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## Developing Dataset Management of Speech Recognition Based Automatic English-Speaking Skill Testing System

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### ABSTRACT

Speech recognition technology has been widely used to aid English language testing, such as for pronunciation and speaking practice for various use cases including job interview simulation. We developed an app, powered by speech recognition technology and regex text processing, that automatically score participants' speaking performance. However, this application lacks dataset management for the speaking test maker to manage the indicators of accepted answers. A feature to effectively manage the dataset and efficiently ease the speaking test creation is needed. This paper presents the development of dataset management feature to support the speech recognition based automatic English-speaking skill testing system. All elements that support the feature in development were tested through Blackbox testing with various scenarios. The elements were proven to work as intended to support the existing system. The new feature has brought efficiency for the English-speaking test maker.

## 1. Introduction

Speaking English fluently has traditionally been one of the abilities examined in English as a Second Language (ESL) or English as a Foreign Language (EFL) classrooms, particularly in Indonesia (Isadaud et al., 2022). The majority of college English lecturers and English teachers at all levels grade their students' English speaking abilities directly. Topic-based presentations, open discussions, guided presentations, role plays, and many more types of English test presentations are examples.

Job interviews are covered in one of the English lessons taught at the university level. Common interview questions asked by employers while interviewing job candidates make up the lesson of the job interview. There are various common English expressions and sentences used to address these typical interview

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questions since they have common types of replies (Anggraheni, 2018). As a consequence, students are taught to employ certain idioms and sentences while responding to particular interview questions. Students are asked to participate in a role-playing exercise called a "job interview simulation," in which some act as the interviewer asking the typical questions while the rest of the class acts as the applicant providing the answers. Direct interview with the professor is another method of simulating a job interview, in which a student serves as the interviewee and the lecturer acts as the interviewer.

When there are a lot of pupils, the latter type of job interview simulation—head-to-head between the lecturer and the interviewee—becomes problematic. The lecturer can use this style of testing to evaluate the students' performance in depth, but it might take hours when there are a lot of students—nearly 30 in one class—because of the length of the exam. This circumstance necessitates a method for automatically scoring the pupils' performance during the English-language job interview simulation. It requires a method or instrument to assist English lecturers or professors in cutting down on the time needed to assess student performance (Sa'diyah. et al., 2022).

Speech recognition technology has been extensively utilized to evaluate and practice English pronunciation. Numerous apps test a small set of English words or phrases utilizing the speech recognition capability (Muhammad & Alimudin, 2018). There are several applications for speech recognition, including schooling. Speech recognition technology is used by several apps, including Duolingo, Talkiebuddy (Muhammad et al., 2019), Rosetta Stones, and others, to give practice with English pronunciation. All of these applications give users instructions on how to read or pronounce the words, phrases, or even sentences that are offered. It will be marked as accurate whenever the spoken text that was obtained using voice to text processing matches with the appropriate words, phrases, or sentences in the database.

The task of matching student speech to text input as well as the appropriate words, phrases, or sentences in the database is difficult when it comes to evaluating students' replies or answers to particular interview questions because the students' responses may differ from the ones used in Duolingo, Talkiebuddy, and other similar programs, where the text to be spoken and the text in the database are identical. To make it obvious, we would want to include the following details:

When asked "Tell me about yourself" in an interview, candidates are frequently asked to provide information about their names, birth dates, and places, as well as their current residences, interests, and educational histories. We want to limit the scope of the coverage to names. Look for words, phrases, or sentences that indicate name mentioning to determine whether a pupil has said his or her name. There are a few different responses that may mention a name, such as "My name is... ", "I am... ", "You can call me... ", or perhaps one of the other options. The testing instrument that we create must be able to recognize clues in responses to particular questions, such as "Tell me about yourself."

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In the previous research, (Sa'diyah. et al., 2022) developed the first stage of the automatic English speaking test app. The first stage app has been able to 1) capture a user's voice and convert it to text using speech recognition technology, 2) provide markings for input text that match with the dataset of accepted / correct respond to a specific question using Regex command, 3) enable administrator to create quiz containing questions and intent parameters which is used as dataset of accepted answers to a specific corresponding answer, 4) allow administrator to manage scoring to each accepted answer 5) manage user, 6) display history of a user attempts and scores, and many more.

The first stage was able to process the input, that is using speech recognition. The participant's voice was captured and converted into text. The text was then processed using Regex algorithm to match with the indicator phrases of each indicator category of a specific job interview question. (Ningrum et al., 2020)

Figure 1 shows how a student as a test taker, in this case an interviewee, comes to the quiz page of a job interview simulation questions. Each question is displayed in the middle above the record button. When the test taker is ready, she/he can press the start button, and the app begins recording. After the beep sound, the test taker can start speaking to answer the corresponding question. If she/he finish answering, she/he can click the button again to stop the recording. Subsequently, the test taker is required to click the submit button. Once the submit button is clicked, the converted speech to text that is captured and stored in a temporary folder is stored in the database and is processed by the app's algorithm to generate a score for his/her performance.

Figure 2 shows a capture of a pop-up screen displaying a result from a participant or test taker. The question is Please introduce yourself. The participant's answer text contains 5 categories, that are Greeting, Name, Opportunity thanking, Education, and Origin. However, the category of Hobby is still green. This means that the answer text does not contain any phrase that resembles or tells about his/her hobby.

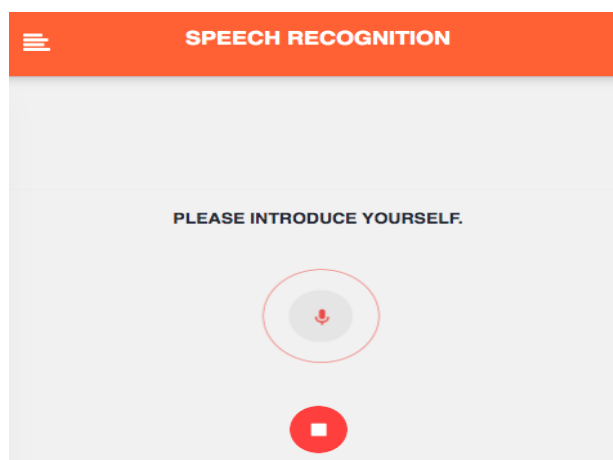


Figure 1. Job Interview Simulation Question Page Where Student Record Voice

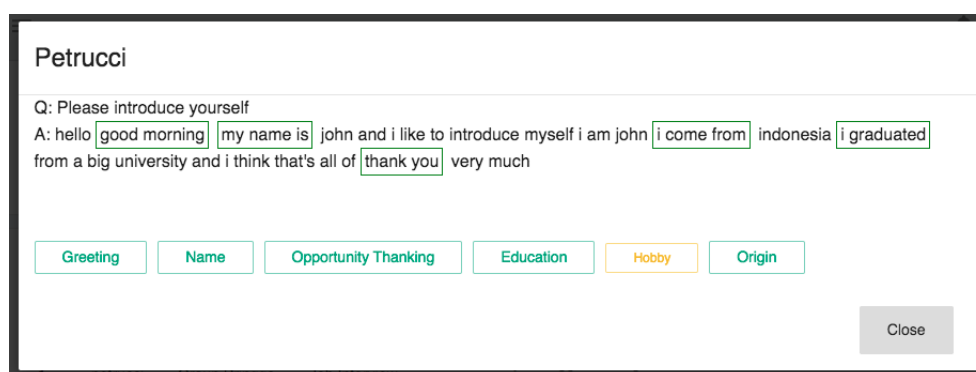


Figure 2. Details of Captured Speech to Text, Processed, and Displayed for Analysis.

The fact that indicator words wrapped in a subject or purpose ought to be able to be used again in queries was discovered in the initial stage app, nevertheless. The first phase app does not provide this functionality, for instance, the topic or purpose of "name" can be utilized as inputs in other inquiries or commands such as "Please introduce yourself."

Therefore, in the present study, we reorganized the workflow of the quiz development and administration, especially on the theme or intent data, for an easier production of questions inside a quiz throughout this app in the future. This innovative method can reinforce and improve the dataset while also opening up a larger variety of subject or intent uses within the app.

We intended to invite additional instructors to contribute in enlarging the dataset by including more intent elements in order to sustain this new functionality. We anticipate that by integrating more teachers, this feature will receive a better update, particularly from the perspective of the instructors as the intent-maker.

## 2. Methodology

Since the focus of this current development is to enable teachers or quiz makers to re-use the stored intent, the method that we use to develop this feature is waterfall method. This method includes stages of Requirements, Design, Implementation, Testing, and Maintenance (Adhella, 2021).

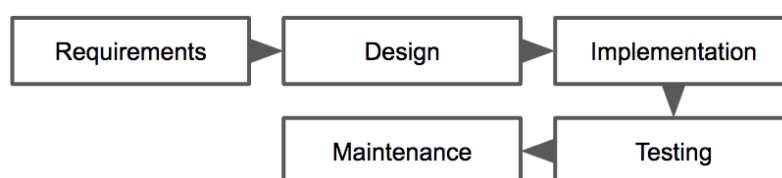


Figure 3. Waterfall Method

According to the teachers' and admin's experience in using the earlier version of the app, different speaking tend to use similar assessment aspect. For example, the

intent of Greeting is always used in almost every speaking performance assessment. This is because Greeting is a common conversational element that one uses (Namrullah & Rasyid, 2021). Whether the one is opening a presentation or opening conversation with friends, or opening a story telling performance, or any other presentation, Greeting is often used. There are other speaking intents that may be shared frequently. Thus, instead of creating new intent containing the same purpose, it is more efficient to use a single intent that is enriched over time and can be re-used. Considering this matter, providing a workflow in which the system can store various intent in a single database that allows teachers to reuse the stored intents for various quizzes is on demand.

The design of the new feature, that is intent, is constructed in such a way so that it allows the teacher to easily re-use existing intent to avoid creating new intent while it already existed. Figure 4 shows that an admin can create and edit the intent database. The saved intents are then re-usable by teachers. Furthermore, teachers, when creating a quiz, can re-use the already existing intents or create a new one.

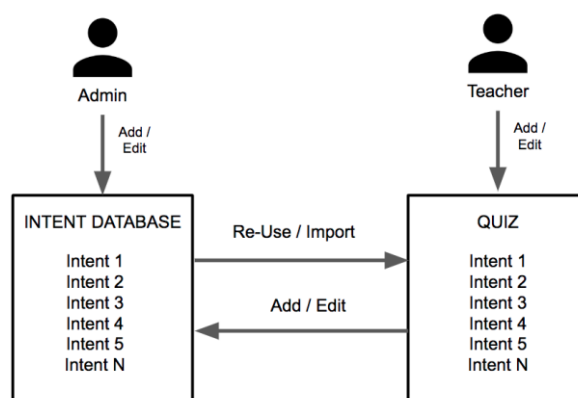


Figure 4. How the intent management works

To implement this new feature, we cloned the existing app project, and we add this new feature. We established the app under the same programming language as used in the earlier version that is PHP. We added a new menu named New Intent in the menu navigation tab. This menu allows the admin or the teacher to add new intent. Furthermore, we added a new access to the teacher in the quiz creator page. Using this feature, teacher is allowed to access the stored intent for reuse.

To check if this new feature works as intended, we test it using Blackbox method. The elements corresponding this feature that we test include Menu to access intents, Intents Data Page, Intent item display button, Intent item edit button, Intent item delete button, and Re-Use intent Field. These elements composite how this new feature works. As these elements are checked and considered working well, the teacher or administrator shall be able to use it as intended.

To maintain this new feature, we planned to continue using this new feature by inviting more teachers to participate in enriching the dataset by adding more intent

items. By involving more teachers, we expect to see what next update that can better this feature especially on the point of view of the teachers as the intent maker.

### 3. Results and Discussion

The result of this research and development is the addition of new feature to our existing automatic English-speaking testing app with speech recognition. We present how the new feature looks and words, and the result of the Blackbox testing that portrays what elements in the new feature, how it is supposed to work, what scenario that we used to test each of the element, and the result. The details of the two are elaborated in the followings.

#### *The intent feature*

This new feature is intended to avoid teachers as test makers creating the new category indicators while actually they consist of the same intent. For example, almost every speaking test that was created by the teachers using this app use the category indicators of Greeting. Every time a teacher composed a new speaking quiz, the category indicator of Greeting was created. This resulted in a number of the same indicator category of Greeting. This is considered not efficient. The idea is to make commonly used category indicator such as Greeting to be able to be stored and accessible for re-use instead of creating the new one but similar. Thus, in this phase of development, we introduced the new feature we call intent. Figure 5 shows the difference of app menu between the earlier app and the currently developed app. There is an addition of Intent sub-menu under the Master Data menu.

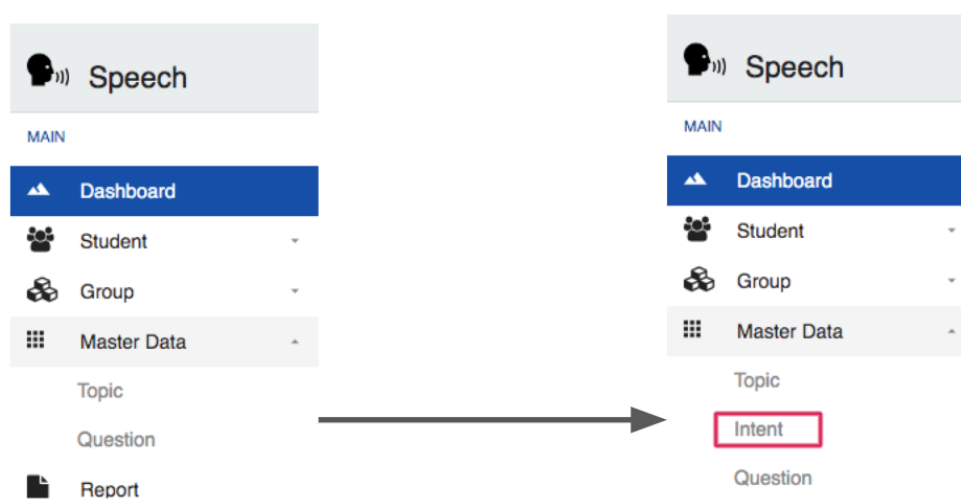
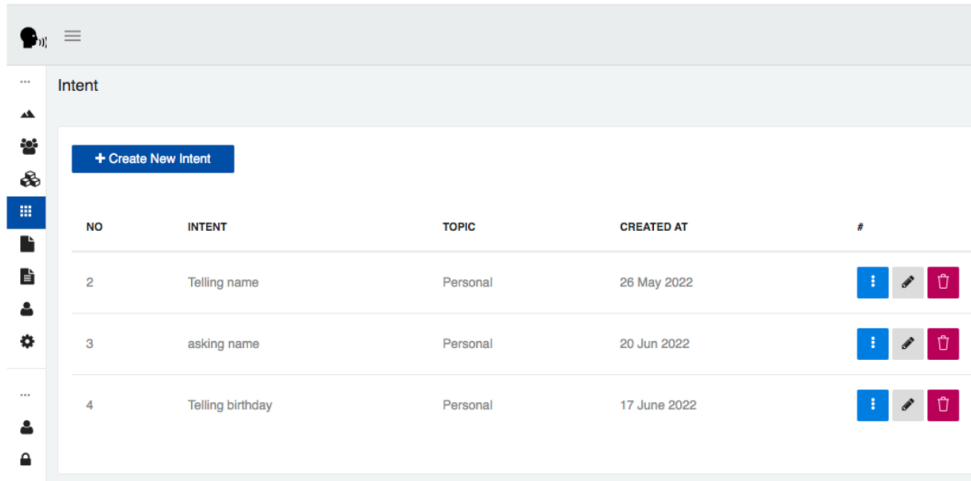


Figure 5. Change and Addition of the New Intent Menu

Figure 6 shows the Create New Intent page. This page is accessible from the Intent sub menu as portrayed in Figure 4. This page displays the already stored

intents created by admin. The teacher or quiz maker can use any of these stored intents without having to create a new one if the intended intent already existed. Admin can create a new intent by clicking on the Create New Intent button.









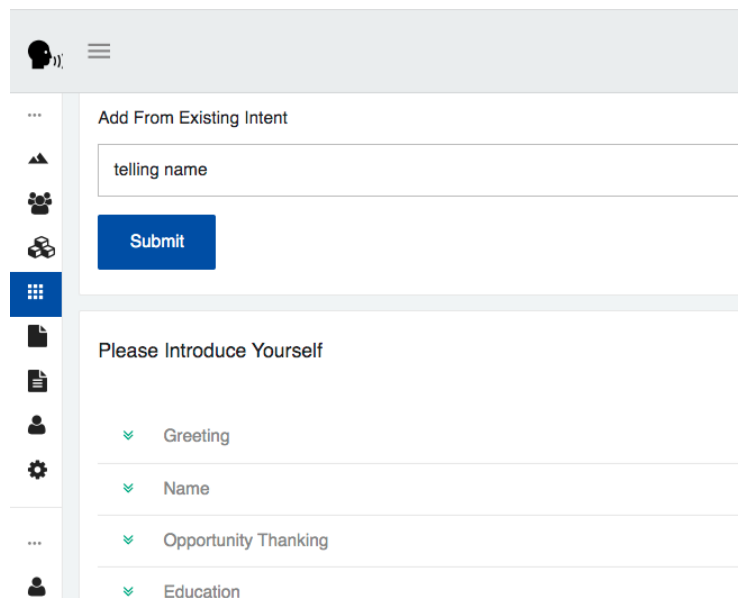
NO	INTENT	TOPIC	CREATED AT	#
2	Telling name	Personal	26 May 2022	 
3	asking name	Personal	20 Jun 2022	 
4	Telling birthday	Personal	17 June 2022	 

Figure 6. The Intent List Page

Figure 7 displays how a teacher, in the quiz creator page, re-use any existing intent from the database by typing initial letters corresponding to the intent in search by the teacher as quiz maker. If the demanded intent exists, it will appear in the text field, and it can be selected and added by clicking the submit button. Once submitted, it will appear in the list of intent or category indicators of answer to the corresponding question.



Add From Existing Intent

Submit

Please Introduce Yourself

- ∨ Greeting
- ∨ Name
- ∨ Opportunity Thanking
- ∨ Education

Figure 7. How Intent Can be Re-Used for Another Quiz

### ***The Blackbox Test Results***

We tested the elements of the new feature within our automatic English-speaking test application, that is also powered by speech recognition technology, through Blackbox testing method (Supriyono, 2020). The elements that we tested were menu to access intents, intents data page, intent item display button, intent item edit button, intent item delete button, and re-use intent field. We presents the expected results, the test scenario, and the results in table 1.

Table 1. The Blackbox Test Results

<b>Element</b>	<b>Expected</b>	<b>Test Scenario</b>	<b>Result</b>
Menu to access intents	Shown in the left menu tab navigating to the intents data page when clicked	Clicking the left menu bar tab, seeing if the intents menu appears Clicking the intent menu, seeing if it navigates to the intents data page	OK
Intents Data Page	Displaying list of stored intents Displaying a button to create new intent Displaying a button to view an intent in the list Displaying a button to edit an intent in the list Displaying a button to delete an intent in the list	Checking if the list displays stored intents Checking if the page displays a button to create new intent Locating if each item in the list displays a button to view the content Checking if each item in the list displays a button to edit the content Checking if each item in the list displays a button to delete the intent item	OK
Intent item display button	When clicked, displaying the content of the intent item in a pop up layer.	Checking if each display button in each intent item displays the content in a pop up layer.	OK
Intent item edit button	When clicked, taking to a new page to the intent item content edit page.	Checking if the edit button of each intent item, when clicked, takes to the edit page of the intent item.	OK
Intent item delete button	When clicked, displaying a pop up confirming the deletion, and when confirmed, item is deleted and show a feedback of the deletion.	Checking if the delete button, when clicked, displaying a pop up confirming the deletion, and when confirmed, item is deleted and show a feedback of the deletion, and the item deleted is no longer in the list.	OK
Re-Use intent Field	When typed in, displays the intent name based on the letter typed in. When an item appearing is selected and the add button is clicked, the intent is added to the intent list.	Typing in the re-use intent field, and see if it displays the result of intent item based on the corresponding letter typed into. Selecting an intent item from the search result list, clicking the add button, and see if the selected intent item is added.	OK



According to our Blackbox test, all elements that support the use of the feature intent worked as intended. This means that the quiz maker can re-use intents that are already stored in the database. Teachers, as quiz maker, no longer need to create the same intent again and again across quizzes. Rather, they can just search any existing intent in the storage and re-use them. This feature gives significant efficiency to the teacher when creating speaking quiz.

#### **4. Conclusion**

Eventually, through this current research and development, the addition of a new feature called re-usable intents brings efficiency in English Speaking quiz creation. All elements that support the re-usable intent feature have been tested through Blackbox testing with various scenarios and have been found working as intended. However, there may be another issue to overcome or additional improvement to perfect the feature. Thus, in the maintenance stage, as suggested by the method we implemented in this research, we encourage the teachers to create more quizzes, to test with more students, and we monitor in case any part of the system requires fixing or additional features that we need to develop in the upcoming research.

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