1. Introduction

* 1. Purpose of Document

This document explains all the functionality and basic features of a system (VK) virtual keyboard that one can use through with their facial expression. This document will explain to its readers and the end-users how it will work.

**Intended Audiences:**

               The audience who will read this document are:

* IT Industry
* Managers
* Customer representative, who must approve it.
* Researchers
* Related to the CS & IT field, who wants to do future work and make amendments as technology goes up.
* Project team
* Project managers
* Designer, whose design must meet the requirements specifies in this document.
* Programmers whose software components must implement the requirements specified in this document.
* Testers, who must ensure that the requirements are validatable and whose tests must validate the requirements.
* Usability Engineers, who must ensure that the user interfaces fulfill the usability requirements.

* 1. Project Overview

According to the study, nearly 1 out of 50 people live with paralysis, approximately 5.4 million people, and most can only change their facial expressions. These people live a boring life because of not direct interaction with computers and the internet or no particular activity, making them happy in their spare time. Hands-free text entry with an on-screen virtual keyboard has been long possible using eye-tracking technology [1]. It is difficult for a person to type with it because it needs more focus. It also requires a good quality camera or eye tracking device that can detect its eyeball movement. So, we have decided to make a system through which they can interact with the world through computers with less exhaustion and no need for eye-tracking technology. The idea is to create a system like a virtual keyboard controlled by a disabled person's facial expression and gestures. The software will be much intelligent to detect and recognize a person's facial expressions using a camera. After recognizing their expressions, which are pre-defined against keys, the software will be used to type on a screen and play games. Disable person can move their head up, down, left, right [2] to use arrow keys. For typing alphabets and numbers on a screen, a person can open their mouth, i.e., not for speaking only for typing [1]. A person can close his/her right eye for using the enter key etc.

The goals of the virtual keyboard are:

* User Satisfaction
* Time-Saving
* Cheap

Benefits of VK are:

* It saves a lot of user time, which is a waste of fixing the gaze on the key for typing.
* It also saves the cost used in buying a special camera (eye-tracking camera) and sensors.
* Very simple and easy to use doesn't require any particular kind of knowledge to use it.
  1. Scope

Our purpose is to target the audience, which is paralyzed and people without hands. We target this audience because there is no proper way of communication for them. A few years back, eye-tracking technology [1] comes to serve these kinds of people. It is somehow useful for controlling a cursor on a screen, but typing is too complicated for an ordinary person. Considering all these things, we will make a system through which the disabled can type quickly.

* We will design our virtual keyboard, which disable can use by changing their facial expression, not using the on-screen virtual keyboard.
* We are also not going to include eyeball detection [1]. Our software requires facial expressions for typing and playing games that are pre-defined against keys.
* Our software will use the Camera on laptops or Webcam for detection and recognize facial expression. Not require any particular camera or device to detect it.

1. Overall System Description

We develop our system in PyCharm using Python. We are targeting the pleasure activities and communication of paralyzed or hand free persons using computers. So it will be deployed on computers and laptops of disabled people, etc. The primary users are paralyzed and hands-free person. Some Assumptions are: disable person can open his/her mouth for typing alphabets on the screen [1], close one of their eyes, and smile to use one of the keys [1], etc. Our system depends on a camera, laptop, PCs, and virtual keyboard, which disabled people can use with their facial expressions

* 1. User characteristics

The significant users who will use this system are paralyzed and hands-free people. Other people can use this system too. But our main concern is paralyzed and hands-free people because this system is specially designed only for this kind of person. These are the direct users of it.

* 1. Operating environment

VK software will be deployed on computers and laptops. Two hardware components are mandatory for VK System, Camera, and laptop or PCs. The third component is software that will operate only on PyCharm, installed on Microsoft Windows 8 or later, macOS 10.13 or later, and Linux that supports Gnome, KDE, or Unity DE. VK software will run on a 64-bit (x64) processor [3].

* 1. System constraints

Some constraints are as follow:

1. The software will operate only on the windows and mac operating systems (Windows 8 or later, mac 10.13 or later) [3].
2. A high-resolution camera is preferred, but it will also operate on your laptop camera. For example. 2 megapixels or more.
3. VK will support only the English language.
4. VK system will be used in a lighted room, i.e., natural light. The purpose of using a lighted room is that the person's live video should be clear and visible to the camera for precise detection and recognition of facial expressions. Too much brightness on a person's face causes a lack of detection. The darkroom is not supported.