## Customer Requirements Speciﬁcation

**SAG ML Text Recognition CRS ـــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــــ**

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# Document Status:

|  |  |  |
| --- | --- | --- |
| **Name** | PO\_SAG\_CRS\_ML\_TR | |
| Version | V1.2 | |
| Status | proposed | |
| Author | AES | |
| Date | [8-14-2022] | |
| Team approval | AES | Approved |
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| Final approval |  |  |

# 

# Document History:

|  |  |  |  |
| --- | --- | --- | --- |
| **Version** | **Author** | **Date** | **Change** |
| 1.0 | AA | [8-11-2022] | * Initial Creation * Add CRS Requirements |
| 1.1 | AES | [8-13-2022] | * Edit The Document Title. * Edit the Reference Document version. * Edit the Project Definition, Features , Key Elements and Requirements. |
| 1.2 | AES | [8-14-2022] | * Edit System Context * Edit some Key Elements. |

# Reference Document:

|  |  |  |  |
| --- | --- | --- | --- |
| **Ref.number** | **Doc.Name** | **Version** | **Status** |
| 1 | PO\_SAG\_CR\_ML | V1.2 | Released |

# Project Description:

## Definition:

The Text Recognition aims to help the blind read by extracting and recognizing text from different kinds of images and then converting it to a sound that they can hear.

## Features:

* Text Recognition.

## Key Elements:

* The Text Recognition model shall recognize text including handwritten on other objects (book, paper, sign, etc.).

## **Text Recognition**

## System Context:

Diagram

Description automatically generated



## CRS Requirements:

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| **Req\_ID** | Req\_PO\_SAG\_CRS\_ML\_TR\_***001***-V1.2 | **Covers** | PO\_SAG\_CR\_ML\_004-V1.1 |
| **Description** | The input image shall be converted into a gray-scale image. | | |

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| **Req\_ID** | Req\_PO\_SAG\_CRS\_ML\_TR\_***002***-V1.2 | **Covers** | PO\_SAG\_CR\_ML\_004-V1.1 |
| **Description** | A resize algorithm shall resize each image and expand it’s dimension to make it compatible with the input shape of architecture . | | |

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| **Req\_ID** | Req\_PO\_SAG\_CRS\_ML\_TR\_***003***-V1.2 | **Covers** | PO\_SAG\_CR\_ML\_004-V1.1 |
| **Description** | A Normalization Algorithm shall Normalize the image pixel values by dividing it with 255. | | |

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| **Req\_ID** | Req\_PO\_SAG\_CRS\_ML\_TR\_***004***-V1.2 | **Covers** | PO\_SAG\_CR\_ML\_004-V1.1 |
| **Description** | An Encoding Algorithm shall encode each character of a word into a numerical value and Compute the maximum length from words and pad every output label to make it of the same size as the maximum length. This is done to make it compatible with the output shape of our RNN architecture. | | |

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| **Req\_ID** | Req\_PO\_SAG\_CRS\_ML\_TR\_***005***-V1.1 | **Covers** | PO\_SAG\_CR\_ML\_004-V1.1 |
| **Description** | The Text Recognition model shall have 2 architectures of CNN and Bidirectional-LSTM. | | |

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| **Req\_ID** | Req\_PO\_SAG\_CRS\_ML\_TR\_***006***-V1.1 | **Covers** | PO\_SAG\_CR\_ML\_004-V1.1 |
| **Description** | The CNN architecture shall process each image to extract the features of each character. | | |

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| **Req\_ID** | Req\_PO\_SAG\_CRS\_ML\_TR\_***007***-V1.1 | **Covers** | PO\_SAG\_CR\_ML\_004-V1.1 |
| **Description** | The Bidirectional-LSTM architecture shall take the features from the CNN architecture which outputs SoftMax probabilities over the vocabulary. | | |

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| **Req\_ID** | Req\_PO\_SAG\_CRS\_ML\_TR\_***008***-V1.0 | **Covers** | PO\_SAG\_CR\_ML\_004-V1.1 |
| **Description** | The CTC decoder shall take these probabilities from different time steps to finally get the raw text from images. | | |

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| **Req\_ID** | Req\_PO\_SAG\_CRS\_ML\_TR\_***009***-V1.0 | **Covers** | PO\_SAG\_CR\_ML\_004-V1.1 |
| **Description** | Output formatter shall format the text output to Output Formatter. | | |

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| **Req\_ID** | Req\_PO\_SAG\_CRS\_ML\_TR\_***0010***-V1.0 | **Covers** | PO\_SAG\_CR\_ML\_004-V1.1 |
| **Description** | The Text Recognition model shall return the output to the ECU. | | |