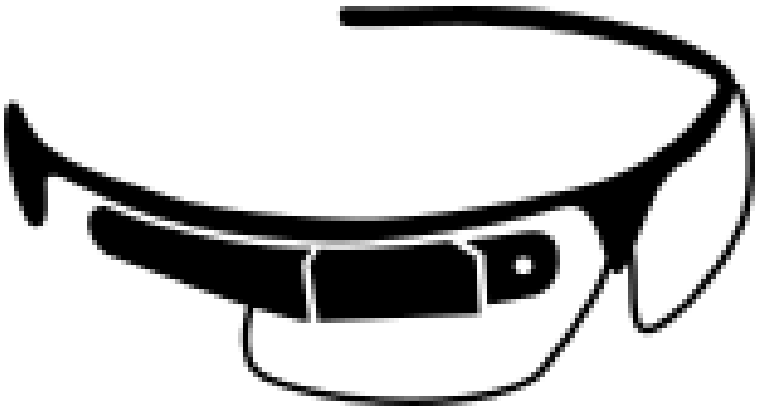
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
THE UNIVERSITY OF TEXAS AT ARLINGTON

SYSTEM REQUIREMENTS SPECIFICATION
CSE 4317: SENIOR DESIGN II
SUMMER 2021



LOOKING GLASS
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MICHAEL AIYEDUN
MATTHEW SPEER
SUMAN RAMAN POUDEL
ALEXANDER WEST

Revision History

Revision	Date	Author(s)	Description
0.1	6.19.2021	MS, AW, MA	document creation
0.2	6.22.2021	AW	document revision
0.2	6.23.2021	AW,SP	document revision
0.2	6.24.2021	AW	document revision

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1 INTRODUCTION

Looking Glass functions as a QR code reading software for smart glasses, to provide users with the ability to access stories and information on QR codes. Looking Glass is installed on smart glasses by museums to scan QR codes placed around their exhibits in order to offer additional context and visual and audio mediums to learn about the art installations. It allows exhibit owners to create their own QR codes and customize the information they provide to their patrons.

2 System Overview

Looking Glass will function under five primary layers with one of them, the application layer, being the central unit that connects all the others. The application layer will handle all the input from the interface, camera, motion input, and data layers as well as make sure to return the necessary output for each different layer to properly function. The interface layer will be one of two primary user layers, managing the user experience. The camera layer will be the other user interactive layer, following the user's directive to determine what information they wish to receive. The motion input layer will be a secondary back end system that will determine the user's intent based on their head movement**.** The data layer will store the content necessary for exhibits to archive and be retrieved for the user upon requests received from the application layer.

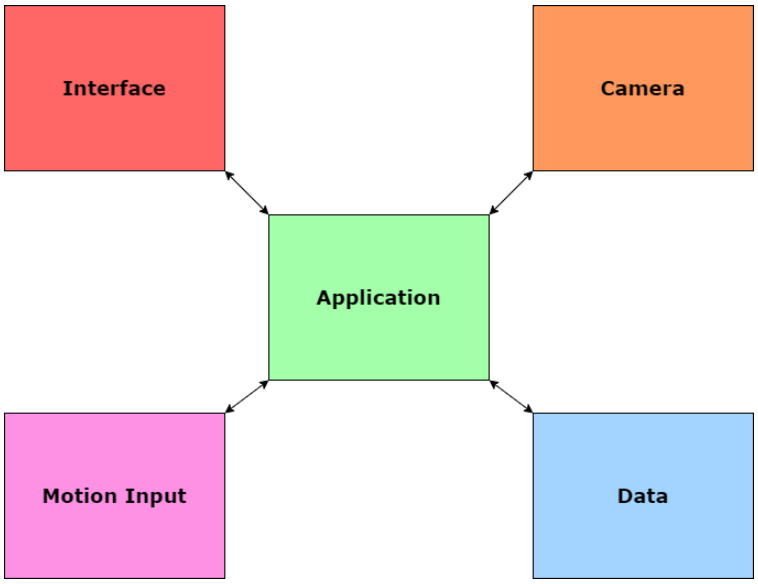

Figure 1: Looking Glass layer overview

2.1 Interface Layer Description

This layer is responsible for the main bulk of the user's interaction with the application. It will feature the audio, video, and text for exhibits that the user wishes to view as well as be responsible for input such as the touch controls.

2.2 Camera Layer Description

The camera layer will receive permission from the application layer to begin scanning for QR codes. It will follow the user's gaze in order to determine which codes the user desires to inspect so it can relay said information to the application layer to process.

2.3 Application Layer Description

The application layer holds the bulk of the software as it takes all the requests from all other layers and outputs them accordingly to ensure proper processing. It will receive the touch inputs from the interface layer to determine application state and send the proper audio and visuals the user wishes to experience. To the camera layer, it will permit or deny it to scan for QR codes at the user's behest and when the camera layer returns a QR code it will begin to process it. For the data layer, the application will process the QR codes from the camera layer in order for it to retrieve and then format the contents

to be sent back to the interface layer. With the motion input layer, the application layer will occasionally send requests to monitor the user at which point it will receive the motion input layer's accelerometer readings in order to determine the user's intent.

2.4 Motion Input Layer Description

The motion input layer will receive requests from the application layer to measure the head motion of the user. This will be sent back to the application layer to determine what QR codes the user is possibly trying to scan or if they are wanting to avoid opening up new codes.

2.5 Data Layer Description

The data layer will store all the audio, video, and text for each exhibit. Upon request from the application layer, it will retrieve the necessary data and send it back to the application layer to be processed.

3 Subsystem Definitions & Data Flow

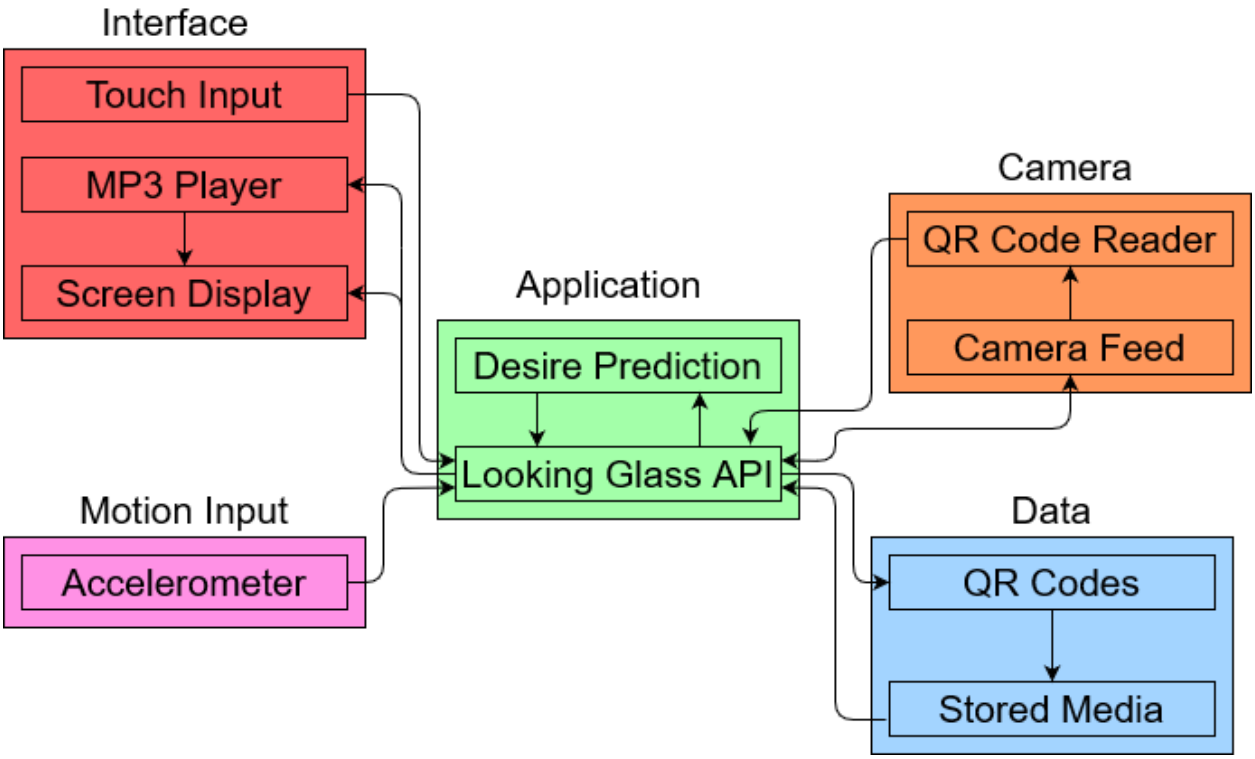

Figure 2: Looking Glass data flow diagram

4 Interface Layer Subsystems

The interface layer primarily deals with the encapsulation of the application, presenting the audio and visual information to the user while keeping track of the physical input as well. The interface layer is divided into the touch input, mp3 player, and screen display.

4.1 Touch Input

The touch input will read the user's physical touch on the smart glasses' touch pad, recording which direction or number of taps the user inputs in order to determine their commands to activate the Looking Glass into modes to scan for QR codes or to close down currently active codes.

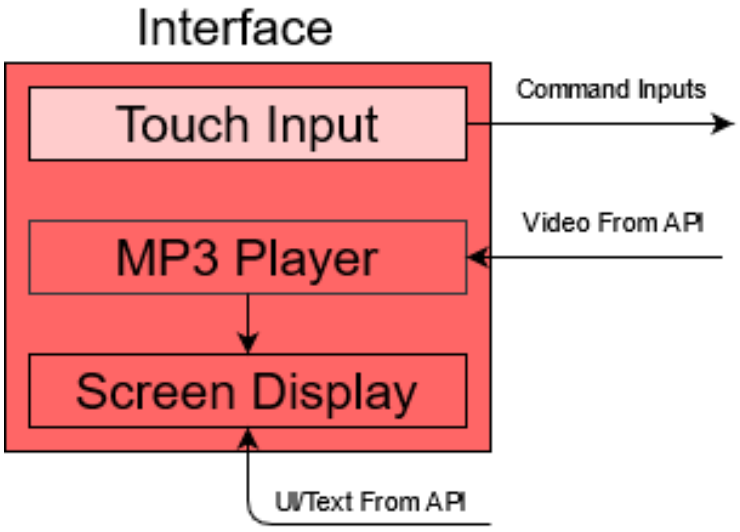

Figure 3: Touch Input diagram

4.1.1 Assumptions

Assume hardware for program contains touch controls with directional swipe capabilities and able to read press input.

4.1.2 Responsibilities

This subsystem is responsible for any physical input of the user. It will inform the application layer whether the user wants to close currently active codes or if the user wishes to seek out new QR codes.

4.1.3 Touch Input Interfaces

Table 2: Touch Input Interfaces

ID	Description	Inputs	Outputs
#1	Swipe Touch Input Command	Finger Swipe	Close QR Code Request
#2	Press Touch Input Command	Button Press	Activate and Deactivate Scan Mode

4.2 MP3 Player

The MP3 player will be responsible for playing all mp3 files for any audio content. It will receive the necessary information from the pipeline of the application layer retrieving audio from the data layer.

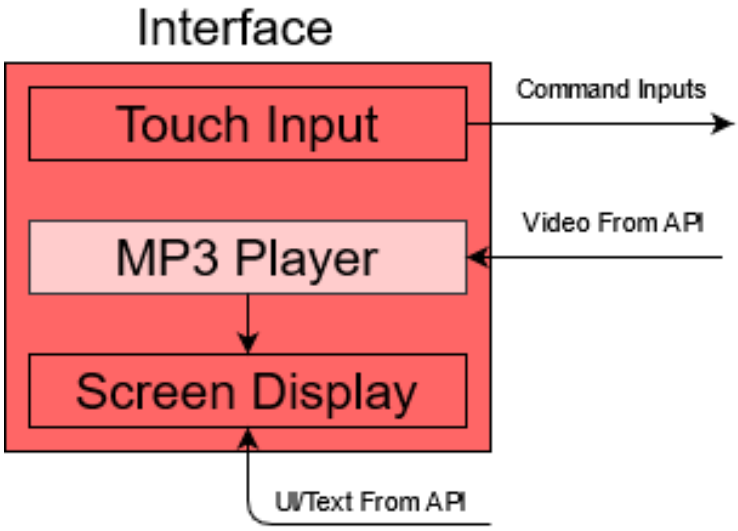

Figure 4: MP3 Player diagram

4.2.1 Assumptions

The application layer will be able to correctly retrieve the proper MP3 files necessary for the interface layer to be able to play.

4.2.2 Responsibilities

This subsystem is responsible for playing any audio files connected with any scanned QR codes.

4.2.3 MP3 Player Interfaces

Table 3: MP3 Player Interfaces

ID	Description	Inputs	Outputs
#1	Audio Content	MP3 Interface Content	Audio

4.3 Screen Display

The screen display will present the user with all text and video content associated with any scanned QR code. It will act as the primary method of interaction with the user and providing them with feedback of the application.

4.3.1 Assumptions

Smart glasses display will be able to display text in a size that is legible and additionally videos will be safe for viewing without any medical concerns.

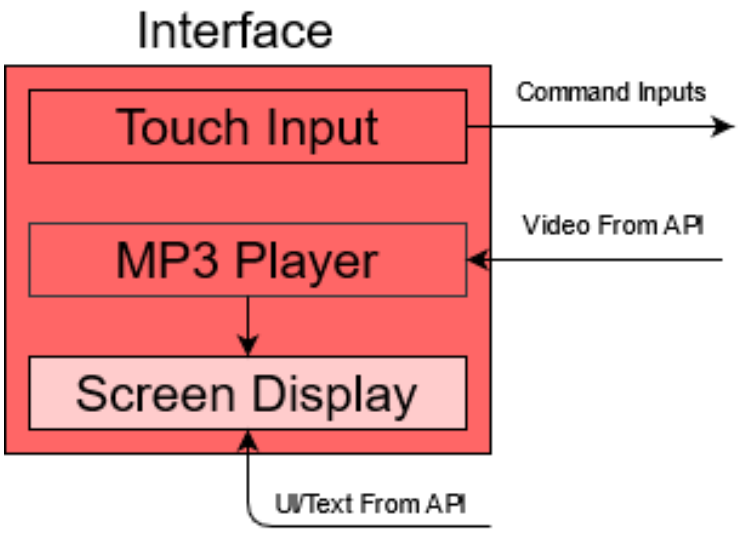

Figure 5: Screen Display diagram

4.3.2 Responsibilities

The screen display is responsible for any and all visual content of the software. It is responsible for any display or content from a scanned QR code.

4.3.3 Screen Display Interfaces

Table 4: Screen Display Interfaces

ID	Description	Inputs	Outputs
#1	Text Display	Text Interface Content	Text Visual Display
#2	Video Display	Video Interface Content	Video Visual Display

5 Camera Layer Subsystems

The camera layer is responsible for providing visual data and scanning for QR codes for the application to process. It is composed of a QR code reader and a camera feed.

5.1 QR Code Reader

The QR code reader acts as the functionality of reading the QR codes from the active camera feed of the smart glasses.

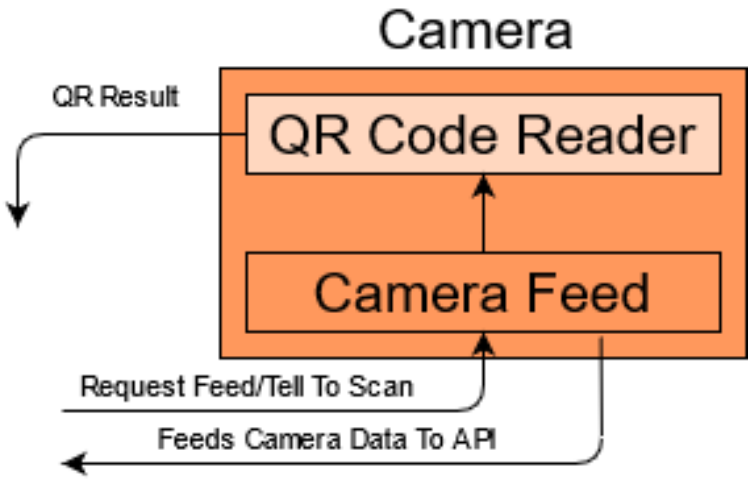

Figure 6: QR Code Reader diagram

5.1.1 Assumptions

When the Smart Glass user is making an attempt to use the smart Glass' QR scanner, it will be used within a maximum range of **5 feet from the code that the user is trying to scan.**

5.1.2 Responsibilities

Displaying the correct information based on what QR code is scanned in correlation to the art exhibit

5.1.3 QR Code Reader Interfaces

Table 5: QR Code Reader Interfaces

ID	Description	Inputs	Outputs
#1	Code Scanning	QR Code	Code Data Request

5.2 Camera Feed

The camera feed will handle the requests from the application to begin scanning for QR codes and provide data back to the application layer to determine its desire prediction analysis.

5.2.1 Assumptions

The Camera feed will be active throughout the complete duration of the museum tour, what separates it from the QR code scanner is the fact that it is an constant running function without a direct interface for the user as the environment around the user creates the setting for the smart glass interaction.

5.2.2 Responsibilities

This feature is fundamental for the QR Code scanner to function as it needs to be able to read and point out the QR code from the user's surrounding when the time to scan is called upon.

5.2.3 Camera Feed Interfaces

Table 6: Camera Feed Interfaces

ID	Description	Inputs	Outputs
#1	Camera Request	API Request	Camera Activation
#2	Data Feed	N/A	Camera Data

6 Application Layer Subsystems

The application layer is the core of Looking Glass. It is responsible for the interaction of all other layers as it receives their output and provides the input necessary for them to function. It is composed of a desire prediction subsystem and the Looking Glass API.

6.1 Desire Prediction

The desire prediction subsystem will receive data from the API and calculate a desire factor to return to the API in order to determine what the user is wanting to look at, if there are multiple codes which one to analyze, and overall attempt to predict the user's behavior.

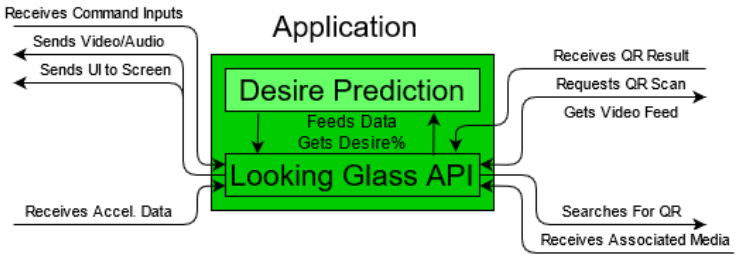

Figure 7: Desire Prediction diagram

6.1.1 Assumptions

Accuracy of the camera feed and accelerometer will be able to compute the viewpoint of the user.

6.1.2 Responsibilities

The desire prediction is responsible for trying to help ascertain what precisely the user is attempting to do, whether scanning a QR code or trying to avoid it. It is a quality of life implementation in order to improve viewing experiences.

6.1.3 Desire Prediction Interfaces

Table 7: Desire Prediction Interfaces

ID	Description	Inputs	Outputs
#1	Data Analysis	Desire Prediction Request	Desire Calculation

6.2 Looking Glass API

The Looking Glass API will handle the entirety of the application flow. It will receive the input from the interface layer and return the interface contents necessary to the viewer. **The API** will allow the camera to activate and analyze its contents. The API will receive the motion input data and combine it with the camera feed data to send to the desire prediction subsystem for analysis. In addition it will send out data requests to the data layer and receive the stored media to return to the interface layer.

6.2.1 Assumptions

The API will be able to properly connect with all other layers in order to analyze and process the data flow.

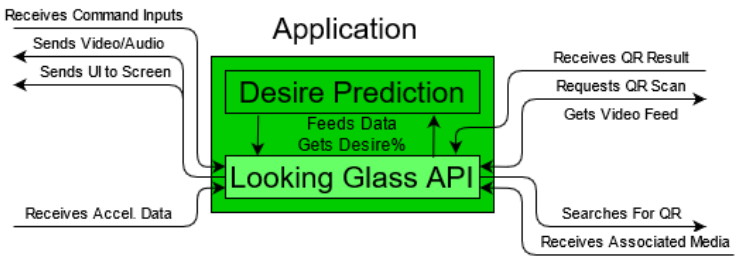

Figure 8: Looking Glass API diagram

6.2.2 Responsibilities

The Looking Glass API is responsible for the processing of all other layers and connecting them to ultimately produce the entirety of the software as all functionality runs through it before going out to the proper channel.

6.2.3 Looking Glass API Interfaces

Table 8: Looking Glass API Interfaces

ID	Description	Inputs	Outputs
#1	Touch Input	Touch Input	Camera State Change
#2	Reading Input	Camera Data Accelerometer Data	Desire Prediction Request
#3	Camera Scan	QR Code	Code Retrieval Request
#4	Media File Retrieval	Media Files	Interface Content

7 Motion Input Layer Subsystems

7.1 Accelerometer

The accelerometer tracks the user's head movement during application usage. It details the data and regularly updates the application layer so it can make calculations in order to make informed decisions about what courses of action to take.

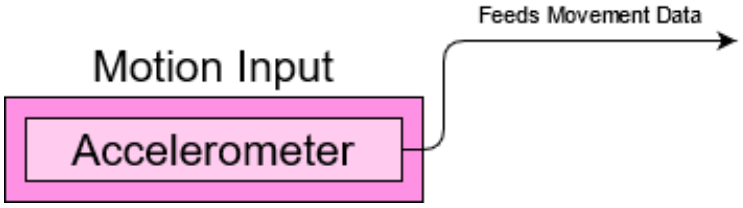

Figure 9: Accelerometer diagram

7.1.1 Assumptions

The accelerometer will be able to accurately measure physical acceleration of the device.

7.1.2 Responsibilities

Feeds the application layer data by measuring the head motion of the user.

7.1.3 Accelerometer Interfaces

Table 9: Accelerometer Interfaces

ID	Description	Inputs	Outputs
#1	Movement Recording	N/A	Accelerometer Data

The motion input layer measures the movement of the user's head in order to provide data to the application layer which it uses to analyze what the user is intending to do. It consists of one subsystem, the accelerometer.

7.2 Accelerometer

The accelerometer tracks the user's head movement during application usage. It details the data and regularly updates the application layer so it can make calculations in order to make informed decisions about what courses of action to take.

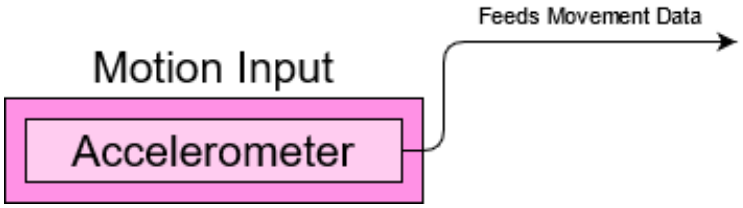

Figure 10: Accelerometer diagram

7.2.1 Assumptions

The accelerometer will be able to accurately measure physical acceleration of the device.

7.2.2 Responsibilities

Feeds the application layer data by measuring the head motion of the user.

7.2.3 Accelerometer Interfaces

Table 10: Accelerometer Interfaces

ID	Description	Inputs	Outputs
#1	Movement Recording	N/A	Accelerometer Data

8 Data Layer Subsystems

The data layer holds the information relevant for exhibits stored away for the user to access on a whim. It receives the QR code request from the application layer upon which it will access the proper stored media and then return it to the application to present to the user. It is composed of a QR code collection and stored media.

8.1 QR Codes

The QR codes are a collection of codes that have been registered for certain exhibits. They are codes that may be scanned that will correlate to the uploaded media that is stored.

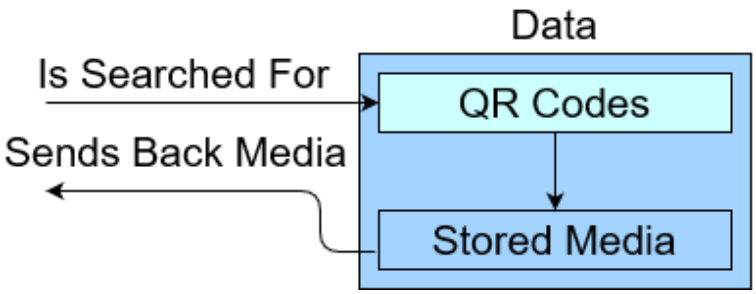

Figure 11: QR Codes diagram

8.1.1 Assumptions

Proper registration of the QR code is necessary in addition to ensuring media is uploaded.

8.1.2 Responsibilities

This subsystem is responsible for directing the application to the proper set of stored media for each exhibit. It keeps track of which content belongs to which section.

8.1.3 QR Codes Interfaces

Table 11: QR Codes Interfaces

ID	Description	Inputs	Outputs
#1	Scanned QR Code	Code Retrieval Request	Stored Media Designation

8.2 Stored Media

Stored media is the files containing the text, audio, and video data relevant to each exhibit. The owner will be able to upload and remove their desired content here and then have QR codes assigned to the data to send to the interface layer ultimately to be viewed by the user.

8.2.1 Assumptions

Any data desired to be stored will be stored in correct format without any corruption and appropriate QR code registered to its designation.

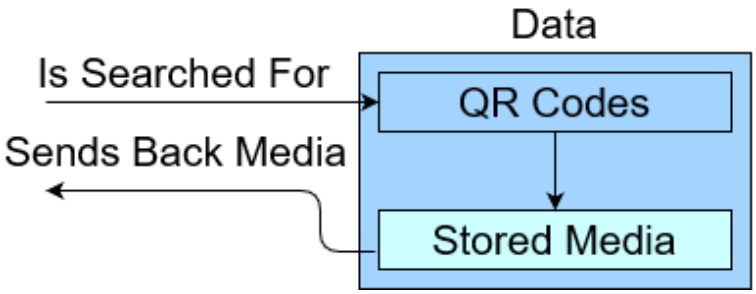

Figure 12: Stored Media diagram

8.2.2 Responsibilities

This subsystem is responsible for storing and dispersing all requested media by a QR code scan. It should ensure that it is sending the correct viable files.

8.2.3 Stored Media Interfaces

Table 12: Stored Media Interfaces

ID	Description	Inputs	Outputs
#1	Stored Media Request	Stored Media Designation	Media Files