Forge VR Explorer Requirements

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Abstract

The Forge VR Explorer branches from an Autodesk prototype project called Vrok-It, which is a simple web-based 3D model viewer and mobile virtual reality (VR) explorer. The project will expand upon its ability to display uploaded 3D models in browser and in VR, and improve its accessibility. Conventionally, viewing 3D models in VR is a challenge if you have model files on many devices, or have a headset that only works in conjunction with a smartphone. The Forge VR Explorer aims to do this by utilizing a web-based software that uses the features of the Autodesk Forge API. The project will also be expanded with new ideas and stretch goals as the project is developed.

SYSTEMS AND SOFTWARE REQUIREMENTS SPECIFICATION (SSRS) FOR

Forge VR Explorer

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FORGE VR EXPLORER SSRS

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1 INTRODUCTION

The system being developed is intended to be a place in which users with CAD files can go and easily view those files in both a 3D viewer and optionally in VR. The user will also be able to move through the models depending on the model that they are currently viewing. This provides a solution to those who don't have access to an expensive CAD programs or fancy VR headsets as it will be a free to use web services that is usable with entry level VR equipment such as Google cardboard. The intended user for this project is a person that would likely not experienced with CAD software and would not have access to software that supports CAD files.

1.1 Scope

The scope of this project includes developing a new website hosting a web application. This software should allow for the upload of a explorable 3D model file to be viewed in browser as well as in a VR environment. This project also aims to reduce barriers from uploading and viewing files by implementing different Forge APIs in order to improve the user overall experience while using the website.

1.2 DEFINITIONS, ACRONYMS, AND ABBREVIATIONS

CAD Computer Aided design is software used to design and view 3D models.

CAD file The type of files that can be uploaded to the website for viewing in the Forge viewer. We will narrow down what types of files can be used as we progress through the development process.

FORGE A collection of API services provided by Autodesk that provide 3D modeling services and tools.

Forge Viewer This is one of the APIs in Forge. It displays 3D models from CAD files and also allows for user interaction.

Model Derivative API This is another API in Forge. It can generate different filetypes that we can utilize in the application.

VR Acronym for virtual reality, typically a peripheral device or smartphone

exploding model A model viewing functionality that separates components from their original locations in order to gain an alternate view of the model.

1.3 REFERENCES

https://developer.autodesk.com/

https://github.com/KeanW/vr-party

Vrok.it

2 OVERALL DESCRIPTION

2.1 PRODUCT PERSPECTIVE

The product would be jump-started from the Vrok-It platform that has already been created. We are to create a new site with some of these assets in order to provide a new experience focused on exploring a model in 3D.

2.2 PRODUCT FUNCTIONS

1) The user is able to choose a CAD model file locally or upload one from another cloud service.
2) Once a model is chosen or a file is uploaded the 3D models will be seen in the Forge viewer at the center of the website.
3) The user will have the ability to connect a smartphone device to the website through the use of a QR scanner.
4) Once the user has connected their a smartphone the model should be able to be viewed in VR with a the use of a VR headset such as Google Cardboard, if supported.
5) "Viewable" 3D models can be interacted with by the user in the Forge viewer in several different ways.

2.3 USER CHARACTERISTICS

When finished this product should be usable by anyone that has access to a CAD model file. If the user is wanting to use the VR portion of the website then they will need access to some sort of VR headset. If the user does have access to a VR headset they should not need any extra knowledge other than how to use the headset.

2.4 SYSTEM LEVEL (NON-FUNCTIONAL) REQUIREMENTS

2.4.1 Software Interfaces

- Interface between the computer and the website, for the uploading of models from a user's local machine into the website for viewing.
- Input will be any 3D model which is sent to the model derivative api to be converted to SVF, then to the Forge Viewer where it is displayed.
- Interface between the website and the device the user wishes to view the model on. Currently vrok.it uses a QR code to accomplish this-Input is the QR code scanned by the phone, output is the manipulatable model in an environment for viewing.

2.4.2 User Interfaces

- The main user interface will be the web application in which the user will be able to upload a model and then view it in the Forge viewer on the webpage.
- The user will be able interact and manipulate the model inside the viewer using an interface. This interface can rotate, move, show an exploded view of the model, and more.
- On a smartphone, the webpage loads a compact version of the main site.
- The viewer on the smartphone is fullscreen when connected, and will be manipulated the same way the webpage is currently manipulating the model.
- The user will be able to navigate through the model in VR using a VR headset.

3 SPECIFIC REQUIREMENTS

3.1 SYSTEM FEATURES

3.1.1 File Uploading

1) This will allow the user to be able to upload any models that they have access to the website.
2) Input   The user will select a file from their computer that they would like to upload to the website.
   Output Finishing the upload process the model that was in the file should now be viewable on the website.
3) a) The user should be able to upload his/her file to the website using a standard pop-up window.
   b) The software must determine if the file is a reasonable size(<50MB), and is an accepted format.
   c) After the file is uploaded, it is then made available to the other components of the software to be used.

3.1.2 Viewable Model

1) The user should be able to see the model that they have chosen or uploaded to the site in the Forge viewer. They should also be able to interact with that model in the Forge viewer.
2) Input   The user will chose from the list of predefined models or upload their own model.
   Output The model will now be view able in the large model viewer and the user should be able to interact with that model.
3) The model must not be so large or detailed that the website can not render it.
4) The model should be displayed in full in the Forge viewer and should not be hard to interact with.
5) a) The Forge viewer will present the user's model in a window set into the webpage.

b) This window must be interactive, and display the user's model correctly.

c) The viewer should be able to display a reasonably sized(<50MB) model.

3.1.3 Smartphone Connection

1) This will enable the users to connect their phone to the Vrok-It website. This is needed so that the user will be able to view their model in a VR environment through the use of their phone and a compatible VR headset.

2)   Input   The user will scan a QR code located on the main page of website with a QR scanning application on their phone.

   Output The model that is currently loaded into the Forge viewer on the website will now be displayed on the phone and ready to be viewed in VR.

3) The user must have a device that is capable of using a QR scanning application. The phone also has access to an Internet connection to be able to connect to the websites current session.

If the user opts to view the model in VR, then a VR headset is also required for the user's device.

4) The phone should be connected to the website within a few seconds. This might vary depending on how good of an Internet connection the user currently has.

5)   a) In order to provide VR functionality for an android device, the software must first establish a connection.

  b) Using a QR scanner, the android device will be linked to a mobile version of the viewer displayed in stereoscopic format.

  c) This requires a stable Internet connection in order to deliver the content to the device.

3.1.4 Forge Authentication

1) This is used to get authentication and authorization when using Forges other APIs. This provides security for the users using the APIs on the website.

2) The token will be created automatically every time a user accesses the website.

3) The user must be able to gain access to the website on a laptop or desktop.

4)   a) During the loading of the web page the authentication API should generate a token For the user in case they want to use either the data management API or the model derivative API.

3.1.5 Data Management

1) Users that have files in A360 or in Fusion 360 should be able to gain access through those files from the website.

2)   Input   The user should be able to somehow identify that they want to gain access to their files on either A360 or Fusion 360.

       Output Using the Forge Data Management API the user should then have access to both of these Cloud storage sites.

3)
- The authentication API must have created a Token for the API to use.
- Must have an account with either A360 or Fusion 360.
- Must conform to API general use cases

4)
- The files should load in a viewable format.
- The files should only be visible if they are viewable if not the user should be notified that the file they were trying to upload was unable to be used.

5)   a)   The website give users the option to access their A360 and Fusion 360 accounts.

       b)   This should be done through the use of the Forge Data Management API.

       c)   Once the user has access to these accounts they should then be able to obtain the files they want to use and upload them to the Forge viewer.

3.1.6   Model Derivative

1) With the use of the Forge Model Derivative API users should be able to convert any CAD files that they have access to into the SVF format that is used by the viewer so that they can be displayed in the Forge viewer.

2)   Input   The user will upload a CAD drawing file that they want to convert to an SVF file.

       Output This should then return the correctly converted SVF file and it should now appear in the list of viewable models on the website. If the conversion fails the user should be notified of the failure.

3)
- The authentication API must have created a Token for the model derivative API to use.
- The user must have used the proper CAD files to be converted.

4) The program should clearly display the model in the list of viewable models.

5)   a)   The website must allow users to take their CAD source files and convert them to a file that will be usable in the Forge viewer.

       b)   The website should notify if the file conversion has failed.

3.1.7   Hardware Detection

1) This feature serves as a way for the software to understand the hardware its being run on. This will be the foundation for giving a user feedback on potential experience viewing.

2)   Input   The user connects their phone to Vrok-It through the use of a QR scanner.

Output After connection it should verify what type of device that the user has connected.

3) Reliance on the user giving permission to allow the software to get information about hardware specifications. Similar to Androids permissions the user many not want to give information out so our hardware detection may be hindered and unable to function at all.

4) Needs to be able to obtain hardware specification as fast as possible to give users feedback immediately. The sooner our software understands the user's hardware the faster it can give a recommendation about optimal viewing.

    a) The software must be able to detect the user's smartphone when it connects using the QR code provided.

    b) When a connection is made, the software will then detect the device, verify it is supported.

    c) If device is known, the software then will use presets for the viewer on the device, otherwise it should alert the user about incompatibility and performance conflicts.

    d) These alerts will inform the user that the device will not operate optimally with the project.

3.1.8 Google Cardboard

1) View the model on the user's device in VR using peripherals such as Google Cardboard.

2) input   A functioning model uploaded to the project site.

    Output A model displayed on the user's device.

3) Depends heavily on hardware on the device that the user is using. Devices with low-end hardware will likely not be able to display models that are large or have a lot of detail very well.

4) The models need to be able to be manipulated by the viewer. If they are too large, the models will cause errors if they are modified within the viewer.

    a) The VR model viewer displayed on the Android device must be supported on Google Cardboard's lenses.

    b) The model must be tracked properly in the model viewer.

    c) The model viewer on the mobile device can be controlled by the webpage.

3.1.9 Website Redesign

1) In order to accommodate for new features, we would like to redesign the landing, and key interaction areas of the website. This will allow for more creative development as the project progresses, as well as improve the look of the project as a whole.

2) Input   Website source files and control.

    Output An updated and structured web layout.

3) This website must support the Forge API, the Forge viewer, and must be viewable on mobile.

4) The updated website must have support for the same sources as the Vrok-it website.

    a) The website must be able to properly display the project.

    b) The updated site will include a new landing, separate pages for the project, as well as being able to content as we expand.

    c) Key functionality such as uploading a model file and viewing the file should be accessible as soon as the user loads the site.

4   GANTT CHART & SIGNATURES

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