

Software Requirement **Specification**

for

Emotica.AI

(Emotion Detection & Classification System)

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Introduction

Emotion recognition is the method of evaluating the sentiments of a human subject by analysing their facial expressions. Various tools, techniques and methods are used for emotion recognition and with rapid development and innovation in machine learning, software for emotion recognition are improving and growing rapidly. Such software are now capable of even detecting micro-expressions which might reveal a person's true feelings. This can help corporations to improve their products or services by proper evaluation of customer feedback using emotion recognition software.

Purpose

The objective of this document is to explain the system called 'Emotion Detection and Classification System' which job is to recognize human emotions or expressions.

Project Scope

Emotion recognition is a method used in software that permits a program to "examine" the sentiments on a human face by utilizing sophisticated image dispensation. Firms have been testing with an amalgamation of advanced formulas with image processing practices that have materialized in the last decade to appreciate more regarding what a video or an image of an individual's face tells us concerning how they are feeling.

With the current innovation, emotion identification software has developed very adeptly. Moreover, its aptitude to track first facial looks for emotions like happiness, sadness, surprise, anger, etc., emotion detection software can also capture what specialists describe as "micro-expressions" or restrained cues of body language, that might reveal a person's feelings devoid of their knowledge and to fully understand our customer's requirements, and refer them their choice and evaluate their responses. This can help with innovation, product development and also build a loyal customer base

Definition, Acronyms, Abbreviations

SRS:- Software Requirement Specification (*a document that describes what the software will do and how it will be expected to perform and also describes the functionality of the product needs to fulfil by all stakeholders.*)

USB:- Universal Serial Bus (*a common interface that enables the communication between devices and a host controller such as PC or smartphones*)

GPU:- Graphic Processing Unit

User: a- person who is going to use the system

Python package:- Collection of modules

Reference

<https://medium.com/@enisinanaj/writing-a-software-requirements-specification-document-97d622805aef>

<https://www.studocu.com/in/document/thapar-institute-of-engineering-and-technology/software/ieee-srs-template-2-converted/9443241>

<https://www.geeksforgeeks.org/software-requirement-specification-srs-format/>

Fundamentals of Software Engineering, Fourth Edition, Rajib Mall

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Overview

Since the dawn of the AI era, emotion & its detection using this technology became one of the crucial as well as important fields of study. The technology evolved a lot with all its dependencies & so emerged its need & applications.

Emotica.AI is a real-time emotion recognition system that uses CNN(Convolutional Neural Network) for deep learning of the nodes, which tends to improve the real-time review and feedback systems with time .

To keep up with both the efficiency & accuracy, our system focuses on the priorities of image classification following the micro-expressions & facial contours for precise calculations.

Overall

Description

The software is installed in the user's system and the user needs to make an account and then the software can detect emotions real time or using stored images. This can help the client evaluate customer satisfaction and help to improve their products and increase sales and revenue. Our software is user friendly and only requires that the user must have basic knowledge of how to operate a computer system so that he can monitor the software properly.

Product Perspective

Emotion Detection System is software first installed in the respective system and the user has to make an account to access the system.

The software can detect the emotion of a person either from his stored image or by taking a real-time snapshot in a real-time scenario.

Product Functions

The software described in this SRS will be used to detect human emotions. This project can be used in many fields such as customer satisfaction in a marketing platform and will build a better relationship between the seller and the customer. Our software can also be used in medical research fields to aid patients with autism, in self driving cars to detect behaviour and 'alertness' of driver and also emotion analysis during interviews.

User Characteristics

The user who is going to access this system should have basic knowledge of computer operations. The user can take the help of the manual or can contact the support team for the same.

General Constraints

Software must be executed on a 100% compatible computer, there must be enough RAM, disk storage, etc.

Do not tamper with the software.

Assumptions and Dependencies

Users must have the basic knowledge to use any operating system.

Specific Requirements

Describes the user interface, hardware and software requirements, communicational interface, functional and other requirements.

The system must have at least 1 USB port and camera for real time video recording, Python 3.7 or above is required with proper packages and libraries for which minimum 1 GB of RAM is required. Nvidia GPU with proper CUDA architecture support is required for better performance.

1GB of hard disk space is required for software installation.

The better the specifications of the system, more enhanced will be the performance.

We have designed our software using iterative waterfall model using two iterations for better accuracy.

External Interface Requirements

User Interface

Our system will be able to work actively on all platforms (Windows/MAC/Linux) with python 3.7/python 3.8/python 3.9.

GPU is the best platform for using it.

Unlike the user, the administrator will be able to save the registered emotions and export them in xlsx/csv format.

Hardware Interface

The device to be used must have 1 USB port, Camera for real-time video recording.

Software Interface

Non-GPU Based

The device to be used must have the libraries attached to python. Some of these libraries are NumPy, Keras, CV2, Tkinter, pillow, TensorFlow.

To install these packages minimum of 1GB memory is required.

GPU Based

The device to be used must have the libraries attached to python. Some of these libraries are NumPy, Keras, CV2, Tkinter, pillow, TensorFlow.

(To install TensorFlow)

Hardware Requirements

The following GPU-enabled devices are supported:

- NVIDIA® GPU card with CUDA® architectures 3.5, 5.0, 6.0, 7.0, 7.5, 8.0 and higher than 8.0. See the list of [CUDA®-enabled GPU cards](#).
- For GPUs with unsupported CUDA® architectures, or to avoid JIT compilation from PTX, or to use different versions of the NVIDIA® libraries, see the [Linux build from source](#) guide.
- Packages do not contain PTX code except for the latest supported CUDA® architecture; therefore, TensorFlow fails to load on older GPUs when CUDA_FORCE_PTX_JIT=1 is set. (See [Application Compatibility](#) for details.)

Software Requirements

The following NVIDIA® software must be installed on your system:

- [NVIDIA® GPU drivers](#) —CUDA® 11.2 requires 450.80.02 or higher.
- [CUDA® Toolkit](#) —TensorFlow supports CUDA® 11.2 (TensorFlow >= 2.5.0)
- [CUPTI](#) ships with the CUDA® Toolkit.

- [cuDNN SDK 8.1.0 cuDNN versions](#)).
- (Optional) [TensorRT 7](#) to improve latency and throughput for inference on some models.

Communication Interface

There is a good internet connection required for installing the system along with all the packages

Functional Requirements

- Install the software with all the required packages
- The system must ask the user for camera permission
- The system must ask the user for recording
- The system must allow exporting the overall data.

Safety Requirements

- System reliability will improve as long as the video's quality is good and the person's face is visible

Performance Requirements

The minimum system requirements for the computer to be used are as follows:

- **Processors:** Intel® Core™ i3 processor or equivalent
- **Disk Space:** 1 GB
- **Operating System:** Linux, macOS, Windows 10
- **Python version:** python 3.7/python 3.8/python 3.9
- **Included Development packages:** NumPy, Keras, CV2, Tkinter, pillow, TensorFlow
- **Compatible tools:** Microsoft Visual Studio, PyCharm, Spyder or VSCode

Design Requirements

Feasibility Study:- The project solution against the stated problem statement meets the three important feasibility status: Software, Hardware, Economic/Financial Feasibilities.

Software Feasibility Unit - Open Source Licenses with no third-party intervention of modules.

Hardware Feasibility Unit - RTX3050Ti 1600MHz (Primary Development Block).

Economic Feasibility Unit - All the requirements were fulfilled using the in-house technologies & open source libraries.

Requirements:- The requirement of a small business operating offline needed a practical solution to get a really fast feedback mechanism to save both customers and Businesses' time.

Analysis:- After a few discussions with our team and stakeholders, we came across a solution of getting the facial expression of the customers (by asking for their consent) at the billing spot or with the product to get a really fast review or feedback.

Design:- After gathering the proper requirements and analyzing our team proceeded with the design keeping in mind that the system will be easy to operate. For that, we designed a dfd of our system for a better understanding of our stakeholders.

Development:- To implement the system/software we selected the python platform due to the following reasons.

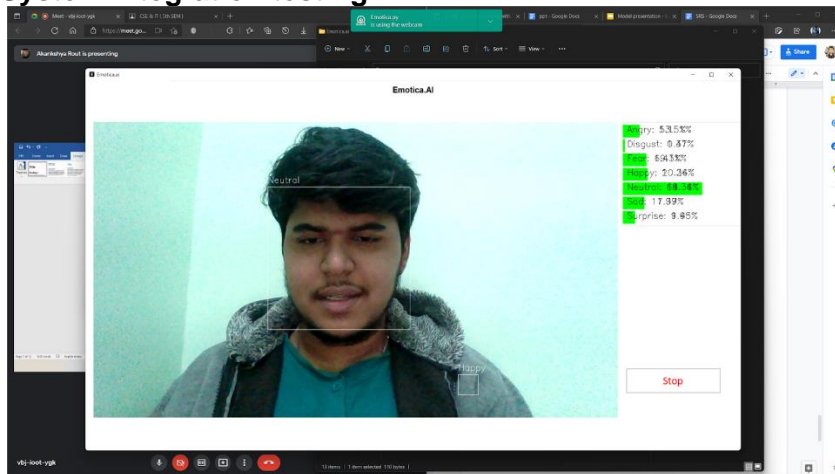
1. The Support System is highly enhanced.
 2. Supports a large number of libraries.
 3. Any third-party software is not required.
 4. Easy to train the system
- We used ML approaches to train our system in the initial iteration.

Testing:- For the testing phase following tests are done:-

1. Unit and Component-Testing

1.	Emotion Detection and Classification
1.1	Installation
1.1.1	Python Install -> VS code/ PyCharm / Anaconda / Jupyter / IDLE
1.1.2	packages -> pip
1.2	Execution
1.2.1	Start -> button
1.2.2	Camera -> Enabled
1.2.3	Face Detection
1.2.4	Emotion Detection
1.2.5	Stop -> button
1.2.6	Camera -> Disabled
1.3	Export
1.3.1	Export -> xlsx/csv
1.3.2	Labelled emotion -> classified

4. System integration testing



Other Requirements

The device to be used must have a better quality camera for clear visuals.