E-learning Paradigm for Teaching Enhancements

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Abstract

E-learning is the interaction between a learner who strives to acquire knowledge or skills by instruction, or study with a remote knowledge source, one that is physically separated from the learner. E-learning referring to learning via the internet has become a major phenomenon in recent years. But many of the Students does not getting the full advantage of E-learning because of the language problem. We tried to overcome this problem by providing the subtitles thus enhancing the E-learning. In today's pluralistic and highly mobile society, successful spoken-language application is very useful and effective. The need of this kind of application is being felt for regional Language. As Hindi is spoken in major part of India, it is very useful for the rural areas where literacy rate is low as well as in the urban area where one does not have enough time because of faster life. Therefore we have designed a speech to text converter for Hindi which takes input from wave file as well as from microphone. This system includes training component and synthesizer which converts speech signal to meaningful text. This paper provides the brief description of E-learning, Education culture in India, Importance of Regional Languages in E-learning, Benefits of E-learning in India, methodology for regional language support in E-learning.

Keywords: E-learning, Regional language, Text, Speech

1. Introduction

Electronic learning (or e-Learning or eLearning or computer based learning) is a type of education where the medium of instruction is computer technology. No in-person interaction may take place in some instances. E-learning is used interchangeably in a wide variety of contexts. In companies it is referred to the strategies that use the company network to deliver training courses to employees. In the USA, it is defined as a planned teaching/learning experience that uses a wide spectrum of technologies mainly Internet to reach learners at a distance. Lately in most Universities, e-learning is used to define a specific mode to attend a course or programmes of study Where the students rarely, if ever, attend face-to-face or for on-campus access to educational facilities, because they study on-line. E-learning can be CD-ROM-based, Network-based, and Intranet-based or Internet- based. It can include text, video, audio, animation and virtual environments [4]. It can be a very rich learning experience that can even surpass the level of training you might experience in a crowded classroom. It's self-paced, hands-on learning. The quality of the electronic-based training, as in every form of training, is in its content and its delivery. E-learning can suffer from many of the same pitfalls as classroom training, such as boring slides, monotonous speech, and little opportunity for interaction. The beauty of e-learning, however, is that new software allows the creation of very effective learning environments that can engulf you in the material.

2. E-learning in India

With a population in the learning age group of 18-32 of roughly 350 million, the country's educational infrastructure like schools, colleges, labs and even roads leading to schools have hardly kept up. Yet there is a far bigger problem that affects the quality of education in our country. Teaching as a profession is a choice of few young men and women. As a result there is an acute shortage of good teachers in our country. Often inexperienced, not so competent teachers are employed many a times with poor quality of teaching. In India, a majority of population lives in non-urban setup where the educational infrastructure and resources are usually meager and scanty. There has been a phenomenal rise in the number of engineering colleges in India over the past decade or so. Most of these institutions offer undergraduate programs in Information Technology, Computer Science/Engineering, and Electronics and Communication, apart from the traditional engineering disciplines.

The increase in the number of available seats for engineering has not been matched by a parallel enhancement of efficient educational infrastructure and resources. A consequence of this situation is that students from many of these colleges find it difficult to fulfill basic requirements of their curriculum, such as the final year project. Also, a

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significant number of talented students, faculty and professionals are struggling with challenges of mastering the ever-changing technology.

Final year students in underdeveloped parts of the country often have little under- standing of real life problems. Though talented, they lack experience and exposure, and their skills are often inadequate. They are capable of producing excellent work but lack able guidance.

Trained teaching faculty at all education levels- technical, secondary and primary is lacking, or teachers are unmotivated. The students that come from such background are less likely to excel than those who are exposed to the best education in the world.

E-learning techniques like video lectures can be very beneficial for students in rural educational institutions as they can provide the students the exposure to the best education in the world. Many institutes have opened their web servers for free lecture-on-demand for several courses.

3. Hurdles for E-learning in India

Followings are major hurdles for e learning in India

1. Students are usually economically backward and cannot afford personal computer and the present infrastructure lacks an easy access to computing facilities.
2. Even if the end user facility is provided, the Bandwidth in rural areas or even towns is extremely scarce and it is a usual experience in small Indian cities and towns that a file of even a few MBs takes a substantial time to download. Typically, the video lectures available publicly run into a few MBs and require an efficient adaptive streaming strategy.
3. The students usually communicate in their local languages and can understand bits or pieces of English and cannot completely catch the flow of the video lectures that are being downloaded.

4. Why E-earning is the answer for India

Fortunately, E-learning has the answer to all of these issues.

- A few good teachers can be scaled up to teach thousands of students. Besides, recorded classrooms can be a real boon. Recorded classrooms of the best teachers can benefit the whole learning population. Faculty availability is not restricted by geography or even time. So small towns having no teachers can learn from the best of teachers.
- With high quality study material already available any time, students are better prepared in the class. Their absorption level goes up. Besides, collaborative tools like discussion boards and chat sessions help collaboration among students and between students and teachers. This is also supplemented by email support. The suite of eLearning tools have been designed to replicate all aspects of the classroom learning experience and others unique to the online medium. This helps impart a complete learning experience.
- No more missed sessions. You can always study the playback of recorded sessions. Even the slow students in the class can catch up with the rest of class.
- Interactivity is better. As all the study materials are prepared in advance including white boards (equivalent of black boards in the class!), hence the teacher spend more time with students!

- Due to scalability, and ubiquity eLearning is far more cost effective than traditional learning!
- Removes the bias of sex, religion, colour, cast etc. In fact the option of anonymous feedback on pacing and comprehension, eliminates conventional classroom inhibition, that prevent students from telling the teacher “I haven't understood”
- E-learning emphasizes continuous learning and promotes “just-in-time” and “just enough” learning, a boon for busy executives and professionals.
- Finally, many studies have proved that absorption levels are at least 20% higher in E-learning compared to traditional learning.

5. Recent Trend and benefits

With the proliferation of computers, learning through computers has been rapidly gaining acceptance. It can be observed that not only are computers being used to teach courses at higher levels of education, but also being introduced for learning at lower (pre-school and kindergarten) levels.

In this section we will discuss new trends in education system and benefits of these trends. A recent case in point is the OLPC (One-Laptop per Child) programme that aims to make available inexpensive laptops for the children of the rural areas of the world [7]. Another case is that of some schools in Mumbai introducing laptops for children to increase their efficiency at learning. We can use the term eLearning to denote learning through the use of computers. E-learning can be used in academic settings as well as for corporate training. A number of benefits can be obtained through the use of E-learning:

- Increase in conceptual understanding through the use of interactivity and animation and through the use of audio and visuals
- Lower-cost
- Ease of distribution
- Ease of updating
- Learners can learn at one's own pace and time.

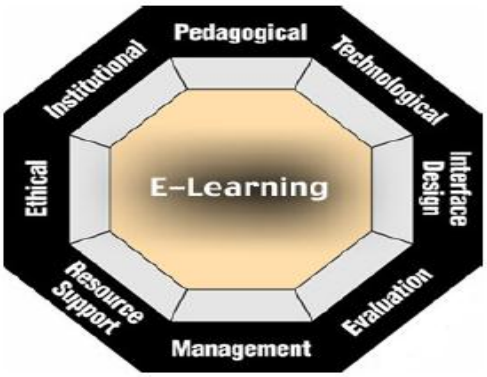

Figure 1: Framework of e learning [8]

This is especially important for learners that cannot attend school physically during the regular hours. Software can not only be used for presenting the learning material to the learner, but also to prepare the content. The ability to create the content easily is also a very important aspect in the acceptability of such software.

6. Objective of the study

The main objective of this study are to make E-learning more beneficial for India especially for rural areas. For this the following factor must be kept in mind

- E learning lecture should be more understandable.
- E learning material should be Open source so that everybody can access it
- Use of audio and visuals
- Ease of distribution

6.1 Solutions to the Problems

- Financial problem is related to Government so it could be tackled in different manner.
- Bandwidth problem requires different type of strategy so it would be handled by adopting different approach.

The study proposes captioning video lecture in Hindi/Regional language Because Hindi/Regional Language is understandable to most of the people in India. Typically, the lectures in major universities are delivered in English. The optimal use of these lectures is possible if the audience, who may only know English partially, get some additional input in their own language. A Hindi language captioning system is to be developed for complementing the end user's comprehension of the lectures delivered in English.

6.2 Method and structure of learning material

The structure of the system is divided into two sections: "Content" and "Presentation"

Content (XML) File:

- All content text information will be saved in an UTF-8 encoded XML file
- Every text element will have size information associated with it so that text size can be changed as may be required for different languages
- Different language content can be saved in the same file
- Path to additional file used as content like images and sound files if needed must also be provided here.

Presentation (Flash) File:

- Presentation will parse XML document and select and display content depending on language chosen
- Images used will be in layered PNG format with text and image at different layers all cast names of learning object will be the file [3]
- Name so that it is possible to identity and change them through the XML file
- Text area and frame must be able to expand to accommodate the content.

7. Method

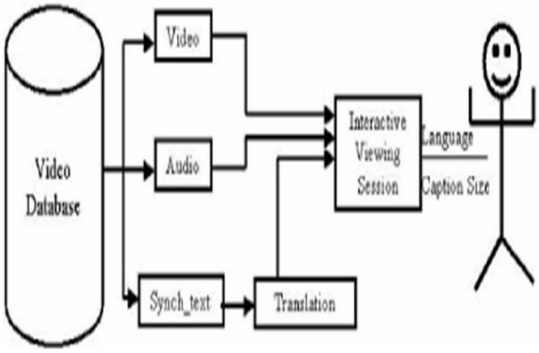

Figure 2 – Enhanced Architecture of E-learning

7.1 Asynchronous e- learning

Asynchronous E-learning is more flexible than synchronous because the student can choose the time he wishes to access a lesson. It comes in two forms, facilitated and self-paced.

7.1.1 *Facilitated asynchronous e learning*

Facilitated asynchronous E-learning involves an instructor and group of students, but the interaction is not in real time. The instructor will post assignments on a Web page, which includes for example, online reading or research conducted on various Web sites, on line course material and quizzes. Students communicate with each other through discussions,

and submit their homework to the teacher via e-mail. An advantage of this type of training is that can receive personalized attention and guidance from the teacher.

7.1.2 *Self-paced asynchronous e learning*

Self-paced asynchronous E-learning consists of standalone instructional material that can be accessed and completed via the Web, without additional interaction among students [1]. Materials could include guided tutorials, discovery learning simulations, and assessment exercises. Examples are self-paced courses taken via the Internet or CD-ROM, online discussion groups, and email. There can also be on line support and communication with a time delay, with the teacher.

7.2 Text Processing

The Hindi language is spoken by the most of the people in India. Hindi is written with Devnagri script. Unlike other foreign language in which basic unit of writing system is a character, Hindi language uses a syllable as basic unit. Hindi is spoken and written syllable by syllable [5]. The syllabic writing in Devnagri script is based on the phonetics of linguistic sound.

Structure of Script

Devnagri script has 52 letters, which are known as 'verna'. This Verna can be referred as 'Phonemes'. These varnas are divided into two categories [6]:

Swaras (vowels)
Vyanjana (Consonants)

Swaras (vowels) the Verna which can be uttered their own, without help of other varnas are known as Swaras. Thus Swaras are independent in nature. Verna further classified as short, long, diphthongs according to their utterance.

Vyanjana (Consonents) the Verna which gets manifested only with the help of other varnas are known as Vyanjana. It is dependent in nature. Vyanjana further classified in many categories according to their source centers in human body that help to produce these sounds, such as velar, palatal, retroflex, dental, labial etc. Some of them are voiced, voiceless, aspirated and unaspirated.

7.3 Speech Recognition

Each speaker recognition system has two phases:

Enrollment
During enrollment, the speaker's voice is recorded and typically a number of features are extracted and generated template or model for voice.

Recognition
In the Recognition phase, a speech sample or "utterance" is compared against a previously created voice template or model. Recognition falls under two categories:

Text Dependent Recognition
If the text (spoken word) must be the same for enrollment and verification this is called text-dependent recognition. Generally Text dependent Recognition is often used. Text-dependent methods are usually based on template-matching techniques.
In this approach, the input utterance is represented by a sequence of feature vectors, generally short-term spectral feature vectors. The time axes of the input utterance and each reference template or reference model of the registered speakers are aligned using template matching algorithm and the degree of similarity between them, accumulated from the beginning to the end of the utterance, is calculated.

Text Independent Recognition
Text-independent systems are most often used for speaker independent speech recognition. In this case the text (spoken word) during enrollment and test is different.

7.4 Steps Involved in Speech Recognition

Speaker recognition is performed in four steps:

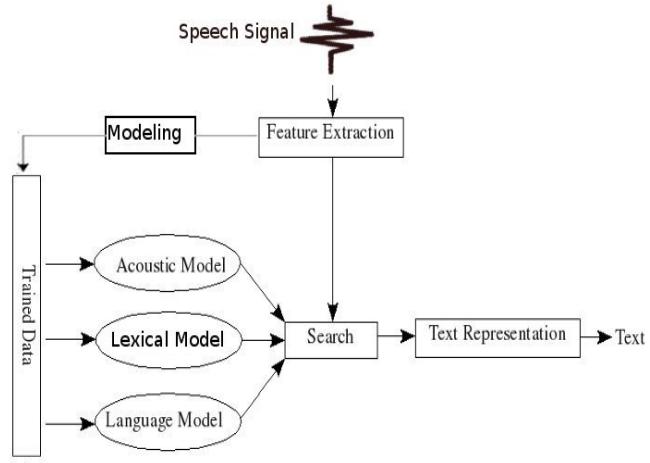

Figure 3 – Architecture of Speech Recognition

7.4.1 Signal Acquisition

Signal is acquired with a microphone or other medium, although performance increases with higher quality capture devices. In speaker recognition, the speech waveform is sampled at a rate between 6.6 kHz and 20 kHz and processed to produce a new representation as a sequence of vectors containing values of what are generally called parameters. It

is normalized and windowing is done for further processing [2].

7.4.2 Feature Extraction

It is heart of a speech recognition system. Its main purpose is to convert speech waveform to some type of parametric representation called feature vectors for further analysis and processing by classifiers. When dealing with speech signals there are some criteria that the extracted features should meet. Some of them are listed below:

- Discriminate between speakers while being tolerant of intra-speaker variability's,
- Easy to measure,
- Stable over time,
-Occur naturally and frequently in speech,
-Change little from one speaking environment to another,
-Not be susceptible to mimicry.

Various techniques and algorithms are used to extract the features. These techniques includes

- Linear Predictive Coding (LPC)
- Linear Predictive Cepstral Coefficients (LPCC)
-Filter bank based Cepstral Coefficients e.g. Mel Frequency Cepstral Coefficients (MFCC) etc.

7.4.3 Model Recording or Training

The models work as the print of speaker's speech which is further used to identify speaker computing matched score. The various Models used to process and store voice templates and the popular models used for this task are:

-Vector Quantization
-Frequency estimation
-Gaussian mixture models
-Artificial Neural Networks
-Decision trees
-Hidden Markov models

7.4.4 Template Matching

Using input signal and trained model (template) matching score is computed and one or more than one match is given as result. In case of Speaker identification the result is Speaker ID and in case of Speaker Verification the result is Accept/Reject.

8. Implementation

We have implemented a graphical user interface for speech recognizer. It accepts inputs from wav file as well as from microphone. It has two components:

8.1. Trainer

Trainer is graphical user interface for training module its main purpose is to train the Recognizer from training data.

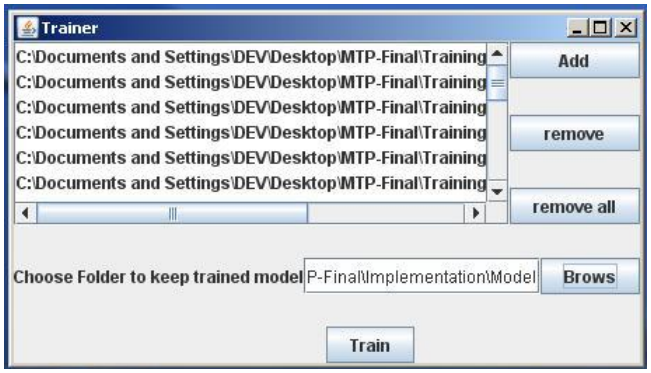

Figure 4 – GUI for Training Interface

8.2. Recognizer

Recognizer takes input either from file or directly from microphone and shows the results

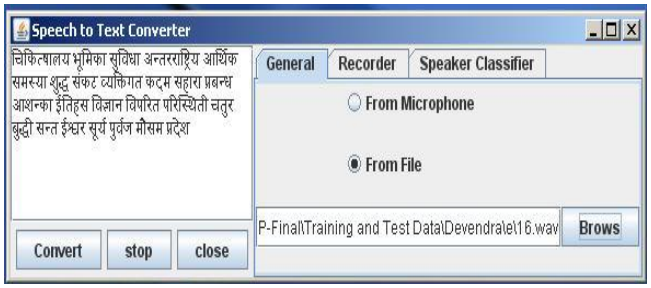

Figure 5 – GUI for Speech to Text Converter

9. Web Portal

There are two modes of streaming. In live streaming mode, users can watch transmitted lectures on the web portal. If they miss a live lecture or do not have time for it, they can watch it later, on demand. These functionalities are feasible on the web portal.

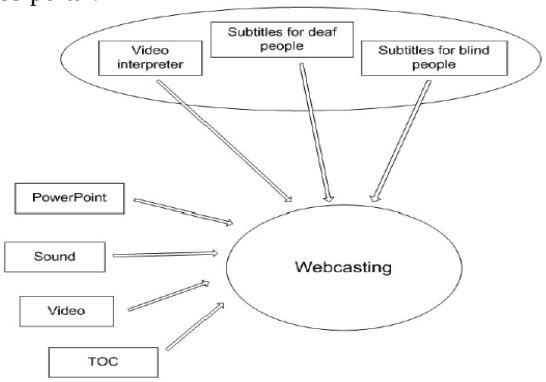

Figure 6 –Extended Web Cast System

A snapshot of recorded lecture is illustrated on Figure. On the

top we have lecture's title and lecturer's name. Video and sound is transmitted with Windows Media Player.
Subtitles can be seen in live streaming mode with the help of sub title le which is generated by the text processing. Table of contents is generated automatically from the presentation slides.

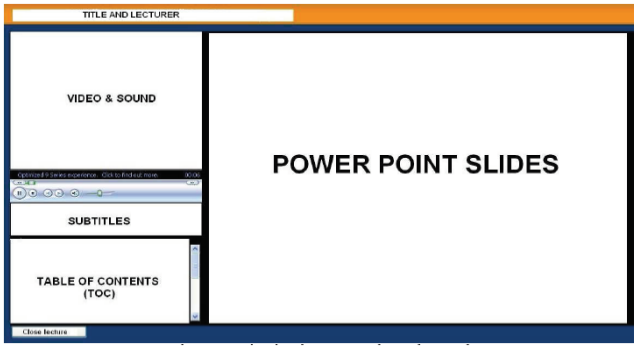

Figure 7 – Viewing Lecture on the Web Portal

10. Results

Table 1 – Test Performance

Medium of Instruction	No. of Students	Score Avg. %	Range %
English	80	36.5 %	28% to 44%
Hindi	80	64.5 %	48% to 75%

Table 1 summarizes the impact of Regional language in test performance. The findings from this experiment indicates that the Medium of instruction play a major role compared to other demographics, as the regional language students performed better compared to English. Significant gap is noticed between regional language students and English medium students. The cut-off marks, economic and educational background of their families and the gender of the student have minimal impact.

11. Conclusion and Future work

E-learning has become a great teaching tool in this current technological society. As more and more contents are developed they will become more effective with proper multilingual support. In this Paper we have seen importance of E-learning and proposed Methodology for E-learning with regional language. This Research has a lot of scope for future development. Features like ability to capture videos for making presentation, Support for many different languages templates for presentation, video transition effects and many more such functionalities can be implemented in the later versions of the software.

Acknowledgments

I convey my sincere thanks to my Project guide Prof. D.B. Phatak for his support and guidance which helped me to carry out Research. I am grateful for his constant advice, support and encouragement throughout the Research work. I also thank Dr. Upinder Dhar Vice Chancellor, JK Lakshmipat University, Jaipur and Dr. B.V. Babu Director IET, JK Lakshmipat University, Jaipur for support, help and the many insightful discussions. I express a word of thanks to my friends Vipin, Rohit, Sunil, and Jignesh for their constant support and suggestion. Above all my deepest sense of gratitude to my parents, my elder brother and sister to whom I am heavily in debt for the love and affection showered on me which has contributed in a big way in achieving this goal.

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