and the different use cases in which the user is involved. In the above diagram, the user is shown to access different use cases like referring to the dictionary whenever he needs to understand a word, playing or pausing the stream of characters, words or sentences. The user can create and save files as well as access the default files.

CHAPTER 4

Analysis Modelling

4.1 Data Modeling

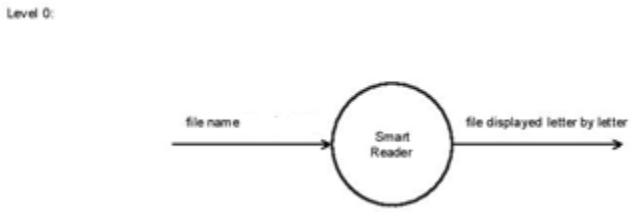


Figure 4.1.1. Level '0' DFD

The Level '0' Data Flow Diagram (DFD) is depicted above. It describes the system and the various inputs and outputs that it produces. Our system takes a text file as input and displays it letter by letter, as output.

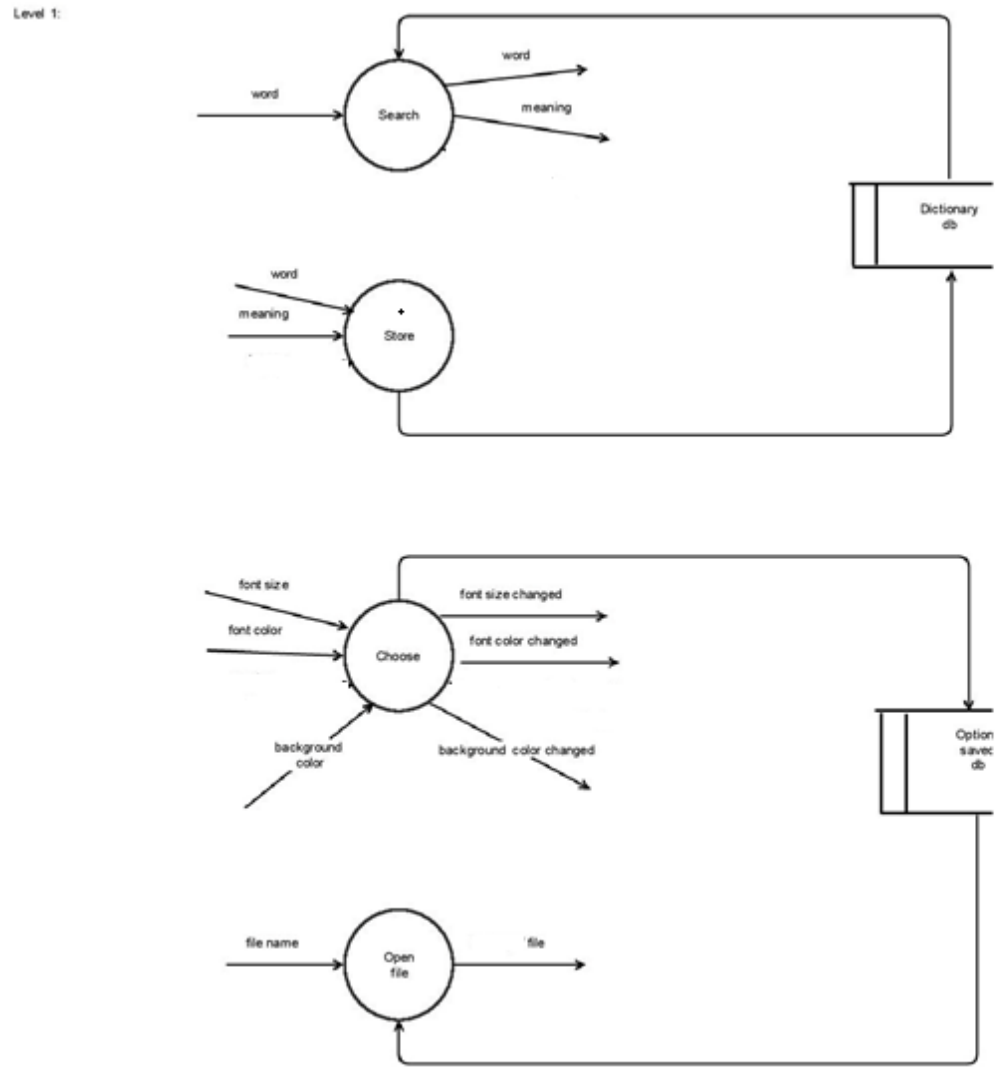


Figure 4.1.2. Level '1' DFD

In the Level '1' DFD, the system is further divided into two modules – 'Choose' and 'Open File'. The second module gives access to the input text file, while the first one is responsible for the various changes being made – Font size, Font color and background color (highlight).

4.2 Timeline Chart

	Task Mode	Task Name	Duration	Start	Finish	Predecessors
1		Literature Review	15 days	Tue 25-08-15	Mon 14-09-15	
2		Study of Text Processing techniques	5 days	Tue 15-09-15	Mon 21-09-15	1
3		Study of Database connectivity techniques	5 days	Tue 22-09-15	Mon 28-09-15	1,2
4		Study of Programming Languages	10 days	Tue 29-09-15	Mon 12-10-15	2,3
5		Algorithm Analysis	7 days	Tue 13-10-15	Wed 21-10-15	4
6		System Design	15 days	Mon 21-12-15	Fri 08-01-16	5
7		Implementation	25 days	Mon 11-01-16	Fri 12-02-16	6
8		Testing	11 days	Mon 15-02-16	Mon 29-02-16	7
9		Documentation	3 days	Tue 01-03-16	Thu 03-03-16	6,7,8

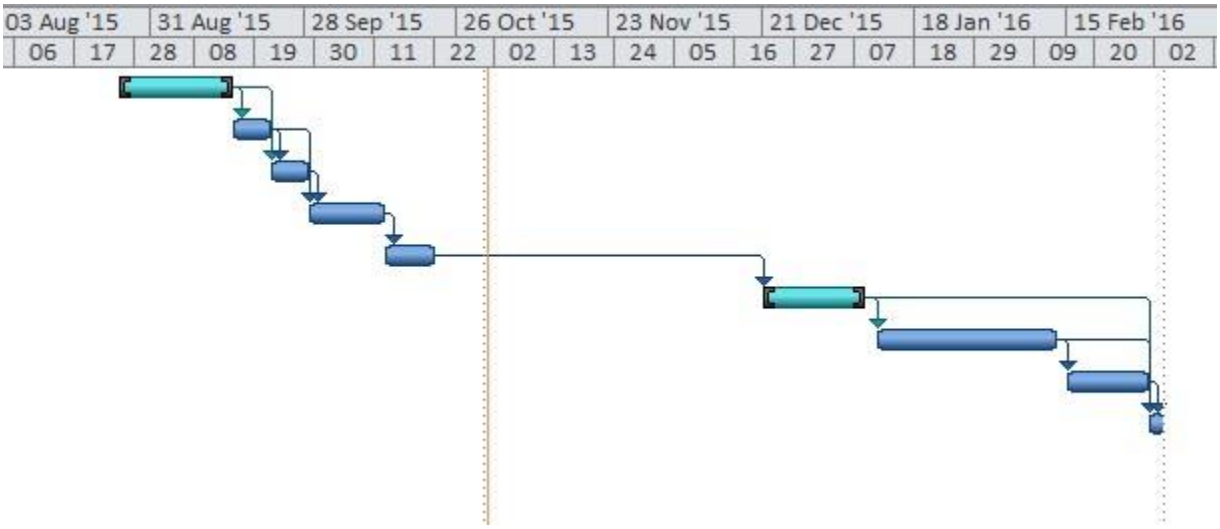


Figure 4.3.1. Timeline Chart

CHAPTER 5

Design

5.1. Architectural Design

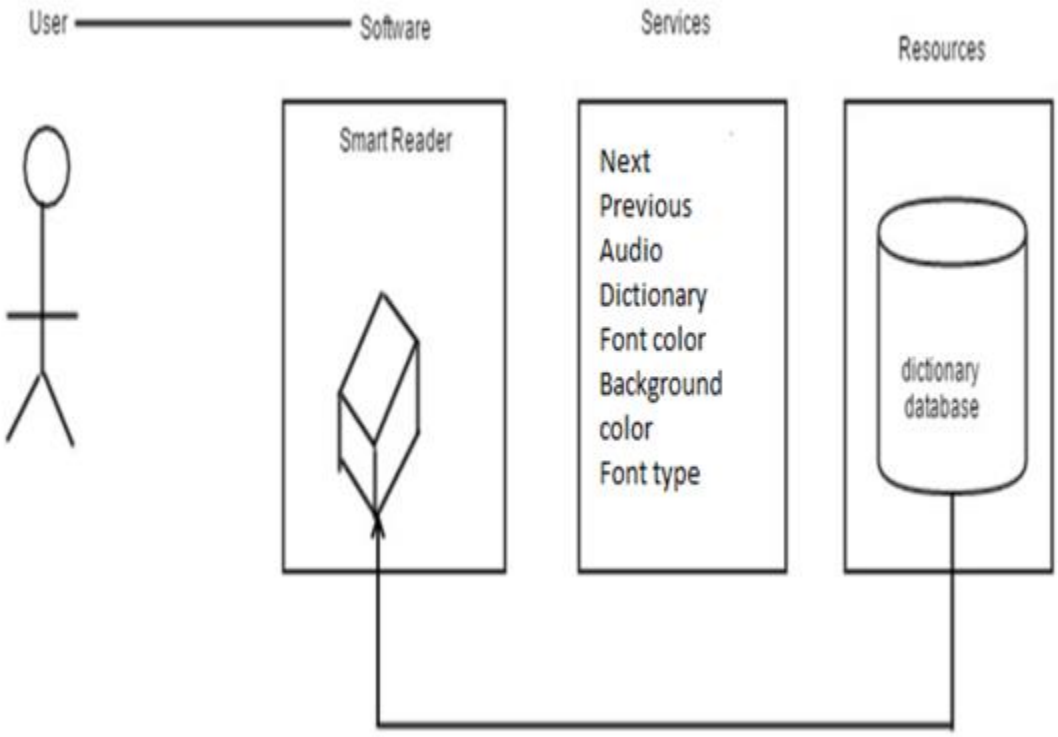


Figure 5.1.1. Architectural Diagram

Split

This function splits the entire file letter by letter.

Next

The Next option allows the user to go to the next character or word, and display it.

Previous

The Next option allows the user to go to the next character or word, and display it.

Audio

The Audio feature in the software makes it possible for users to listen to the sound of each letter and the word. They can also listen to the entire file, if they wish to do so. This is used for cases of extreme dyslexia.

Dictionary

The Dictionary option enables the user to look up the meaning of any word, in case he wishes to do so. The entire English dictionary is stored in a database on SQL Server.

Font Color

There is an option provided for the user to change the font color as per his comfort, if he wishes to do so.

Background Color

The text to be read is highlighted using a background, which the user gets to select. The color combination increases the user's comfort, while reading since he is aware of where to focus on the entire page.

Font Style

If the user is not comfortable with the current font style, he can change it.

5.2. User Interface Design

The following images depict the user interfaces for every stage of the system.

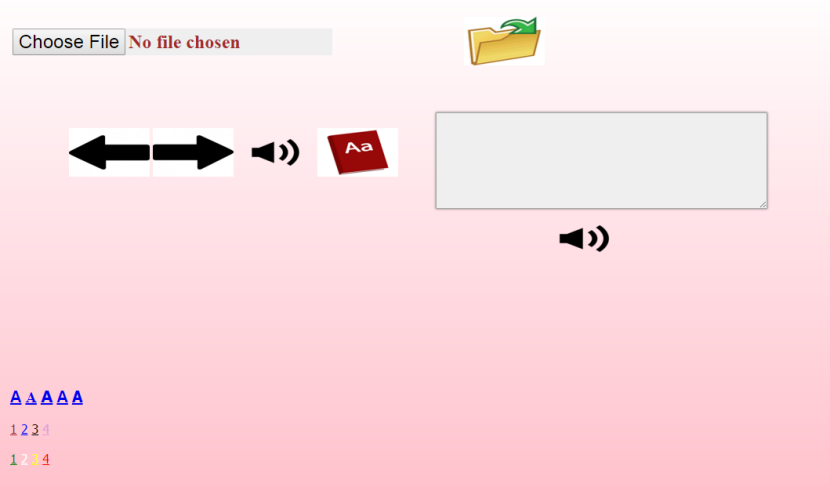


Figure 5.2.1. User interface to take a file as input

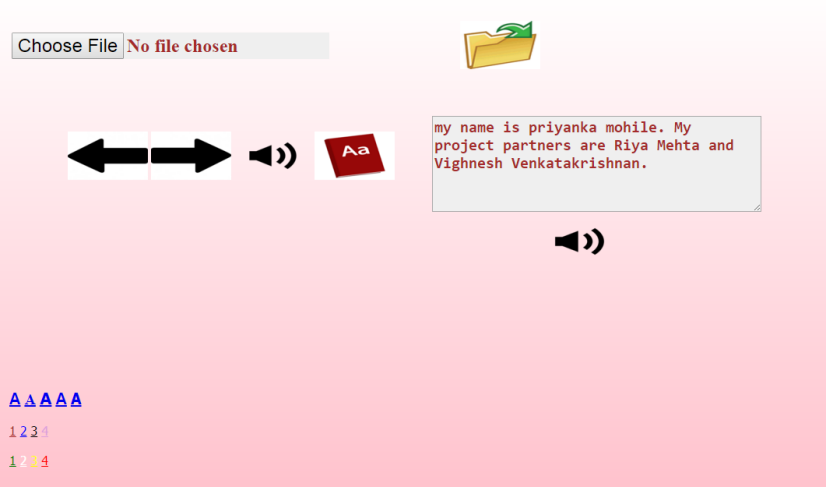


Figure 5.2.2. User interface after accepting a file

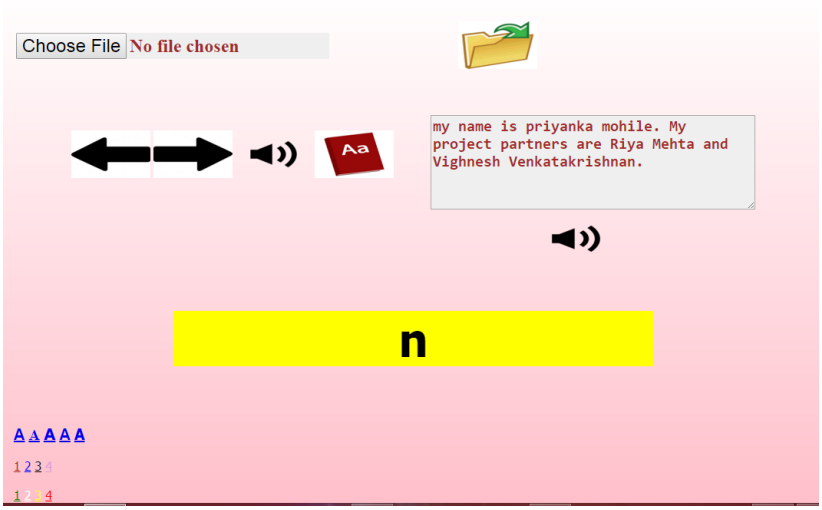


Figure 5.2.3. User interface for splitting, audio, dictionary and other functions, like adjusting font color and style

project

Word Text	Meaning
project	any piece of work that is undertaken or attempted; "he prepared for great undertakings"
project	a planned undertaking
project	present for consideration, examination, criticism, etc.; "He proposed a new plan for dealing with terrorism"; "She proposed a new theory of relativity"

Figure 5.2.4. User interface depicting the dictionary function

CHAPTER 6

Implementation

6.1 Algorithm

Step 1: Retrieve file from the memory

Step 1.1:

Open connection and access the file from the directory

Step 1.2:

if(inputstream !=null)

save string from the file

Step 1.3:

by using a while loop

append text to string builder

convert to string s

Step 2: While(s!=null)

Step 2.1:

Split the sentence into words, and words into letters

Step 2.2:

Display each letter from right to left

Step 2.3:

Display the word

Step 3: Finish

6.2 The File Upload function

```
System.IO.StreamReader reader = new System.IO.StreamReader(FileUpload1.FileContent);
string text = reader.ReadToEnd();
sound1 = text;
```

6.3 The Split Function

```
TextBox1.Text = text;
String[] words = text.Split();
for (int i = 0; i < words.Length; i++)
{
            l1.Add(words[i]);
 }
 foreach (string word in words)
 {

            Char[] letters = word.ToCharArray();
            foreach (char letter in letters)
            {

                s1.Push(letter);


            }
            s1.Push(" ");

 }
w = "";
 while (s1.Count != 0)
 {
                s2.Push(s1.Pop());
  }
```

6.4 The Next Function

```
if (j.Count != 0)
{
          k.Push(j.Peek());
      ch = Convert.ToChar(j.Pop());
      if (ch != ' ')
      {
          w = w + ch.ToString();
            lblSelectedFont.Text = String.Format(ch.ToString());
            sound = lblSelectedFont.Text;


       }
```

```
        else if (j.Count != 0)
        {
            lblSelectedFont.Text = String.Format(w);
                sound = lblSelectedFont.Text;
                l2.Add(w);
                meaning = w;
                w = "";
            }
}
else if (j.Count == 0)
{

            lblSelectedFont.Text = String.Format(w);
       sound = lblSelectedFont.Text;
       l2.Add(w);
       meaning = w;
       w = "";
       Response.Write("END");
       Button3.Enabled = false;
 }
```

6.5 The Previous Function

```
if (k.Count != 0)
{
j.Push(k.Peek());
       ch = Convert.ToChar(k.Pop());
       if (ch != ' ')
       {
           w = w.Remove(w.Length - 1);
             lblSelectedFont.Text = String.Format(ch.ToString());
             sound = lblSelectedFont.Text;
       }
       else if (k.Count != 0)
       {
             w = string.Copy(l2.ElementAt(l2.Count - 1));
             l2.RemoveAt(l2.Count - 1);
             lblSelectedFont.Text = String.Format(w);
             sound = lblSelectedFont.Text;
             meaning = w;

        }
}
```

```
else if (k.Count == 0)
{
lblSelectedFont.Text = String.Format(w);
      sound = lblSelectedFont.Text;
      meaning = w;
       Response.Write("BEGINNING OF TEXT");
       Button4.Enabled = false;
}
```

6.6 Audio

```
if(sound=="")
{
        sound = "Please press a button to continue";
 }
using (SpeechSynthesizer synth =new SpeechSynthesizer())
{
        synth.Volume = 100;
        synth.Rate = -5;
        synth.Speak(sound);
 }
```

6.7 Function for Font Style

```
string font = ((LinkButton)sender).Font.Name;
lblSelectedFont.Font.Name = font;
```

6.8 Function for Font Color

```
chosen = ((LinkButton)sender).Text;
if(chosen=='1'.ToString())
      lblSelectedFont.ForeColor = System.Drawing.Color.Brown;
else if(chosen=='2'.ToString())
         lblSelectedFont.ForeColor = System.Drawing.Color.Blue;
else if (chosen == '3'.ToString())
         lblSelectedFont.ForeColor = System.Drawing.Color.Black;
else if (chosen == '4'.ToString())
         lblSelectedFont.ForeColor = System.Drawing.Color.Plum;
```

6.9 Function for Background Color

```
bg = ((LinkButton)sender).Text;
if (bg == '1'.ToString())
        lblSelectedFont.BackColor = System.Drawing.Color.Green;
else if (bg == '2'.ToString())
        lblSelectedFont.BackColor = System.Drawing.Color.White;
else if (bg == '3'.ToString())
        lblSelectedFont.BackColor = System.Drawing.Color.Yellow;
else if (bg == '4'.ToString())
        lblSelectedFont.BackColor = System.Drawing.Color.Red;
```

6.10 Dictionary

```
string constr = ConfigurationManager.ConnectionStrings["constr"].ConnectionString;
using (SqlConnection con = new SqlConnection(constr))
{
        using (SqlCommand cmd = new SqlCommand("SELECT
        tblSenses.WordText,tblSynsets.Gloss FROM tblSynsets JOIN tblSenses ON
        tblSenses.SynsetID=tblSynsets.ID AND WordText =@word"))
    {
         cmd.Parameters.AddWithValue("@word", m2);
         using (SqlDataAdapter sda = new SqlDataAdapter())
         {
                cmd.Connection = con;
                sda.SelectCommand = cmd;
                using (DataTable dt = new DataTable())
                {
                        sda.Fill(dt);
                       GridView1.DataSource = dt;
                       GridView1.DataBind();
                }
            }
     }
}
```

Chapter 8

8. Results and Discussions

8.1.Proposed System

The system that was proposed at the earlier conceptualization stage is as given:

8.1.1.Accessing files from pc

Browse,select and read plain text files that are saved in the pc.

8.1.2 View

The text file selected to be read, is displayed in the text box.

a)Landscape view:

The text file after splitting,is displayed horizontally word by word and letter by letter in a horizontal stream.

8.1.3 Stream mode with speed adjust features

User can change the speed of the horizontal stream, depending on his needs and reading abilities.

8.2 Developed System

8.2.1 Implementation achieved with respect to the proposed system:

8.2.1.1. Accessing files from pc

Users can browse,select and read plain text files that are saved in the pc.

8.2.2 View

The text file selected to be read, is displayed in the text box.

a)Landscape view:

The text file after splitting, is displayed horizontally word by word and letter by letter in a horizontal stream.

8.2.3 Stream mode with speed adjust features

User can change the speed of the horizontal stream, depending on his needs and reading abilities.

8.2.4 Implementation achieved

8.2.4.1. Variable font size:

Users can switch between varying font sizes and select ones that suit their reading comfort.

8.2.4.2. Variable font color:

Users can switch between varying font colors and select ones that suit their reading comfort.

8.2.4.3. Variable background color:

Users can switch between varying background colors and select ones that suit their reading comfort.

8.2.4.4. Next/Previous button:

Users can click on next or previous button to read the letters and words one by one.

8.2.4.5. Audio button:

Audio buttons have proved to be aiding their reading and understanding abilities.On clicking one audio button,the entire file is read at a stretch and on clicking another button,each letter and word is read.

8.2.4.6.Database dictionary:

Dictionary provides the meaning of the words when clicked on its button.

These aesthetics and options were considered, keeping in mind a complete user experience the software is expected to render to each and every user, depending on his or her reading needs.

8.3 Percentage Completion

Progress w.r.t. to Proposed System: 90 %

Hence, we can safely conclude that all aspects of the conceptualization stage have been precisely implemented.

Chapter 9

Conclusion:

In this day and age of digitization, even education and reading have become digital. We have conceptualized this software keeping in mind the requirements of dyslexic people and voracious readers who do not have the leisure of time or are expected to be extremely competitive.For their ease,we have researched on various types of font which is suitable for them to understand and came to a conclusion to use sans serif fonts and also we studied the color combination charts which helped us in deciding the font color and the background color combinations which do not contrast.We have made use of icons and symbols in our gui considering their difficulty in reading different font styles and foreground and background colors.Also we have used icons for audio and dictionary buttons for easy recognition. We hope our software can be of use to our users to sharpen their comprehension skills and provides a satisfying and fruitful experience.

Future scope:

Once the implementation of the proposed model is complete, Speed Reading can be further improved by adding the following functionalities:

- **Web mining:**

  In this project we have a text file as an input which can be modified by taking a html file as an input from the website,in which we can get the data from different html files and can be processed further.

- **Bookmark:**

  Users can Bookmark the line they were on, so they can go right back to where they left off from.

- **Images:**

We can include an image for every word in the database dictionary,so that when the user is not able to understand its meaning,he or she can refer the image besides the meaning to understand the word easily.

- **Font Size:**

  We can include a drop down list specifying different font sizes.So that if the user is an extreme level dyslexic,he can manipulate the font size and make it bigger or shrink it as per his requirements.

Chapter 10

References:

1. Learning Disabilities Eligibility in the 1990s: An analysis of State Practices, Pamela Kidder-Ashley, James R Deni, Jessica B Anderton, Psychology, Appalachian State University, Boone, North Carolina 28608.
2. Stanovich, K. E., & Siegel, L. S. (1994). Phenotypic performance profile of children with reading disabilities: A regression-based test of the phonological-core variable-difference model. *Journal of Educational Psychology,86,* 24-53
3. A New Era: Revitalizing Special Education for Children and Their Families, PRESIDENT'S COMMISSION ON EXCELLENCE IN SPECIAL EDUCATION,Rodd Paige, Todd Jones, July 2002.
4. Subgrouping Poor Readers on the Basis of Individual Differences in Reading-Related Abilities, University of Nebraska – Lincoln, Catts, Hogan, & Fey, 2003.
5. Mapping the Word Reading Circuitry in Skilled and Disabled Readers, Sandak, Mencl, Frost, & Pugh, Oxford University, 2004.