Augmented Reality
Software & Content Generation Tools
Functional Requirements
for Industrial Industry Use Cases

Foreword

This document was prepared by members of Digital Manufacturing and Design Innovation Institute (DMDII) on November 17th 2016.

DMDII is a public-private partnership of companies dedicated to the advancement of manufacturing.

The functional requirements listed herein are in the nature of recommendations to all augmented reality (AR) software and content generation tool suppliers concerned.

The development of these functional requirements was accomplished by DMDII members through a consensus process.

1.0 Introduction

The rapid increase in the use of AR software and content in the industrial industry resulted in a need for an industry-accepted functional requirement. "Augmented Reality Functional Requirements: AR software & content generation tool," was written to satisfy those needs.

This document provides the AR software and content generation tool manufacturer community with guidance for developing software in a consistent manner with an acceptable level of performance for the industrial industry. As augmented reality software and content use increases, technology evolves and experience is gained in the application of AR software and content this documented will be reviewed and revised. Appendix A contains a history of this document.

2.0 Purpose

The purpose of this document is to provide guidance to the AR software and content generation tool manufacturers for the production of AR software and content generation tools for industrial industries.

3.0 Goal

This document lays out the industrial industries goals for the AR software and content generation tool capabilities, so that users will have a quality experience.

4.0 Definitions

AR – Augmented Reality

SME – Subject Matter Expert

Worker – Person that is consuming the AR content generated

User – Person using the software to generate the AR content.

Administrator – Person that sets up SMEs and worker accounts for a specific application of the generated software content.

Federation – Authentication via LDAP / Active Directory

5.0 Relationship to other documents

In addition to the "Augmented Reality Functional Requirements: AR software and content generation tool," a companion document "Augmented Reality Functional Requirements: Hardware" was created to provide guidance to the AR hardware manufacturers.

6.0 AR Software and Content Generation Functional Requirements:

6.1 Authoring Augmented Reality Content

6.1.1 Adding API Links

6.1.1.1 The software and content generation tool shall allow the user to utilize API links to other databases and websites to display information.

6.1.2 Ease of Use

6.1.2.1 The software and content generation tool shall have a user interface that can be learned by non-software literate personnel (Not a Computer Science or Software Engineering Major ex. Technical Writer)

6.1.3 Output to Branded Application

6.1.3.1 The software and content generation tool shall output to an application that the user will defined the branding of.

6.1.3.1.1 The software and content generation tool shall NOT force its Brand to be displayed in the final application.

6.1.4 Display PDFs

6.1.4.1 The software and content generation tool shall support displaying PDF files to the worker.

6.1.5 Display HTML

6.1.5.1 The software and content generation tool shall support displaying HTML files to the worker.

6.1.6 Display Slide Show

6.1.6.1 The software and content generation tool shall support displaying animated Slide Show files to the worker.

6.1.6.2 The software and content generation tool shall support displaying PowerPoint files to the worker.

6.1.7 Display MP4

6.1.7.1 The software and content generation tool shall support displaying video MP4 files to the worker.

6.2 Creating 3D Content

6.2.1 Automatic generation of ultra-light 3D models from engineering CAD drawings

6.2.1.1 The software and content generation tool shall accept the following 3D model and animated 3D model input formats:

6.2.1.1.1 Creo (PVZ, C3DIs)

6.2.1.1.2 AutoDesk (OBJ, FBX)

6.2.1.1.3 Siemens PLM (JT)

6.2.1.1.4 Catia (CAT Parts or Products, 3D Via)

6.2.1.1.5 SAP Visual Enterprise (RH)

6.2.1.1.6 STP Files

6.3 Deployment of Augmented Reality Content

6.3.1 Deployed Content shall be Device Agnostic

6.3.1.1 The software and content generation tool shall output an application that can be used by AndroidOS, iOS, and Windows OS devices.

6.3.1.2 The software shall NOT require a custom version of OS, for the content to be utilized. The software shall install on a standard OS version for the smart device.

6.3.1.3 The software and content generation tool shall output an application that can be used by a user selected smart device.

6.3.1.3.1 Phones.

6.3.1.3.2 Tablets.

6.3.1.3.3 Binocular Head Mounted Displays.

6.3.1.3.4 Monocular Head Mounted Displays.

6.3.1.3.5 Projection System.

6.3.2 Content Storage

6.3.2.1 The software and content generation tool shall allow the user to select the content storage by supporting all of the below.

6.3.2.1.1 Local (on the smart device).

6.3.2.1.2 Secured Server (hosted by a company behind firewalls).

6.3.2.1.3 Cloud-Based.

6.3.2.1.3.1 The software generated shall support 128bit encryption in transit at a minimum.

6.3.2.1.3.2 The software generated shall support 128bit encryption at rest.

6.3.2.1.3.3 The software generated shall support federation.

6.3.2.1.3.4 The software generated shall support two factor authentication, for the cloud service provider.

6.3.3 Visual Tracking Method

6.3.3.1 The software and content generation tool shall NOT require the use of a visual tracking tag, if the AR hardware supports other tracking methods (ex. SLAM).

6.3.3.2 The software and content generation tool shall NOT require the use of a specific type or style of visual tracking tag.

6.3.4 Zoom

6.3.4.1 The software and content generation tool shall allow the worker (content) to zoom into and out of 3D content.

6.3.4.1.1 For smart devices with touch screens, the worker shall be allowed to pinch finger tips together to zoom in.

6.3.4.1.2 For smart devices with touch screens, the worker shall be allowed to pull finger tips apart to zoom out.

6.3.4.1.3 For wearable head mounted displays, the worker shall be allowed to pinch finger tips (right and left hands) and then pull hands together to zoom in.

6.3.4.1.4 For wearable head mounted displays, the worker shall be allowed to pinch finger tips (right and left hands) and then pull hands apart to zoom out.

6.3.5 Geometry Rotation

6.3.5.1 The software and content generation tool shall allow the worker (content) to rotate 3D content.

6.3.5.1.1 For smart devices with touch screens, the worker shall be allowed to:

6.3.5.1.1.1 Rotate finger tips to rotate 3D content.

6.3.5.1.1.2 Utilize a single finger sliding left/right/up/down to rotate 3D content.

6.3.5.1.2 For wearable head mounted displays, the worker shall be allowed to pinch finger tips (right and left hands) and then rotate hands to rotate 3D content.

6.3.5.1.3 The software and content generation tool shall support the ability for the user to lock the 3D AR content view (Not allow the worker to modify location, position, etc).

6.3.6 Snapshots

6.3.6.1 The software and content generation shall support the ability for the workers to take a snapshot of their smart device (wearable and touch display) display. Allowing them to share that snapshot with others.

6.3.7 Record Video

6.3.7.1 The software and content generation shall support the ability for the workers to record a video of their smart device (wearable and touch display) session. Allowing them to share that video with others.

6.3.8 Remote Guidance

6.3.8.1 The software and content generation tool shall support the ability for the workers to "phone a friend" and obtain guidance from a remote expert, sharing with them the content and vision of what they are seeing.

6.3.8.2 The software and content generation tool shall support the ability for the workers and SME to annotate the display (both sides of communication).

6.3.8.3 The software and content generation tool shall support the ability for the Administrator to assign a SME to a localization tag (this list of SMEs is for this specific asset, see IoT section).

6.3.8.4 The software and content generation tool shall support the ability for the Administrator to assign SMEs to a specific notification. The software shall be able to receive notifications from a 3rd party data source via APIs, OPC-DA, and OPC-UA.

6.3.8.5 The software and content generation tool shall support the ability for the worker to be able to determine the online status of the SME.

6.3.8.6 The software and content generation tool shall support the ability for the SME to receive video calls from the worker on both Desktop and Mobile platforms.

6.3.8.7 The software and content generation tool shall support the ability for the SME to be notified when they are being "called" by a worker. This notification shall be pushed to the SMEs desktop and mobile device (registered devices). The push notification shall function even if the software is not in the foreground.

6.3.8.8 The software and content generation tool shall support the ability to show the SME any calls missed with the worker id, and time/date.

6.3.8.9 The software and content generation tool shall support the ability for the SME and the worker to annotate within the field of view of the worker. The software shall provide the SME with an annotation / drawing toolbar. The tools on the toolbar shall include, but not be limited to: free-hand drawing tool, arrows, highlighted orbs and text blocks. The SME shall be able to select colors for the drawings tools.

6.3.8.10 The software and content generation tool shall support the ability for the SME to draw multiple lines (or select two points) on the screen, and select an option to determine the distance between the lines, in the workers space.

6.3.8.11 The software and content generation tool shall support the ability of the SME to send a file to the worker.

6.3.8.12 The software and content generation tool shall support the ability of the SME to share their desktop with a worker.

6.3.8.13 The software and content generation tool shall support the ability for multiple SMEs to support a single worker in the same video session.

6.3.8.14 The software and content generation tool shall support standard web traffic ports to make it more compatible with typical corporate firewall settings.

6.3.9 Workflow Authoring

6.3.9.1 The software and content generation tool shall support Guided SOP – The user will be able to create workflows to provide guided step-by-step instructions to a worker. Workflows can be linear or make use of branching (e.g. Troubleshooting guides)

6.3.9.2 The software and content generation tool shall support Animated SOP – The user will be able to create workflows to provide guided step-by-step instructions using 3D animations.

6.3.9.3 The software and content generation tool shall support Multi-Person SOP – The user will be able to create workflows to coordinate multi-person tasks.

6.3.10 GetFiles

6.3.10.1 The software and content generation tool shall support File Assignments – The user will be able to assign files to a QR Code or to a 3rd party notification (e.g. documents, drawings, videos, 3D animations, etc…)

6.3.11 AlertME

6.3.11.1 The software shall pass 3rd party notifications to the worker.

6.3.12 QuoteME

6.3.12.1 The software shall provide verbal note-taking, leveraging speech-to-text engines. A Worker will be able to assign a note or record to a QR code QR Code. A worker will also be able to review the note log for the QR Code.

6.3.13 Security

6.3.13.1 The software and content generation tool shall support the requirement for the worker and SME to log into the application.

6.3.13.1.1 In some use cases, the information provided to the worker maybe confidential and therefore require a dedicated log-in.

6.4 Internet of Things

6.4.1 Linking to IoT data

6.4.1.1 The software and content generation tool shall support linking in of IoT data so that it can be provided to the worker.

6.4.1.2 The software and content generation tool shall provide the ability to produce unique QR codes. These QR codes can be assigned to assets on the production floor (unit ops, process skids, equipment, etc...)

6.4.1.3 The software and content generation tool shall provide the ability to link IoT data to specific locations by creating a "localization tags" through the use of QR Code, Near Field, RFID, and/or Bluetooth tags.

6.4.2 Displaying IoT data

6.4.2.1 The software and content generation tool shall support displaying of IoT data, including 3rd party provided data.

6.4.2.1.1 The software and content generation tool shall support displaying IoT data at a 1Hz refresh rate.

6.4.2.1.2 The software and content generation tool shall support displaying static IoT data.

6.4.2.1.2.1 The software and content generation tool shall support a worker requested update of static IoT data.

Appendix A

Version:	Change Description	Responsible
1.0	Initial release of the Augmented Reality Functional Requirements	CLF, LEJ, RRJ