



Bilkent University

Department of Computer Engineering

Senior Design Project

Project Specifications Report

Project Name: Mutrivia

Team ID: T2316

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1. Introduction

Museums have an essential role while maintaining cultural heritage; however, how these heritages are displayed in museums is not the most effective way to capture visitors' attention [1]. When people visit museums, they tend to be bored and easily distracted. Thus, museums start to initiate projects using new technologies such as cloud and mobile technologies, sensors, and artificial intelligence to create memorable experiences [3]. Since interactive experiences typically leave the most impression on people, gamification tools and techniques are influential in drawing museum visitors' attention [1, 2]. So, we will build an interactive question-based game that can be played on mobile phones. Since generating questions for each object in a museum where, for instance, Rahmi Koç museum has over 5000 objects, is a time-consuming task; therefore, we will propose a natural language processing solution that will automatically generate questions from the text we provide. Then, these questions will be used to test people's knowledge and create a competitive environment.

1.1. Description

Mutrivia will be a mobile application that museum visitors will use. There will be museums and quiz environments on the application.

Natural Language Processing will be used on the server. An introductory text for an object exhibited in the museum will be given as input to the system. We have already taken sample texts from the Rahmi Koç Museum in Ankara. The sample text looks like the below (correct answers are highlighted):

"This is one of the first flags ordered by Mustafa Kemal Atatürk for the celebration of the declaration of the Turkish Republic on the 29 th October 1923. It was bequeathed to Nilüfer Çavuşoğlu by her grandfather Zekai Apaydın, one of the first deputies of the Turkish National Assembly and erstwhile Minister of Defence."

Sample multiple-choice questions and answers would be the following:

1- *"On which date was the Turkish Republic declared?"*

29 October 1923

30 October 1923

27 October 1923

28 October 1923

2- *"Who bequeathed the flag to Nilüfer Çavuşoğlu?"*

Nilüfer Çavuşoğlu's grandfather

Atatürk

Zekai Apaydın

Turkish National Assembly

Manually producing different questions from long texts and also finding answers is time-consuming; thus, using artificial intelligence and natural language processing (NLP) can save time for question makers.

The texts are short (about half a page) standing next to the object and giving information about that object. However, not all objects have a detailed explanation; thus they shouldn't be included in the quiz section. After discarding those, the system will generate questions from that text and provide 4 answers, one of them being the correct answer. One of our challenges will be generating false answer choices as distractions. The system must provide answers similar to the real answer; thus the player should be distracted.

Moreover, the texts we will require will be in English because within the framework of the project; it will be a system that can be used in museums in various parts of Europe. In addition, there will be features such as a user-friendly user interface, scoring, and competition in the system that will be similar to Kahoot which is a quiz-based learning game [4] but there will be levels so that people of any age can use the platform. For instance, people who chose different levels shouldn't be in the same session since the difficulty level of the questions will differ considering the players' ages or interests in museums. According to Rahmi Koç Museum manager Özgür Ceren Can, usually primary schools and kindergartens bring classrooms one by one and want to play within their group where the age requires the game to be easy so they will be able to choose the easy level [5]. Furthermore, if a visitor has a special interest in that museum, then s/he can choose the normal level.

There are 10 types of innovations that are under the 3 main categories. Our project is going to be in the scope of customer engagement which is under the experience section [6]. The innovation we want to launch to market is sustainable innovation since it focuses on using new technology to enhance visitor interaction in existing museums [6]. The project aims to launch a new service beyond the core business portfolio of the museums. Therefore, the experience of visitors using our application is revolutionized and the user experience transformation is provided. With that, the user experience is improved.

However, we might face resistance from people about using our application. Since people do not want to change what they use, it is a risk for us to make people use our application. Another possible problem is the language of the application. Because we will launch our application in English initially, people may not want to use our application. In addition to that, we have an implementation risk which is a difficulty-level system. We want to add a level feature which is generating questions according to some difficulty level. We might not be able to implement it, since defining its difficulty level can be abstract. We need to define the difficulty levels properly so that people do not face two extreme questions at the same difficulty level.

1.2. Constraints

1.2.1. Implementation Constraints

- NLP will be used to generate questions
- The answer choices must be related to each other
- There will be two levels according to the easiness of questions
- Git and GitHub will be used for version control
- Questions will be multiple-choice questions, 4 answers
- There will be a scoreboard after the scores are calculated
- A username is going to be asked to keep track of the scoreboard

1.2.2. Language Constraints

- The language will be English. However, this will put an obstacle for those who don't know English yet want to visit museums. Therefore, after releasing the beta version and testing the application to see whether it works properly, then we will translate the texts and questions into Turkish as well.

1.2.3. Timeline Constraints

- The project Specification Report is due on the 17th of October 2022, and Analysis & Requirements Report is due on the 7th of November 2022. The presentations and prototype demos will be replaced at the end of the fall semester. Therefore we need to prepare reports and work on the demo of our project. However, spring semester due dates are not yet announced.
- The questions should be generated in less than 0.5 seconds.

1.2.4. Social Constraints

- Users will engage in a group, or they will use the application by themselves. They will engage the party by party id and see the participants' scores and their scores through the party scoreboard. There will be no profile or no direct user-to-user interactions in the application.

1.2.5. Economic Constraints

- The application will be free for all users. The project website, database, server to keep the project, Google Play Store, and Apple App Store require a fee to maintain the application for users. However, if a museum wants to make their museum available on our application, it will have to pay.

1.2.6. Ethical Constraints

- The application is not going to share any of the data with third-party users and the application is not going to ask or collect further data other than the user's name or username and the difficulty level to determine the level of the game.

1.2.7. Maintainability Constraints

- User feedback will enhance the question-generating AI; for instance, the application will collect 5-star-based accuracy scores after each game. Since the questions are generated using NLP, their reasonability will be checked via user feedback.

1.3. Professional and Ethical Issues

In the making of this project, we have considered the issues that we may have to face both professionally and ethically. Considering the increase in the concern of data privacy violations, we have planned to implement this application so that no private information will be held and thus, data privacy violations would not be a concern in the application's current state. Since the quizzes and/or trivia in the application are planned to be session based, after a session terminates, there will not be any private data other than the user's scores.

As a team, we have also considered the leakage of object descriptions in the museum. There will not be unauthorized use of the museum's object descriptions. But since we will have to store object descriptions from different museums, we will protect this data so that only the current museum visitors can see objects' descriptions.

Additionally, any data preserved for this application will not be shared with third-party users.

2. Requirements

2.1. Functional Requirements

2.1.1. Mobile Application

- The application must allow users to create a party and become a host.
- The application must show a unique id to each party's host, letting other users join the party by using that id.
- The application must let users join a party by entering unique ids.
- The application must let users pick a nickname when joining a party and select a game level.
- The application must have an option to let the user play alone.
- The application must show questions and answer options to the user.
- The application must let the user select an answer option, show the correct answer and show how many points the user gets from that question.
- The application must show the user his/her score.
- The application must show the winner when the game is over.
- The application will be used by scanning a QR code which will be generated and given by the museum.
- The application must provide an all-time leaderboard that shows top scorer users ordered by their score in a party.

2.1.2. Server-side

- The application must be able to generate questions from texts for each party or solo player.
- The application must calculate the number of points users get from their answers.
- The application must order the users of a party according to their score and decide the winner when the game is over.
- The application must generate a unique id for each party.
- The application must check entered party ids and assign users to parties according to the id entered.
- The server must save the user's username or name and score on the scoreboard if a user passes the lower score limit of the leaderboard.

2.2. Nonfunctional Requirements

2.2.1. Performance

We will produce each question in real-time and it shouldn't take more than 0.5 seconds for a smooth user experience. We will store only the required texts, but each time a user plays the game, a new question will be generated; thus, producing fastly is crucial so that the user doesn't wait too long. Also, it should be scalable because multiple museums will be enrolled in the system and all requests should be handled without bottleneck. To make the process as fast as possible, we will use server-side to generate questions and calculate users' points as mobile phones are much slower at doing such calculations.

2.2.2. Usability

The mobile application will be used by many people and people of many ages. Therefore it should be user-friendly. Since we aim to make museums more entertaining, the application should not frustrate users. Also, it should look attractive and likable since it is a game. In short, a simple, easily understandable, and appealing interface will be provided.

The user interface should be simple with no distracting themes. As the main aim of this project is to increase the interaction of people who visit museums with the exhibited objects, complex and detailed user interfaces may distract users from museum objects to only the application.

2.2.3. Extensibility

We will begin with a couple of museums. Therefore, the application should be adaptable to other museums that may be included in the future. In addition, we may add new functionalities in the future such as different language options, different levels of difficulty, and different question types.

2.2.4. Rationality

The questions the application would generate using natural language processing must be accurate to the corresponding object description text. The questions should not be out of context from the objects' descriptions. Also, the answer choices should be reasonable with the question, and the wrong answers should be compatible with the correct answer so that it can distract the player.

2.2.5. Portability

This application is specialized for smart mobile devices only. There will not be any web or desktop version of this project. This project will support both Android and iOS operating systems.

2.2.6. Security

All the data collected from museums are going to be kept securely. No third-party user is going to be accessing this private data.

2.2.7. Reliability

The application must not have extended server downtime to give users an uninterrupted experience. It also must not be laggy and have delays. As the users who will be using the application will be in a friendly competitive state while trying to answer the questions, both the sessions and users' local experience must not be interrupted for long or frequently.

3. References

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