# Meeting Minutes Generator

**Software Design and Requirement Specification**


Session: 2018 – 2022

**Submitted by:**

Muhammad Saad Fareed 2018-CS-632

Muhammad Mudasir Hayat 2018-CS-660

**Supervised by:**

Dr.Farah Adeeba

Department of Computer Science, New Campus

**University of Engineering and Technology**

**Lahore, Pakistan**

# Contents

**List of Figures** ii

**List of Tables** iii

**1 Requirement Specification** 1
- 1.1 Functional Requirement . . . 1
- 1.2 Non-functional Requirement . . . 3

**2 Design specification** 4
- 2.1 Detailed Literature Review: . . . 4
- 2.2 Proposed Methodology: . . . 5
  - 2.2.1 Pre-Processing . . . 6
  - 2.2.2 Speech Recognition . . . 6
  - 2.2.3 Text Summarization Strategy . . . 6
  - 2.2.4 Minutes Of Meeting . . . 7
- 2.3 Data Collection Techniques . . . 8
- 2.4 Experimental Design . . . 9
- 2.5 Meeting Minutes UI: . . . 9

**References** 10

# List of Figures

2.1 System architecture diagram . . . . . 6
2.2 Meeting minutes template . . . . . 7
2.3 Meeting minutes template . . . . . 8
2.4 Meeting minutes template . . . . . 8
2.5 Meeting minutes UI . . . . . 9

# List of Tables

2.1 Meeting Minutes Corpora . . . . . 5

# Chapter 1

# Requirement Specification

## 1.1 Functional Requirement

Meeting minutes generator is a web based application it's functional requirements are categorized on the basis of users. The major users of the meeting minutes generator are initiator and participants. Initiators are users who initiate a meeting and participants are invitees of the meeting. Each user can have more than one role. Some of the functional requirements can be divided amongst the initiator and participants.

Functional Requirements:

1. System shall allow users to download meeting transcript.
2. System shall allow initiator to schedule the meeting.
3. System shall generate transcript at run time.
4. System shall allow user to download recordings.
5. System shall allow initiator to download transcript and meeting minutes.
6. System shall allow users to share the files.
7. System shall allow initiator to share screen.
8. System shall let users to create a new account.
9. System shall allow participants to raise hand.
10. System shall allow users to edit profile.
11. System shall allow initiator to cancel the meeting.

12. System shall allow initiator to record the meeting.
13. System shall allow initiator to add new participants.
14. System shall allow initiator to remove a participant.
15. System shall allow initiator to download participant list.
16. System shall allow initiator to broadcast the meeting minutes via email.
17. System shall allow users to reset password via email.
18. System shall enable initiator to allow participants for share screen.
19. System shall allow initiator to change the meeting schedule.
20. System shall allow initiator to create a meeting event in a personal calendar.
21. System shall allow initiator to mute participants.
22. System shall allow participants to attend the meeting through specific code.
23. System shall allow users to search, edit and share their conversations.
24. System shall authorize the unique email, password from the users and allow to login.

## System Requirements:

For development, the hardware requirements are the following:

- Desktop with 8GB RAM and 64 bit operating system.
- High speed online servers.
- High internet connection.

For usage, the hardware requirements are the following:

- An internet connection (3G or 4G/LTE).
- Speakers and a microphone.
- A webcam or HD webcam.
- Desktop with 4GB of RAM over and above any other system requirements.

## 1.2 Non-functional Requirement

### Reliability:

System should have an uptime due to the very reliable cloud servers.

### Usability:

- System interface should be easy to use and attractive, guide customers in an intuitive manner.
- System shall allow user to respond in a maximum of 4 seconds after looking at the interface.

### Scalability:

System application shall be accessed from any computer browser with mentioned specifications in hardware requirements.

### Performance:

- System should limit the size of the data to 100MB which user wants to have analyzed.
- System should be capable of at least 100 users at a time.

### Supportability:

System shall allow users to be helped by remotely support.

### Security:

System should be end to end secure.

# Chapter 2

# Design specification

## 2.1 Detailed Literature Review:

Minutes of meeting are an official record of actions and to do list took at a meeting.Meeting minutes are something that has become a need of every productive meeting in today's world.In in-person meetings these are recorded by a secretary and in virtual meetings, meeting minutes are recorded manually or automatically.As 11 million meetings are held each day[2].In virtual meetings it's a very difficult task to record meeting meetings manually due to poor internet connectivity or mic issues.In literature, multiple studies exist for automation of meeting minutes.

Zhang et al.[8] proposed methodology to find meeting minutes in parliamentary speeches. Conditional Random Field (CRF) is used to convert text into chunks and extract salient features of the text. A rhetorical syntax tree helped each chunk to be represented in a tree structure which makes it easier to use classifiers for extracting prominent features in a sentence. The accuracy achieved in this experiment was 73.2 %.

Nedoluzhko and Bojar [10] reported mainly a record of what was done at the meeting as future action and to-do list.

In recent study by Koay et al[6]reported usage of sliding window and neural abstractive approach for text summarization. Moreover, meeting keywords are detected as meeting decisions. [8].

To create automated minutes of meeting, we need to have data for training as well as for testing.For in-person meetings data is available[10].The brief description of in-person meeting corpora is given below.

Table 2.1: Meeting Minutes Corpora

| Meeting Minutes Corpus | | | | | | |
|---|---|---|---|---|---|---|
| Corpus Name | Nature Of Meeting | Meeting Duration | Annotation | Corpus Duration | Total Meetings | Transcripts |
| ICSI meeting corpus[5] | natural meetings | 17 to 103 minutes | Transcription generated on Word level | 70 hours | 75 | manual |
| NIST Meeting Corpus[3] | natural meetings | 17 to 80 minutes | Using STT and SPKR | 15 hours | 24 | manual |
| ISL meeting corpus[1] | natural meetings | 60 minutes | Transcription generated on first pass level | 103 hours | 104 | ASR |
| AMI meeting Corpus[9] | Both (70h elicit and 30h natural) | 17 to 180 minutes | Smoothed the manual annotations | 100 hours | 138 | manual |

As evident from literature limited work is done for automatic meeting minutes for Urdu speech and only data available is for in-person meetings there is not data available for virtual meetings so we need to have multi-language(Urdu and English) virtual data for training and testing.

## 2.2 Proposed Methodology:

Meeting minutes are notes that are recorded during a meeting.The highlighted key issues that are discussed and activities to be undertaken are recorded in a particular format.The architecture diagram shown in Figure 2.1. consists of four different modules. This includes pre-processing, speech recognition, text summarization and minutes of meeting. Audio of meeting is passed as input to preprocessing module while attendee list is also recorded. Audio stream is being passed as input to speech recognizer module for meeting transcript after processing the audio. Inputs are passed as wav files as shown in Figure 2.1, At the same time process audio is being passed to summarization module.The end product will be generated as a minutes of meeting in a particular templates that are discuss minutes of meeting section.

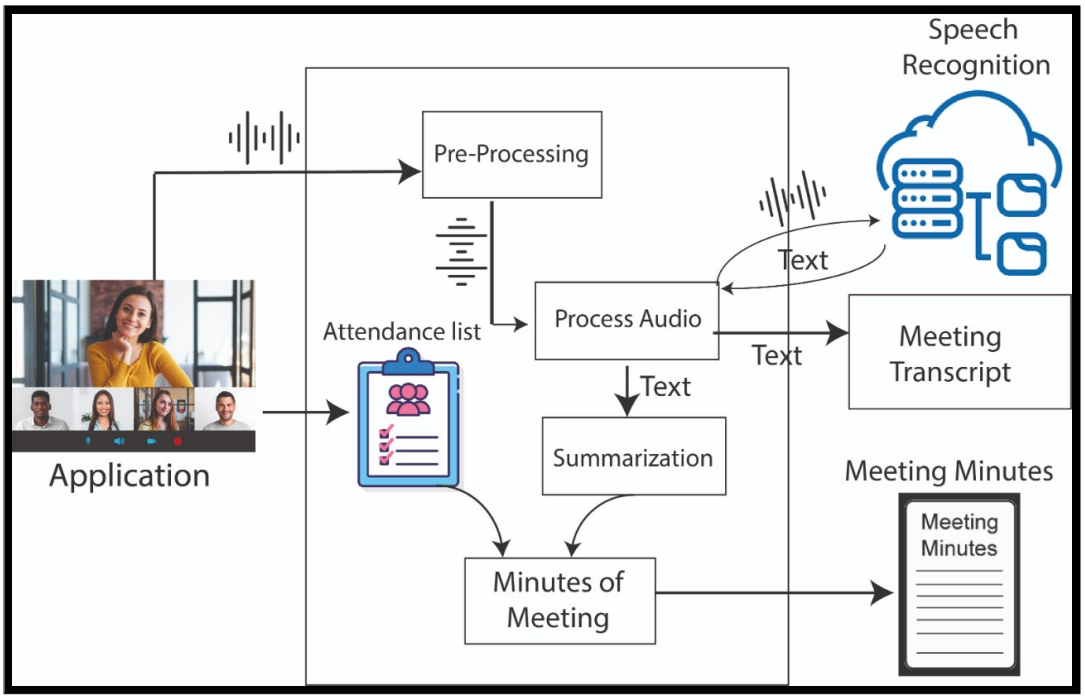


FIGURE 2.1: System architecture diagram

### 2.2.1 Pre-Processing

In pre-processing the meeting xml file is converted into .wav audio file. This .wav file is an array of bytes and further processed in monaural and converted into mono audio. Mono makes sound powerful, clear, and upfront. This mono audio is further optimize and converted into .wav 16khz mono 16bit.

### 2.2.2 Speech Recognition

The audio chunk is send to the external resources for recognition of speech. It converts Urdu and english speech into text. It enables developers to produce transcripts of Urdu and English speech using powerful neural network model through an easy-to-use API.

### 2.2.3 Text Summarization Strategy

There are multiple strategies for the text summarization. Summarization methods are generally either extractive or abstractive[10]. In our project we are using both strategies. It uses a package of TF-IDF features[4] and additional features extraction approach such number of nouns and Proper nouns in sentence, position of sentence in corpus, normalization of sentence length and number of brackets in corpus.

1. In part of speech tagging we normalized how much nouns and proper nouns are present in particular sentence.

2. In sentence length feature we are capturing ratio of length of particular sentence with maximum length of sentence present in the corpus.

3. In sentence position feature we are capturing inverse of square root of sentence present in the corpus.

4. In number of bracket feature we are capturing how much brackets a sentence carrying in the corpus.

All sentence are sorted on the basis of these features and we will pick top N sentence from the corpus. These meeting minutes are then summarize by abstract approach through sequence to sequence model.

### 2.2.4 Minutes Of Meeting

Productive meetings can't remain productive without a record of what has been discussed and what kinds of decisions have been made. After summarization the meeting minutes are organized in a template using different formats and templates of meeting minutes. For meeting minutes generator we are using the minutes of

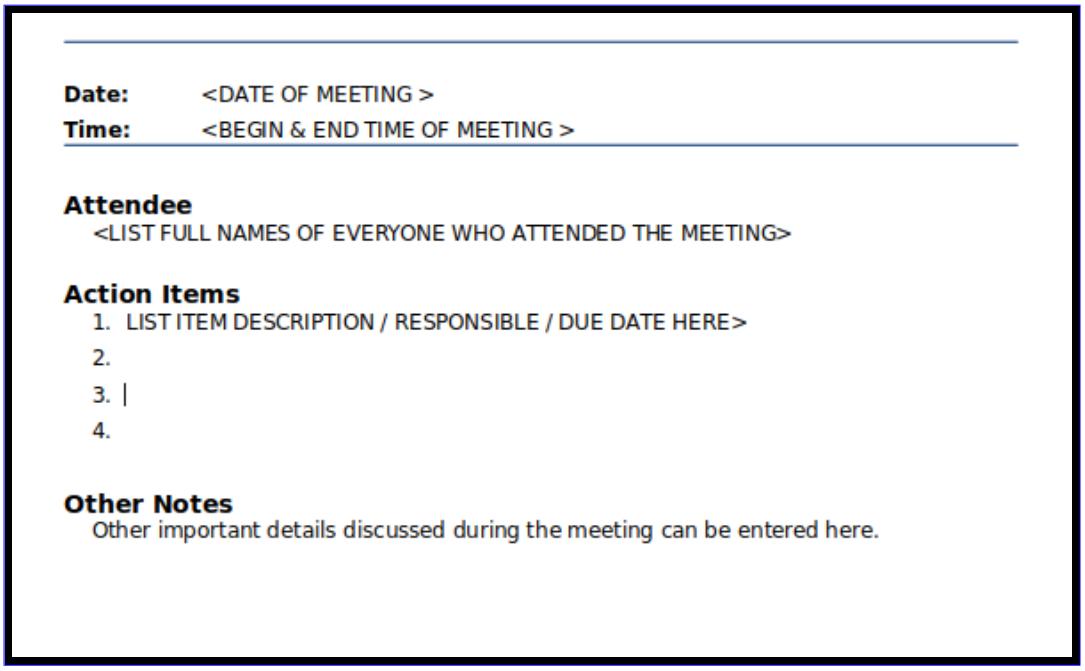


FIGURE 2.2: Meeting minutes template

meeting templates. Some of these are given below. These meeting minutes template's are easy to understand and perfect for effectively capturing the most important topics from meeting.Some of the templates would be given in the application. User's can also made his/her own template for meeting minutes.

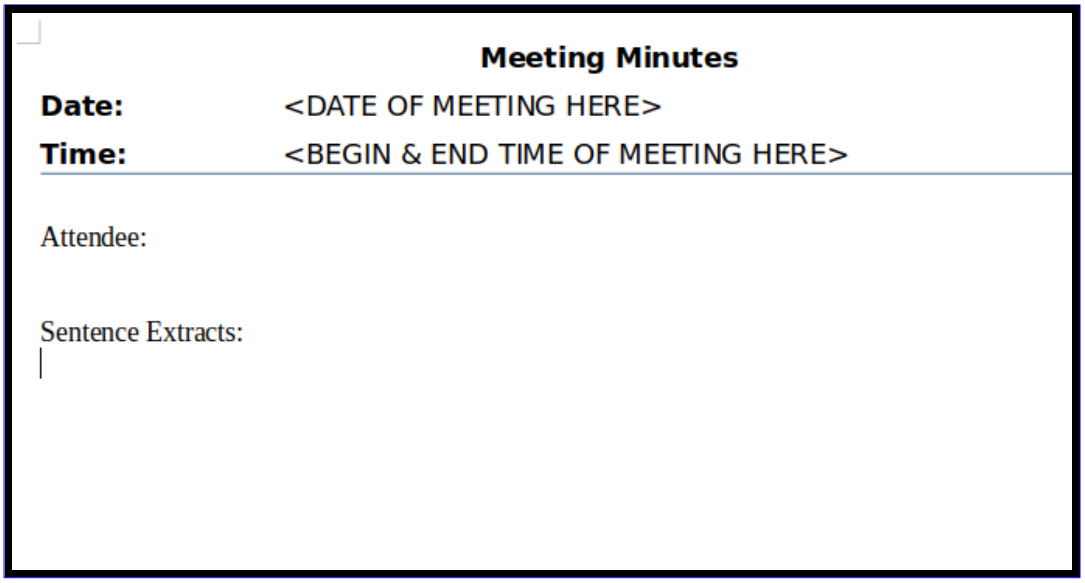


FIGURE 2.3: Meeting minutes template

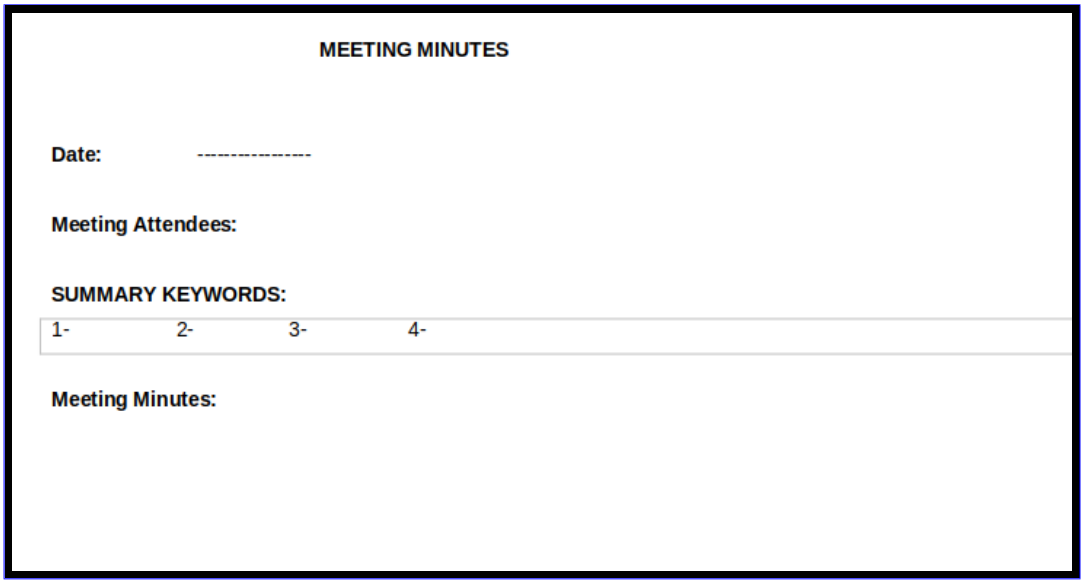


FIGURE 2.4: Meeting minutes template

## 2.3 Data Collection Techniques

In meeting minutes generator we are dealing with English and Urdu languages so we need to have recordings or transcripts in unsaturated format of both languages. The experimental corpus is generated through our meeting application.

it will carry recording of virtual meetings.The meeting corpus contains 30 distinct meetings, two thirds of which are scenario based meetings.The speech files range in length from 10 to 25 minutes and involve from 2 to 5 participants.

## 2.4 Experimental Design

We conducted data set of manual meeting minutes of final year group meetings. we used 30 annotated meeting minutes that carry up-to 2000 sentences. Participants were individually presented with the spoken discourse. As discuss in data collection technique we will make both scenario based which had been played (acted out) for creating the corpus and natural meetings that are Regular meetings often start with the minutes from the last meeting followed by 'matters arising' with what has happened in the previous meeting on the basis of that. For natural meetings we will have random final year group discussion of supervisors and their related groups and for scenario based We conducted the discussion sentence categorization using the data set of manual meeting minutes.For building the word vector, we used 10 annotated meeting minutes that have been split into sentences, "Questions" instances, "Discussion" instances,"Answer" instances and some are "Request" instances. The analysis[7] suggests that detected peaks (conversation overlaps, and other changes at different temporal scales) can be useful in summarization and indexing of meetings.

## 2.5 Meeting Minutes UI:


FIGURE 2.5: Meeting minutes UI

# References


[1] Susanne Burger, Victoria MacLaren, and Hua Yu. The isl meeting corpus: The impact of meeting type on speech style. In *Seventh International Conference on Spoken Language Processing*, 2002.

[2] Digital. meeting minutes stats: *video conferencing statistics 2020*. https://blog.otter.ai/meeting-statistics/, Last accessed on November 1, 2021.

[3] John S Garofolo, Christophe Laprun, Martial Michel, Vincent M Stanford, Elham Tabassi, et al. The nist meeting room pilot corpus. In *LREC*. Citeseer, 2004.

[4] Mark Hall, Eibe Frank, Geoffrey Holmes, Bernhard Pfahringer, Peter Reutemann, and Ian H Witten. The weka data mining software: an update. *ACM SIGKDD explorations newsletter*, 11(1):10–18, 2009.

[5] Adam Janin, Don Baron, Jane Edwards, Dan Ellis, David Gelbart, Nelson Morgan, Barbara Peskin, Thilo Pfau, Elizabeth Shriberg, Andreas Stolcke, et al. The icsi meeting corpus. In *2003 IEEE International Conference on Acoustics, Speech, and Signal Processing, 2003. Proceedings.(ICASSP'03).*, volume 1, pages I–I. IEEE, 2003.

[6] Jia Jin Koay, Alexander Roustai, Xiaojin Dai, and Fei Liu. A sliding-window approach to automatic creation of meeting minutes. *arXiv preprint arXiv:2104.12324*, 2021.

[7] RaviKiran Krishnan and Sudeep Sarkar. Detecting group turn patterns in conversations using audio-video change scale-space. In *2010 20th International Conference on Pattern Recognition*, pages 137–140. IEEE, 2010.

[8] Megha Manuel, Amritha S Menon, Anna Kallivayalil, Suzana Isaac, Dr KS, et al. Automated generation of meeting minutes using deep learning techniques. *International Journal of Computing and Digital System*, 2021.

[9] Iain McCowan, Jean Carletta, Wessel Kraaij, Simone Ashby, S Bourban, M Flynn, M Guillemot, Thomas Hain, J Kadlec, Vasilis Karaiskos, et al. The ami meeting corpus. In *Proceedings of the 5th international conference on methods and techniques in behavioral research*, volume 88, page 100. Citeseer, 2005.

[10] Anna Nedoluzhko and Ondrej Bojar. Towards automatic minuting of the meetings. In *ITAT*, 2019.