ViQu – A smart Interview/viva and quizzing solution

Capstone Project Proposal

Submitted by:

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Table of Contents

Project Overview

Engineering design problems are generally open-ended. They have no single correct answer, rather a range of possible solutions. The yearlong Capstone project keeps the desirability of open-ended design problems, the limitations of students' knowledge and experience in check while helping us learn.

In the various laboratory classes in the college we have numerous viva(s) and quizzes. This task of conducting vivas and quizzes is quite cumbersome for the teachers as it takes a lot of preparation. Also, the checking process is quite redundant, time taking and tiring which leads to delayed results.

So, our team is trying to create a product "ViQu" which is a solution to the problem. A product based on Raspberry Pi 3 along with some sensors will be created, which will be able to conduct vivas, create quizzes and even check them hence, creating a digitized result sheet instantly.

Moreover, a database of MCQs and subjective viva-like questions will be created overtime by the teachers which will help in the future. This question bank will have ques of 3 difficulty levels.

Finally, the product ViQu will be able to conduct vivas, mark them, create quizzes, mark them and a fine database of questions will be created for the above.

Need Analysis

- **Need to simplify the viva process:**

  As the number of students is increasing every year the work load on teachers also keeps increasing. Viva(s) are an integral part of lab work but on the other are too tedious for the teachers. Hence, ViQu will take this responsibility off their shoulders.

- **Need for a question bank:**

  Now a days the Quizzes need to be created by the teachers every time they are held. But with ViQu a large database of MCQs as well as subjective viva like questions will be created overtime which will help in the future.

- **Need for quicker and easier quiz checking process:**

  As we see the process of checking quizzes is quite redundant, tedious and time taking hence, the results sometime get delayed. ViQu will simplify this process.

Objectives

In order to fulfill our capstone project, we intend to achieve the following objectives:

- **To simplify the viva process:**
    1. ViQu will ask the questions.
    2. ViQu will create a transcript of the answer given by the student by using text summarization.
    3. ViQu will do a probable marking and create a mark sheet.

- **To create a question bank:**
    1. When the teachers will make the quiz the questions will be added to their question bank and by the passage of time it will improve.
    2. ViQu will create quizzes and ask viva questions from these question banks.

- **To simplify the quizzing process:**
    1. ViQu will generate the quiz based on the question bank.
    2. ViQu will apply image processing to check the answered quizzes.
    3. ViQu will evaluate these quizzes and will create a mark sheet.

- **To improve our skill set:**
    1. We want to have a project experience in a team.
    2. We would like to learn new technologies such as using Raspberry Pi, applying natural language processing.

Literature Survey

Technology of automatic text summarization plays an important role in information retrieval and text classification, and may provide a solution to the information overload problem. Text summarization is a process of reducing the size of a text while preserving its information content. This paper proposes a sentences clustering based summarization approach. The proposed approach consists of three steps: first clusters the sentences based on the semantic distance among sentences in the document, and then on each cluster calculates the accumulative sentence similarity based on the multi-features combination method, at last chooses the topic sentences by some extraction rules.[1]

Text Summarization is the process of creating a condensed form of text document which maintains significant information and general meaning of source text. Automatic text summarization becomes an important way of finding relevant information precisely in large text in a short time with little efforts. Text summarization approaches are classified into two categories: extractive and abstractive. This paper presents the comprehensive survey of both the approaches in text summarization.[2]

Hiring processes, when conducted by humans at least, have always been problematic because bias is so often unconscious. Personality and psychometric testing, blind auditions, webcam interviews and nameless CVs are on the rise, but in a face-to-face environment, anything from gender, race, clothing, education and accent can provide an unwitting platform for discrimination. Humans are inconsistent where robots are incapable of being anything but consistent.[3]

OCR reading technology is benefited by the evolution of high-powered desktop computing allowing for the development of more powerful recognition software that can read a variety of common printed fonts and handwritten texts. But still it remains a highly challenging task to implement an OCR that works under all possible conditions and gives highly accurate results.[4]

Methodology

- We will be collecting the problems faced in the viva and quiz taking process and will also evaluate how the whole process is undertaken. Will properly analyze how the quizzes are set and how the marking schemes of viva and quizzes is set.

- Then we will be searching for the perfect solution through research about how these problems can be solved such as the use of Raspberry Pi, NLP, various APIs, etc. We will firstly try to test these individual modules on our own system before putting them to test on the actual product.

- Then we will go on with the proper hardware implementation and side by side create modules for various features.

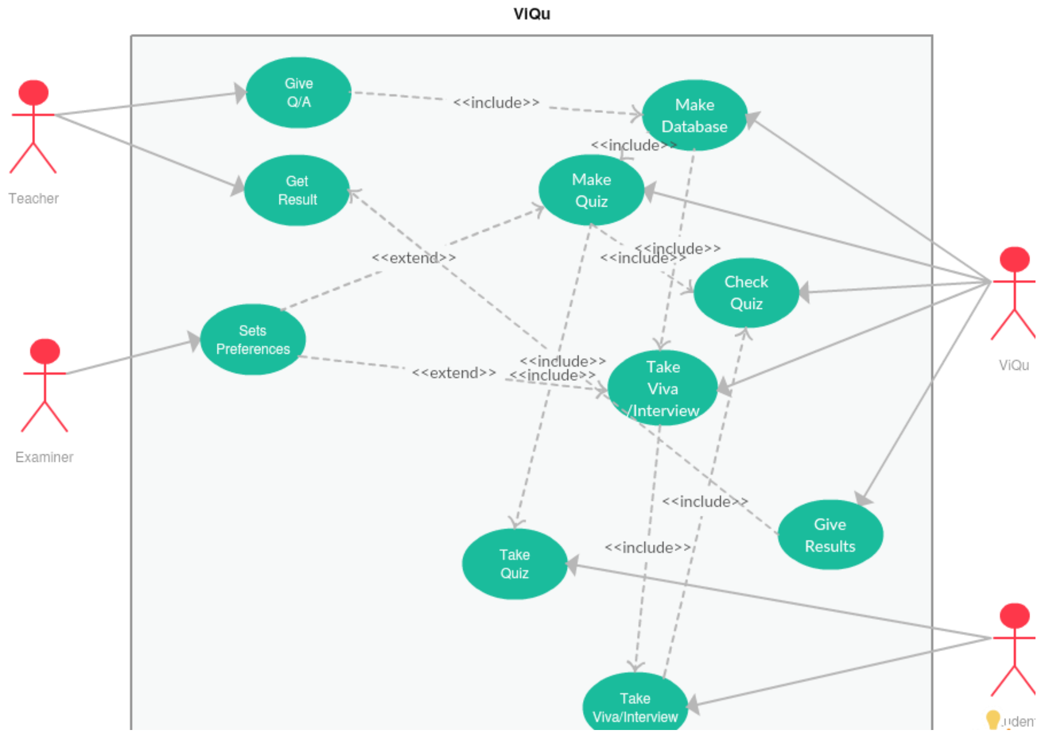
- Now we will run certain tests and try to keep the scenario as real as possible. We will involve a few teachers in it who might help us in getting a small question database to be created.

- Finally, we will try to solve the errors which are seen in the previous stages and will further improvise/optimize the product as needed.

- Now we will put the product to real time testing and will also create a report on the same.

Requirement Analysis and Design Diagrams

1.USE Case Diagram:



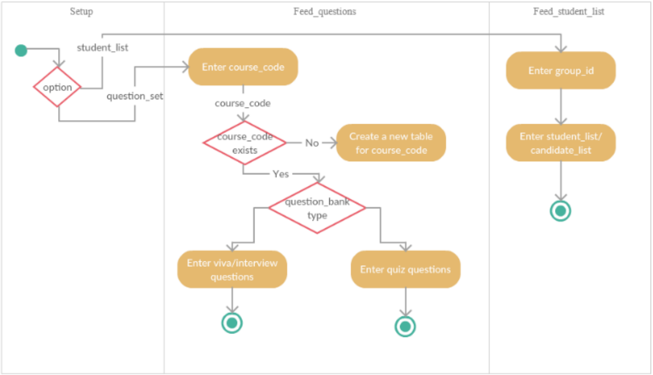
2.Use Case Template:

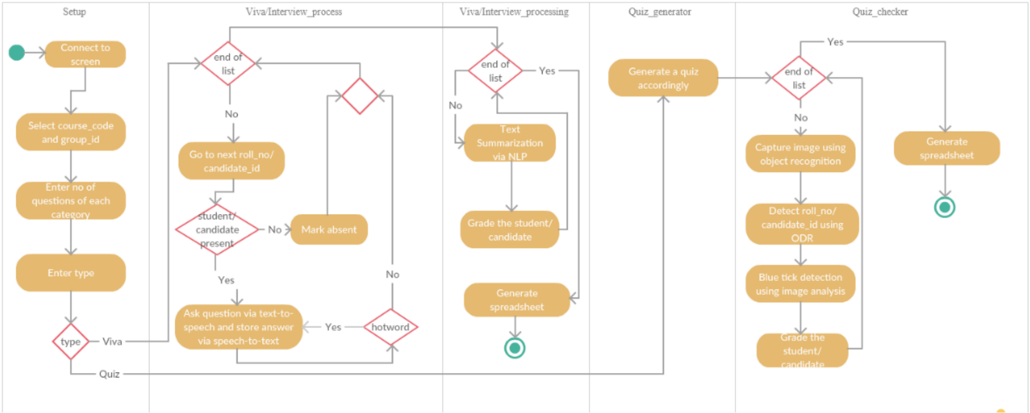
Use Case ID:	UID-101		
Use Case Name:	Interviewing/Viva and Quiz system		
Created By:	CPG28	Last Updated By:	CPG28
Date Created:	April 2nd, 2018	Date Last Updated:	April 3rd, 2018

Primary Actor:	Examiner
Secondary Actor:	Student, Teacher,ViQu
Description:	Teacher needs to submit questions and answers to ViQu, ViQu will make the database of these Q/A.ViQu will use the database for quizzing and taking interview/viva, Students will take the interview and quiz and ViQu will evaluate them for interview/viva it will use text summarization (using natural language processing) and for quiz it will use image processing to find out marked answers, these answers will be submitted to teacher.
Preconditions:	1. Hardware should be working correctly. 2. Interview/Viva should be in English. 3. Proper image should be provided for checking the quizzes. 4. Q/A should be provided by the teacher. 5. Extra disk space may be required. 6. Presence of the examiner may be required.
Postconditions:	1. ViQu can calculate the marks according to the students' performance. 2. Teacher can view the marks allotted by the ViQu.

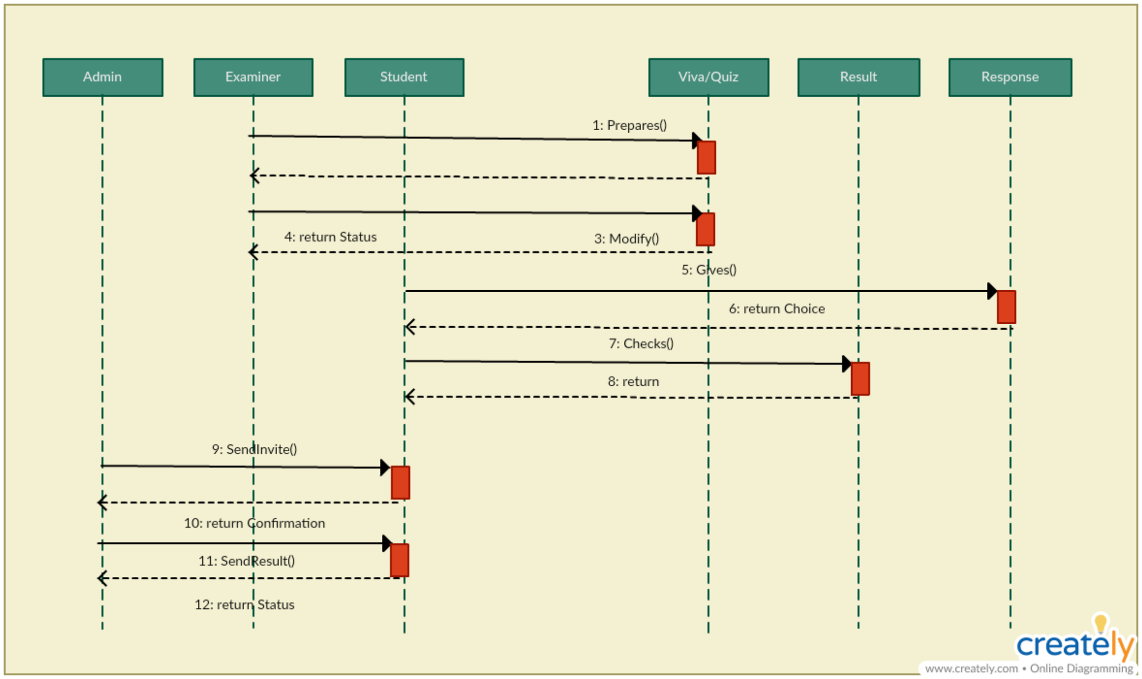
	3. Teacher can update the marksheet, if needed. 4. Question bank can also be generated using the database.
Minimal Condition:	1. Database will be generated. 2. Quizzes will be generated. 3. Results will be provided.
Frequency of Use:	1. The process of Interviewing/Viva and Quiz depends upon the number of participants. 2. Question/Answer and updating of database will occur every month.
Trigger:	1. Providing Q/A will trigger Database. 2. Database will trigger Quiz making. 3. Taking interview will trigger taking interview/viva by ViQu. 4. Providing quiz pictures will trigger checking quizzes. 5. Any kind of evaluation will result in result generation.
Variations:	1. Question/Answer can be provided as text file or as excel file. 2. Pictures may be directly provided to the system instead of making ViQu take them.
Extensions:	End session if input not provided for too long.
Assumptions:	1. Students responds in English. 2. Pictures provided for checking viva should be in good quality.

3.Activity Diagram:



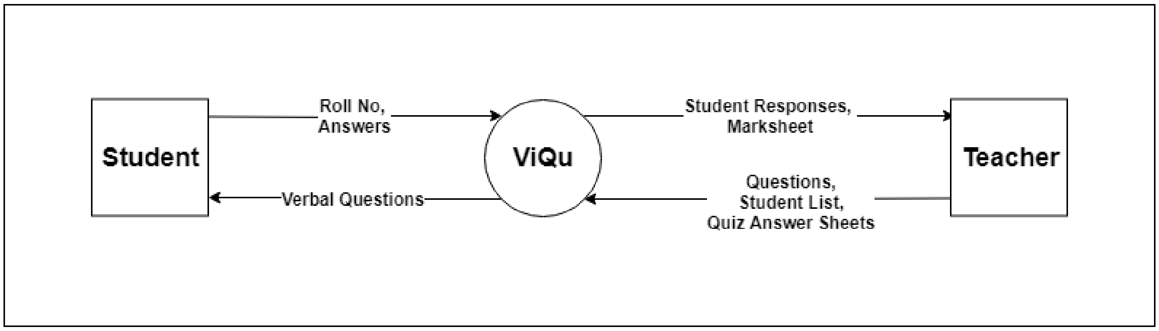

Setup
Viva/Interview_process
Viva/Interview_processing
Quiz_generator
Quiz_checker
Connect to screen
Select course_code and group_id
Enter no of questions of each category
Enter type
type
Viva
Quiz
end of list
No
Go to next roll_no/ candidate_id
student/ candidate present
No
Mark absent
Yes
Ask question via text-to-speech and store answer via speech-to-text
Yes
hotword
No
end of list
Yes
No
Text Summarization via NLP
Grade the student/ candidate
Generate spreadsheet
Generate a quiz accordingly
Yes
end of list
No
Capture image using object recognition
Detect roll_no/ candidate_id using ODR
Blue tick detection using image analysis
Grade the student/ candidate
Generate spreadsheet

4.Sequence Diagram:

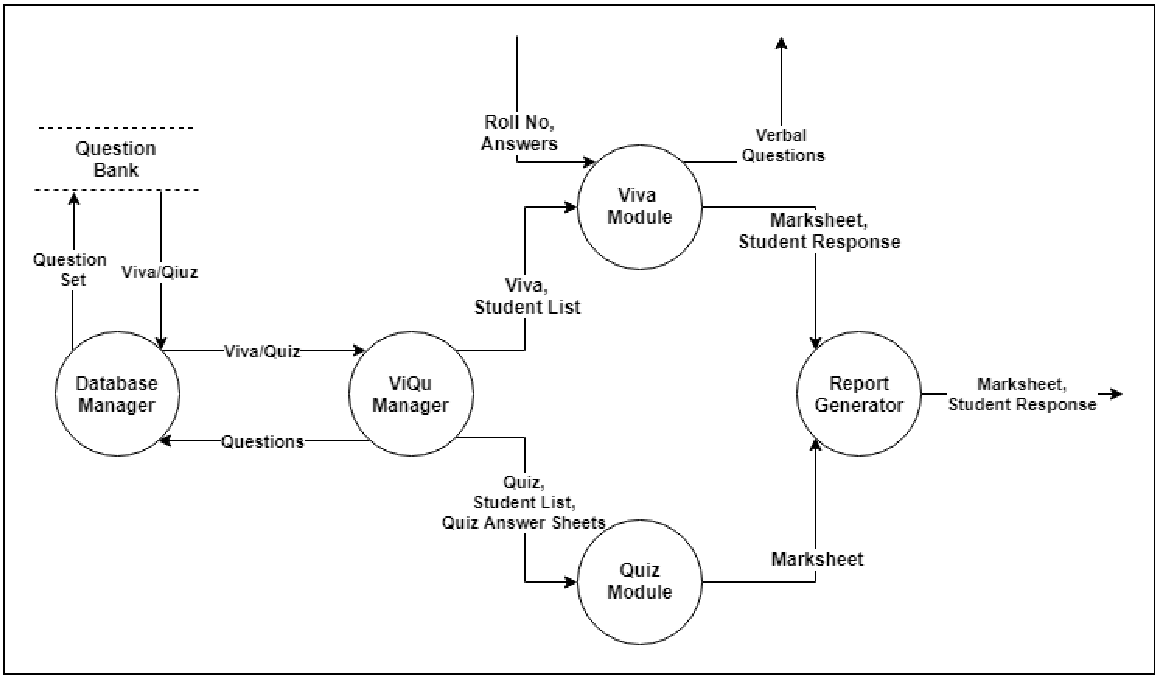


5.Data Flow Diagram:

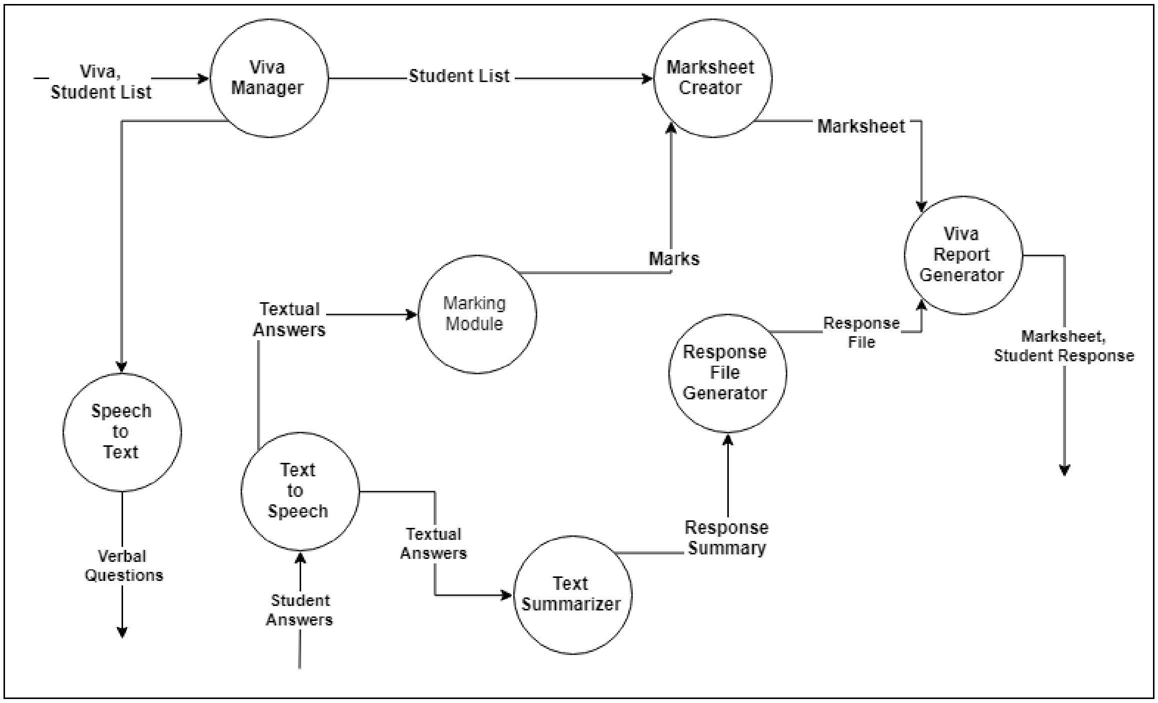
Level 0:



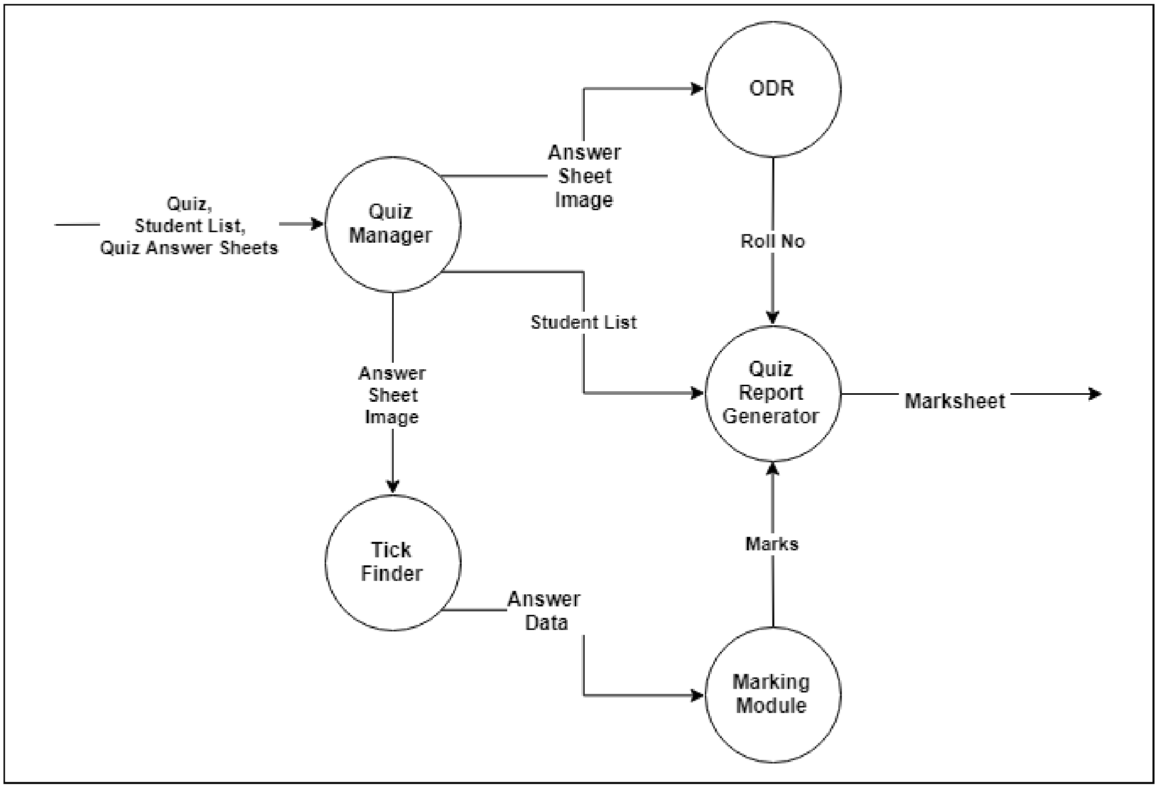
Level 1:



Level 2-1:



Level 2-2:


Quiz,
Student List,
Quiz Answer Sheets
Quiz Manager
Answer Sheet Image
ODR
Roll No
Student List
Answer Sheet Image
Quiz Report Generator
Marksheet
Tick Finder
Marks
Answer Data
Marking Module

6.Tasks and Subtasks:

1. Identification of project

2. Planning of project and need analysis
2.1. Planning
2.2. Scope plan

3. Study
3.1. NLP
3.2. Image Analysis
3.3. Raspberry Pi

4. Designing of various diagrams
4.1. Use-case diagram
4.2. Activity diagram
4.3. Work Breakdown Structure

5. Hardware interfacing
5.1. Setup of Raspberry Pi 3
5.1.1. Setup sensors
5.1.1.1. Camera
5.1.1.2. Mic
5.1.2. Setup Actuators
5.1.2.1. Speaker
5.1.3. Validating interfacing

6. Software interfacing
6.1. Setup Module
6.1.1. Create GUI (using Python – Tkinter library)
6.1.2. Create Different modules for Viva/Interview and Quiz setup

6.2. Viva/Interview Module
6.2.1. Viva/Int erview Generator
6.2.1.1. Question Bank Creation
6.2.1.2. Question Selector based on difficulty
6.2.2. Viva/Interviewing process module
6.2.2.1. Text-to-speech module (for asking questions)
6.2.2.2. Speech-to-text module (for registering response)
6.2.2.3. Storage module
6.2.3. Viva/Interview Processor
6.2.3.1. Text-summarization module (using NLP)
6.2.3.2. Keyword Extractor
6.2.3.3. Grade Analyzer

6.2.3.4. Spreadsheet Creator

6.3. Quiz Module
6.3.1. Quiz Generator
6.3.1.1. Question Bank Creation
6.3.1.2. Question Selector based on difficulty
6.3.2. Quiz Analyzer
6.3.2.1. Image Capturing module (using object recognition)
6.3.2.2. Roll no./Candidate ID detection module (using ODR)
6.3.2.3. Blue Tick Detection module (using Image analysis)
6.3.2.4. Marking module
6.3.2.5. Spreadsheet Creator

7. Integration
7.1. Software and Hardware integration
7.2. Module integration

8. Testing
8.1. Unit testing
8.2. Module testing
8.3. System testing
8.4. Acceptance testing

9. Deployment
9.1. Beta testing
9.2. Modifications
10. Evaluations

Assumptions and Constraints

Assumptions:

1. There are sufficient number of questions of each level(easy/medium/hard) of both interview as well as quiz modules, along with answers.
2. An invigilator must always be present during the time of interview.
3. There is a specific place for the student's roll number on the quiz sheet.
4. The student checks the correct answer using Blue Ink pen on the quiz sheet.

Constraints:

1. At a given time only one teacher can work with the interview bot.
2. The interview bot should only be handed to a teacher, and not anyone else to ensure security.
3. The result sheet generated will not be saved by the interview bot once the bot is set up again.

Analysis and Working Principles

1. Deep Learning:

Deep learning (also known as deep structured learning or hierarchical learning) is part of a broader family of machine learning methods based on learning data representations, as opposed to task-specific algorithms. Learning can be supervised, semi-supervised or unsupervised.

Deep learning models are loosely related to information processing and communication patterns in a biological nervous system, such as neural coding that attempts to define a relationship between various stimuli and associated neuronal responses in the brain.

Deep learning architectures such as deep neural networks, deep belief networks and recurrent neural networks have been applied to fields including computer vision, speech recognition, natural language processing, audio recognition, social network filtering, machine translation, bioinformatics and drug design, where they have produced results comparable to and in some cases superior to human experts.

We intend to use the same for text summarization process in the Interview/Viva process. Various open source libraries such as Tensor Flow, Microsoft Cognitive Toolkit, Theano, etc. work as an underlying principle to a Python library Keras, also open source, which we will be using to help the system in learning the text summarization patterns.

Keras contains numerous implementations of commonly used neural network building blocks such as layers, objectives, activation functions, optimizers, and a host of tools to make working with image and text data easier.

Also, with further study we may use the same library for other computation heavy tasks such as ODR - Optical Digit Recognition and tick detection, both used in the quiz checking process.

2. Raspberry Pi 3:

To make the product a stand alone one we will be using the Raspberry Pi 3 single board computer which while being a simple and easy to use computer will also empower us to run the computationally heavy modules due to its quite high specifications.

The Raspberry Pi 3 Model B includes 802.11n WiFi, Bluetooth 4.0, and a quad-core 64-bit ARM Cortex A53 running at 1.2 GHz, RAM 1GB of LPDDR2-900 SDRAM, and the graphics capabilities, provided by the VideoCore IV GPU.

3. Speech-to-text and text-to-speech:

These engines on the systems rely on the Google API which is available using the python library SpeechRecognition.

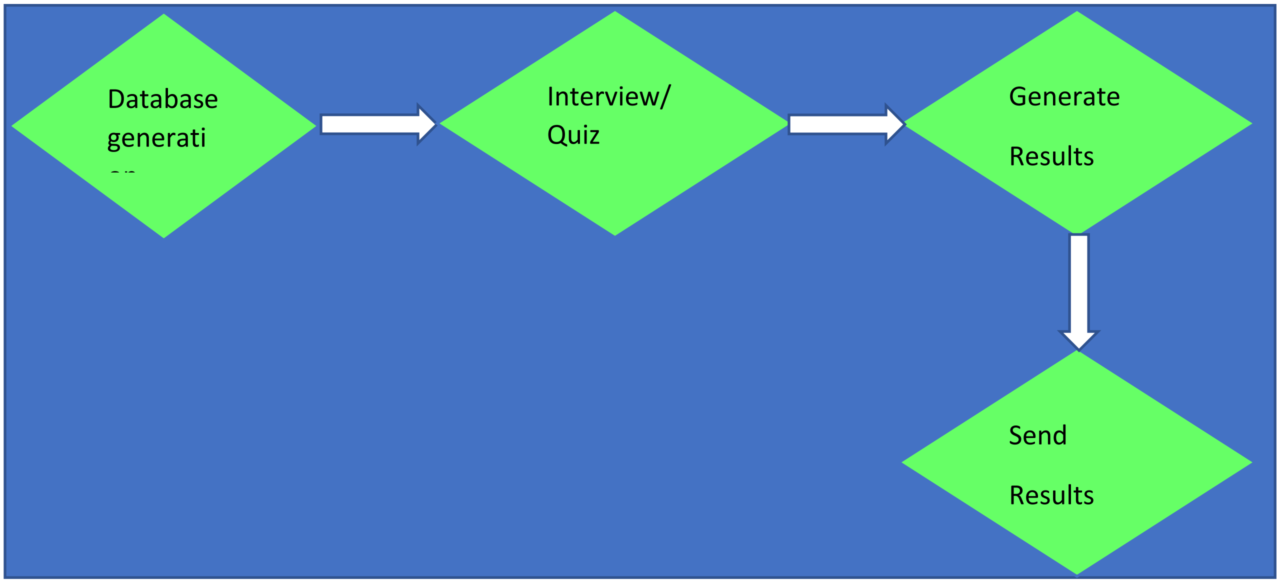
Google has a great Speech Recognition API. This API converts spoken text (microphone) into written text (Python strings), briefly Speech to Text. You can simply speak in a microphone and Google API will translate this into written text. The API has excellent results for English language.

There are several APIs available to convert text-to-speech in python. One of such APIs is the Google Text to Speech API commonly known as the gTTS API. gTTS is a very easy to use tool which converts the text entered, into audio which can be saved as a mp3 file.

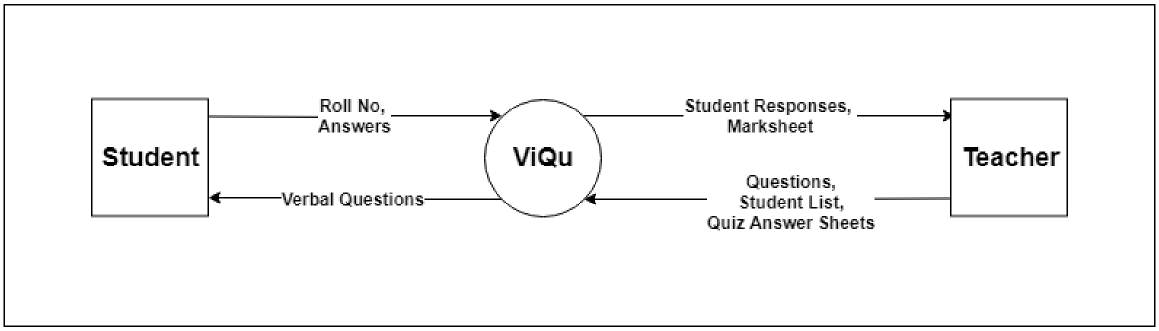
The gTTS API supports several languages including English, Hindi, Tamil, French, German and many more. The speech can be delivered in any one of the two available audio speeds, fast or slow.

Design Model

1. System Architecture:

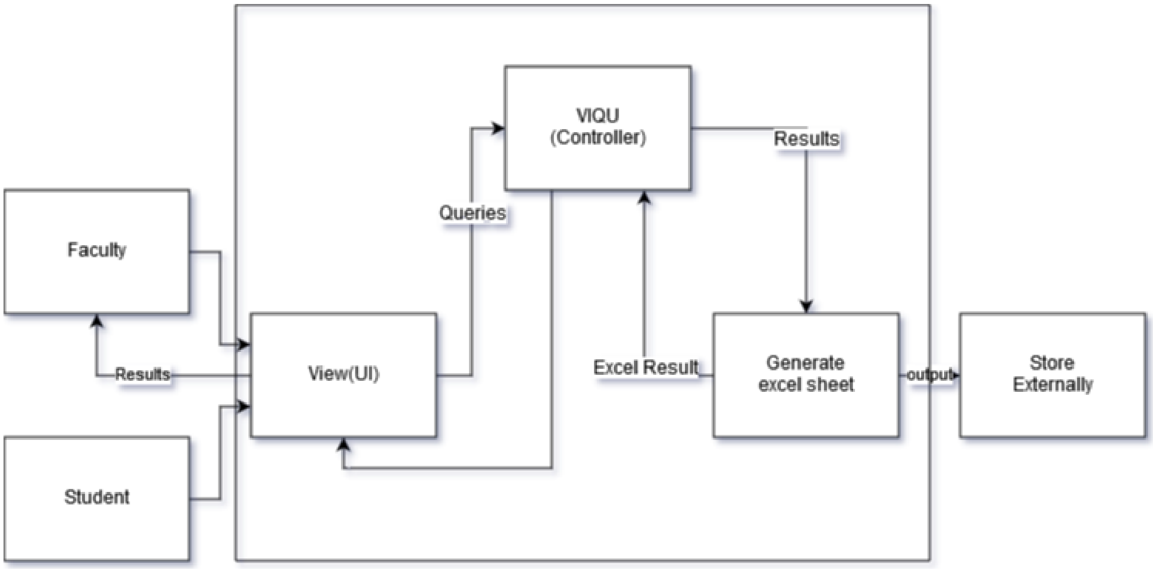


2. Context Diagram:



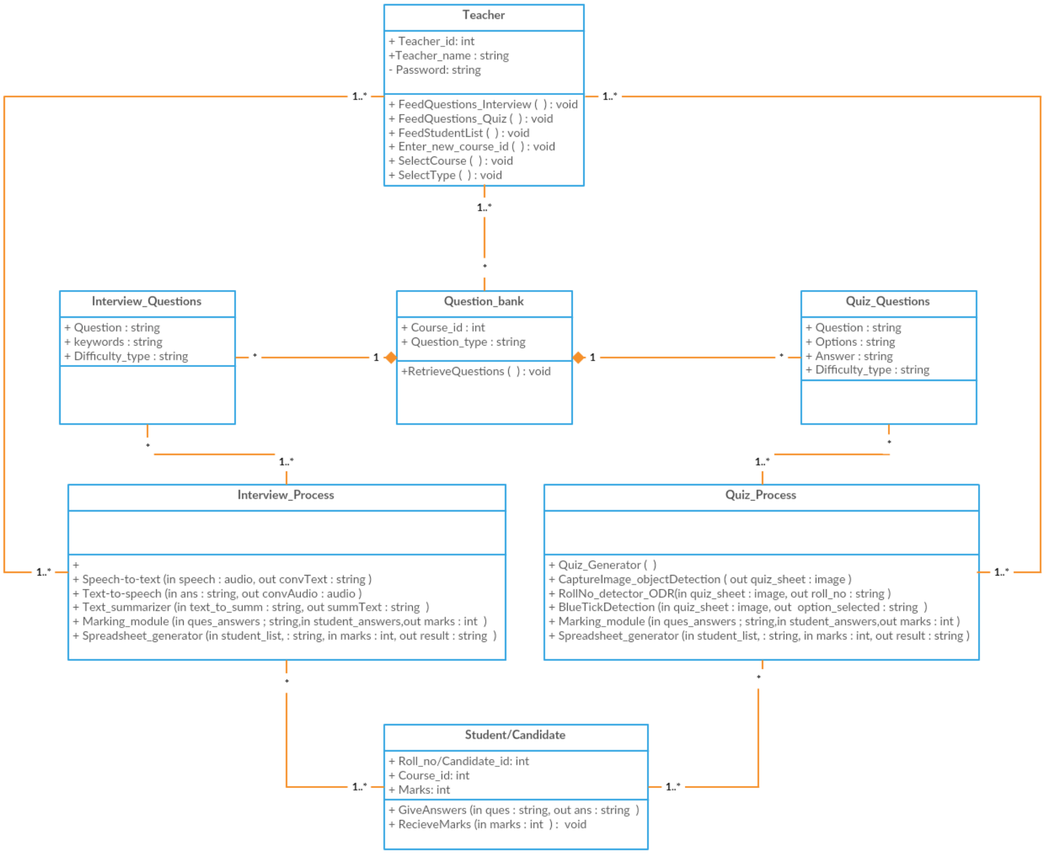
3. MVC Architecture:

Model-View-Controller Architecture



4.Component Diagram:

5.Class Diagram:


Teacher
+ Teacher_id: int
+Teacher_name : string
- Password: string
+ FeedQuestions_Interview ( ) : void
+ FeedQuestions_Quiz ( ) : void
+ FeedStudentList ( ) : void
+ Enter_new_course_id ( ) : void
+ SelectCourse ( ) : void
+ SelectType ( ) : void
1..*
1..*
1..*
*
Interview_Questions
+ Question : string
+ keywords : string
+ Difficulty_type : string
*
1
Question_bank
+ Course_id : int
+ Question_type : string
+RetrieveQuestions ( ) : void
1
*
Quiz_Questions
+ Question : string
+ Options : string
+ Answer : string
+ Difficulty_type : string
*
1..*
*
1..*
Interview_Process
+
+ Speech-to-text (in speech : audio, out convText : string)
+ Text-to-speech (in ans : string, out convAudio : audio)
+ Text_summarizer (in text_to_summ : string, out summText : string)
+ Marking_module (in ques_answers ; string,in student_answers,out marks : int)
+ Spreadsheet_generator (in student_list, : string, in marks : int, out result : string)
1..*
Quiz_Process
+ Quiz_Generator ( )
+ CaptureImage_objectDetection (out quiz_sheet : image)
+ RollNo_detector_ODR(in quiz_sheet : image, out roll_no : string)
+ BlueTickDetection (in quiz_sheet : image, out option_selected : string)
+ Marking_module (in ques_answers ; string,in student_answers,out marks : int)
+ Spreadsheet_generator (in student_list, : string, in marks : int, out result : string)
1..*
*
*
Student/Candidate
+ Roll_no/Candidate_id: int
+ Course_id: int
+ Marks: int
+ GiveAnswers (in ques : string, out ans : string)
+ RecieveMarks (in marks : int) : void
1..*
1..*

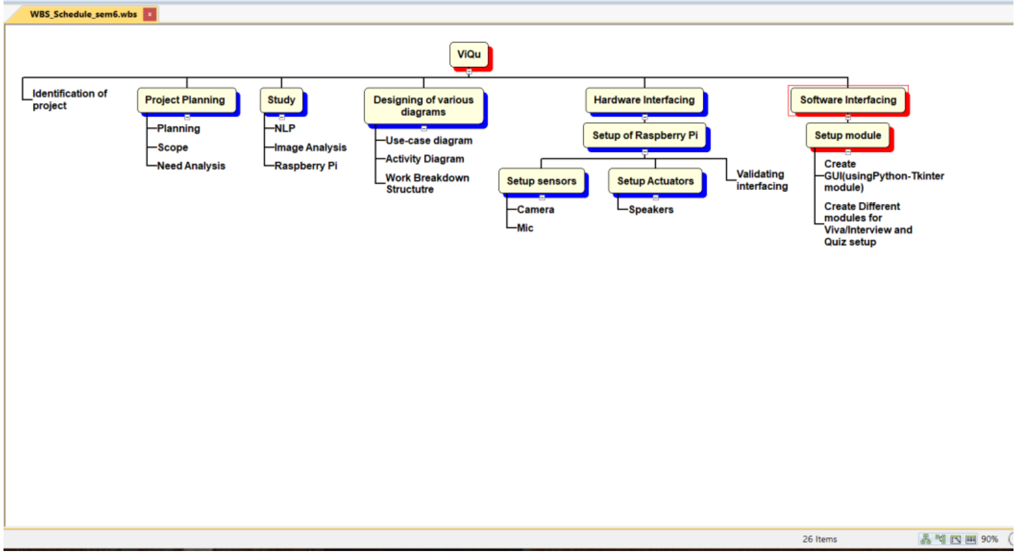
Work Plan

S.No	Activity	Month	January		February			March			April				May	
		Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Identification of project		■	■												
2	Planning of project and feasibility study (technical – software and hardware and, economic)				■	■										
3	Module testing						■	■								
4	Hardware interfacing								■	■	■	■				
5	Software implementation												■	■	■	■

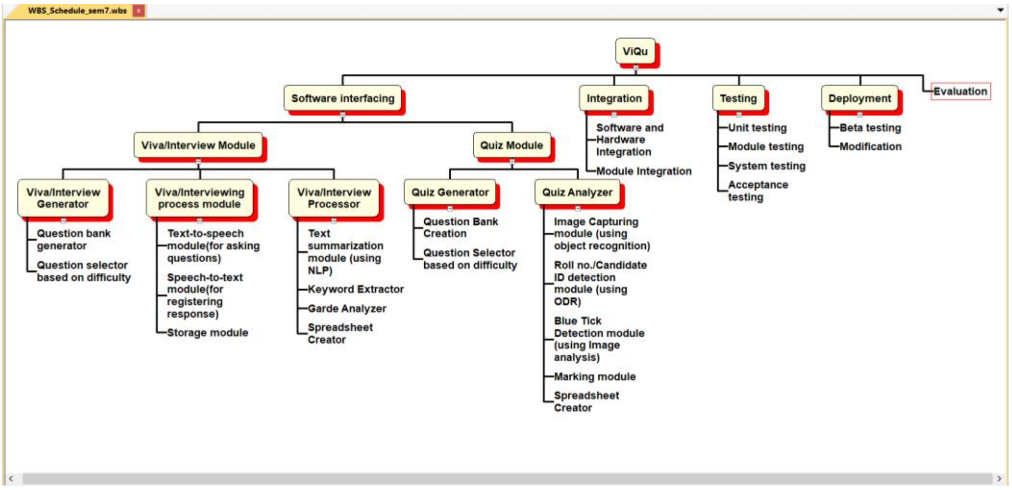
S.No	Activity	Month	July	August				September			October				November				December
		Week	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
5	Software implementation		■	■	■	■													
6	Design optimization						■	■	■	■	■								
7	Performing Modifications											■	■	■	■				
8	Results Evaluation															■	■		
9	Final Report																	■	■

Work Breakdown Structure

Semester 6

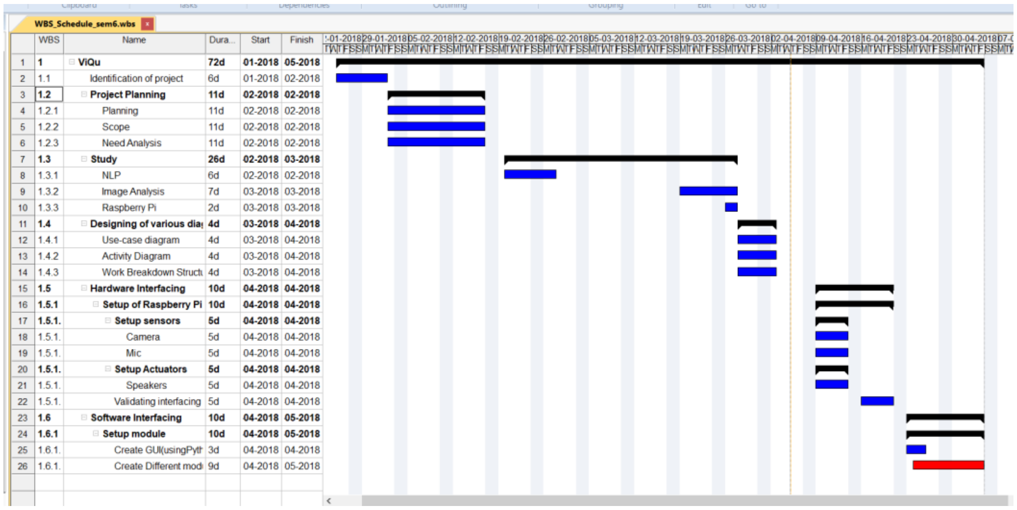


Semester 7



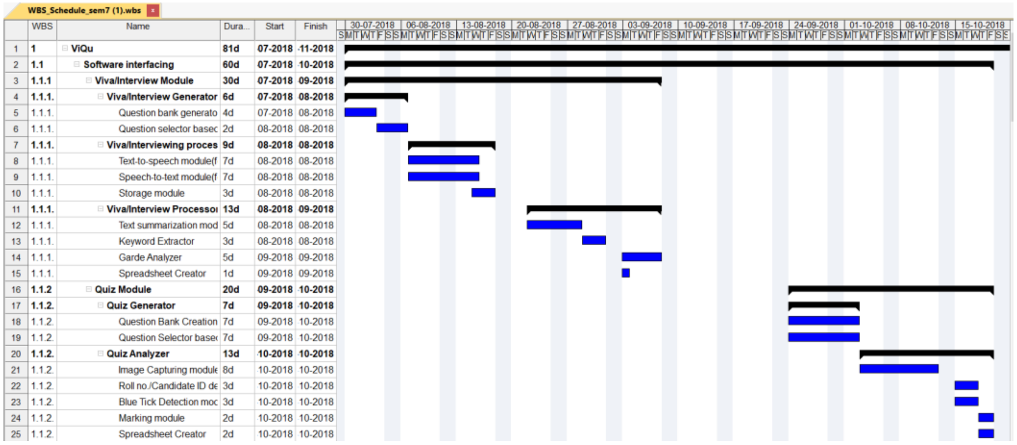
Gantt Chart:

Semester 6

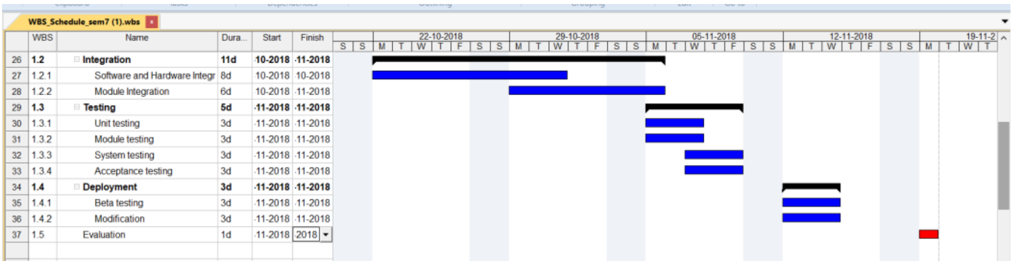


	WBS	Name	Dura...	Start	Finish
1	**1**	**ViQu**	**72d**	**01-2018**	**05-2018**
2	1.1	Identification of project	6d	01-2018	02-2018
3	**1.2**	**Project Planning**	**11d**	**02-2018**	**02-2018**
4	1.2.1	Planning	11d	02-2018	02-2018
5	1.2.2	Scope	11d	02-2018	02-2018
6	1.2.3	Need Analysis	11d	02-2018	02-2018
7	**1.3**	**Study**	**26d**	**02-2018**	**03-2018**
8	1.3.1	NLP	6d	02-2018	02-2018
9	1.3.2	Image Analysis	7d	03-2018	03-2018
10	1.3.3	Raspberry Pi	2d	03-2018	03-2018
11	**1.4**	**Designing of various dia**	**4d**	**03-2018**	**04-2018**
12	1.4.1	Use-case diagram	4d	03-2018	04-2018
13	1.4.2	Activity Diagram	4d	03-2018	04-2018
14	1.4.3	Work Breakdown Structu	4d	03-2018	04-2018
15	**1.5**	**Hardware Interfacing**	**10d**	**04-2018**	**04-2018**
16	**1.5.1**	**Setup of Raspberry Pi**	**10d**	**04-2018**	**04-2018**
17	**1.5.1.**	**Setup sensors**	**5d**	**04-2018**	**04-2018**
18	1.5.1.	Camera	5d	04-2018	04-2018
19	1.5.1.	Mic	5d	04-2018	04-2018
20	**1.5.1.**	**Setup Actuators**	**5d**	**04-2018**	**04-2018**
21	1.5.1.	Speakers	5d	04-2018	04-2018
22	1.5.1.	Validating interfacing	5d	04-2018	04-2018
23	**1.6**	**Software Interfacing**	**10d**	**04-2018**	**05-2018**
24	**1.6.1**	**Setup module**	**10d**	**04-2018**	**05-2018**
25	1.6.1.	Create GUI(usingPyth	3d	04-2018	04-2018
26	1.6.1.	Create Different mod	9d	04-2018	05-2018

Semester 7



	WBS	Name	Dura...	Start	Finish
1	**1**	**ViQu**	**81d**	**07-2018**	**11-2018**
2	**1.1**	**Software interfacing**	**60d**	**07-2018**	**10-2018**
3	**1.1.1**	**Viva/Interview Module**	**30d**	**07-2018**	**09-2018**
4	**1.1.1.**	**Viva/Interview Generator**	**6d**	**07-2018**	**08-2018**
5	1.1.1.	Question bank generato	4d	07-2018	08-2018
6	1.1.1.	Question selector basec	2d	08-2018	08-2018
7	**1.1.1.**	**Viva/Interviewing proces**	**9d**	**08-2018**	**08-2018**
8	1.1.1.	Text-to-speech module(f	7d	08-2018	08-2018
9	1.1.1.	Speech-to-text module(f	7d	08-2018	08-2018
10	1.1.1.	Storage module	3d	08-2018	08-2018
11	**1.1.1.**	**Viva/Interview Processo**	**13d**	**08-2018**	**09-2018**
12	1.1.1.	Text summarization mod	5d	08-2018	08-2018
13	1.1.1.	Keyword Extractor	3d	08-2018	08-2018
14	1.1.1.	Garde Analyzer	5d	09-2018	09-2018
15	1.1.1.	Spreadsheet Creator	1d	09-2018	09-2018
16	**1.1.2**	**Quiz Module**	**20d**	**09-2018**	**10-2018**
17	**1.1.2.**	**Quiz Generator**	**7d**	**09-2018**	**10-2018**
18	1.1.2.	Question Bank Creation	7d	09-2018	10-2018
19	1.1.2.	Question Selector base	7d	09-2018	10-2018
20	**1.1.2.**	**Quiz Analyzer**	**13d**	**10-2018**	**10-2018**
21	1.1.2.	Image Capturing module	8d	10-2018	10-2018
22	1.1.2.	Roll no./Candidate ID de	3d	10-2018	10-2018
23	1.1.2.	Blue Tick Detection moc	3d	10-2018	10-2018
24	1.1.2.	Marking module	2d	10-2018	10-2018
25	1.1.2.	Spreadsheet Creator	2d	10-2018	10-2018



	WBS	Name	Dura...	Start	Finish
26	**1.2**	**Integration**	**11d**	**10-2018**	**11-2018**
27	1.2.1	Software and Hardware Integr	8d	10-2018	10-2018
28	1.2.2	Module Integration	6d	10-2018	11-2018
29	**1.3**	**Testing**	**5d**	**11-2018**	**11-2018**
30	1.3.1	Unit testing	3d	11-2018	11-2018
31	1.3.2	Module testing	3d	11-2018	11-2018
32	1.3.3	System testing	3d	11-2018	11-2018
33	1.3.4	Acceptance testing	3d	11-2018	11-2018
34	**1.4**	**Deployment**	**3d**	**11-2018**	**11-2018**
35	1.4.1	Beta testing	3d	11-2018	11-2018
36	1.4.2	Modification	3d	11-2018	11-2018
37	1.5	Evaluation	1d	11-2018	2018

Functional and Non-functional Requirements

Functional Analysis:

Viva/Interview module:

- This module will fetch questions from the database to create a set of questions to be asked based on examiner preferences of difficulty level in the viva/interview.
- It will ask the candidate the set of questions created above using text-to-speech software module.
- It will record the response of the candidate to the asked question using speech-to-text software module.
- The recorded text above will then be summarized using the text-summarization software module.
- Also, the desired keywords will be searched in the candidate's response.
- Based on certain parameters of marking such as number of keywords required and relevance to the actual answer, marks will be awarded on a scale of 5.
- Finally, when all the questions have been asked a summary of the viva/interview is created with the final score.
- Also, in case of multiple candidates a spreadsheet can also be created with the details of all the candidates.

Quiz module:

- This module will fetch questions from the database to create a set of questions to be asked based on examiner preferences of difficulty level in the viva/interview.
- A quiz will be generated according to the difficulty required.
- After the candidates have taken the quiz, the quiz sheet is scanned via the camera attached to the device.
- The module scans the roll number/candidate id from the sheet using ODR software module.
- Now it detects the blue colored ticks on the multiple-choice questions and evaluates it.
- Finally, it enters the score of the candidate in the spreadsheet.

Setup module:

- This module is used by the examiner to setup the device for various requirements of the viva/interview/quiz.
- The examiner can enter the number of questions to be asked.
- The examiner can enter the difficulty level of the viva/interview/quiz required.

Non-Functional Analysis:

Performance requirement:

- This is a hardware-based project, so the actual performance of the device is dependent on the hardware we choose to build it.
- Moreover, the project has various resource hungry software modules like text summarizer, ODR ,etc hence hardware is to be chosen careful.

Product Cost:

Since it is a hardware-based project various device must be bought to create it.

The estimated budget related to these devices are as follows:

1.	Raspberry Pi 3	-	₹3150
2.	Mic	-	₹500
3.	Camera	-	₹1000
4.	Speakers	-	₹350
	Total	-	**₹5000**

Hardware used:

1. Raspberry Pi
2. Mic

3. Camera
4. Speakers

Software used:

1. Python Language
2. Python libraries
    2.1. Tkinter
    2.2. Keras
    2.3. Pytessaract
    2.4. Text-to-speech library
    2.5. Speech-to-text library
3. OS for Raspberry Pi 3

Security:

Since the device is always in the control of examiner, the students can never temper with it. Also to make it more secure we will be providing a feature where the final spreadsheet of marks can only be open with the help of a password, further making the data more secure.

Moreover, the device is not connected to the network, so it is not hackable.

Project Outcomes

Our project named “ViQu” is an assistant for taking viva, creating quizzes and analyzing them and evaluate accordingly and some the main objectives are as follows:

- ViQu will be a box case in which raspberry pi will be embedded with speakers, camera and mic.
- ViQu will be able to take the viva of a student and evaluate it, so as to make the process of viva faster and easier for both student and faculty.
- ViQu will also record these vivas for any future discrepancies if there are any.
- ViQu will also be able to create quizzes (MCQ type) and evaluate them by feeding the answered quiz picture to the ViQu and will finally give an excel file of the mark sheet.

Individual Roles

Team Member Name	Hardware Integration	Interview/Viva Module	Quiz Module	Software Testing	Integration Testing
Shivam Sharma 101503208	✓	✓		✓	✓
Shobhit Jain 101503211	✓	✓	✓	✓	
Shreya Aggarwal 101503213	✓		✓	✓	✓

COURSE SUBJECTS

- Natural Language Processing – for summarizing text after speech recognition.
- Information Management System- for creating and maintaining our database and using SQL (structured query language)
- Image Processing- for recognizing MCQs based quiz sheets.
- Engineering Design- for implementation of Raspberry Pi (like Arduino)
- Python

References

[1] http://ieeexplore.ieee.org/document/5234971/

P. y. Zhang and C. h. Li, "Automatic text summarization based on sentences clustering and extraction," *2009 2nd IEEE International Conference on Computer Science and Information Technology*, Beijing, 2009, pp. 167-170.
doi: 10.1109/ICCSIT.2009.5234971

[2] http://ieeexplore.ieee.org/document/7860024/

N. Andhale and L. A. Bewoor, "An overview of Text Summarization techniques," *2016 International Conference on Computing Communication Control and automation (ICCUBEA)*, Pune, 2016, pp. 1-7.doi: 10.1109/ICCUBEA.2016.7860024

[3]https://www.theguardian.com/careers/2016/dec/14/soon-robots-could-be-taking-your-job-interview

[4] http://ieeexplore.ieee.org/document/5328096/

M. A. Rahiman and M. S. Rajasree, "A Detailed Study and Analysis of OCR Research in South Indian Scripts," *2009 International Conference on Advances in Recent Technologies in Communication and Computing*, Kottayam, Kerala, 2009, pp. 31-38.
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