



BLINK LATOR

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Abstract: Technological advances in medicine have significantly decreased affected person's difficulties. One of the main classes of bodily disabilities that result in paralysis is motor neuron disease (MND). An affected person with MND is not able to speak, walk, express feelings, and communicate. Due to the weakening of the muscles, the affected person has the best control over the blinking of the eyes, which makes it tough for the affected person, in contrast to an everyday person, to relate to the surroundings and communicate their fundamental desires and the surroundings generally tend to suppress an essential element of their emotions due to the restlessness of the broadcast. A suitable mixture of hardware and software programs should be integrated to obtain a functional solution. This document discussed a portable solution for converting blink sequences to speech. CV library for programming Raspberry Pi 3 A camera detects winking and based on the EAR calculation, the code converts the sequence. The flashes with the corresponding voice output.

Keywords: Motor Neuron Disease, emotionally detached, liaison, Raspberry Pi 3, Raspbian, Open CV, Ear Aspect Ratio, eye blinks, speech.

I. INTRODUCTION

In a world jam-packed with modernization, there still exist a number of the foremost chronic and non-curable unwellness. One in every of that is nerve cell disease (MND). MND describes a bunch of diseases that have an effect on the nerves (motor neurons) within the brain and neural structure that tell your muscles what to do. The symptoms of MND vary from muscle cramps, spasms to emotional liability, however, they vary in speeds of development from person to person. Blink-Lator aims at the obstruction two-faced by the patients in terms of communication and also the problem to precise ones emotions because of their physical disability. In Blink-Lator, face detection is done first, followed by extraction of the eye. The extraction of the eye occurs because the area of interest here is the part of the eye. To detect and count blink signals, a simple metric known is used as the eye aspect ratio (EAR). EAR can be calculated based on the corresponding face markings of different face parts depending on what the user desires. In terms of blink detection, we're only interested in two types of facial structures, namely the eyes. Each eye is represented by 6 (x, y) coordinates, starting at the left corner of the eye and then going clockwise around the rest of the eye region.

Artificial intelligence is a research field that describes the ability of humans and other machine learning and the ability to respond to certain actions, also known as (A.I.). The demand for artificial intelligence is growing every day. Computer experts predict that by 2020, "85% of customer interactions will require no human intervention." This means that simple requests from people depend on computers and artificial intelligence, just like when we use Siri or Galaxy to ask about the weather, temperature, and when to use the face as a credential to unlock the phone. Like any other government, there are organizations and regulations to control its use.

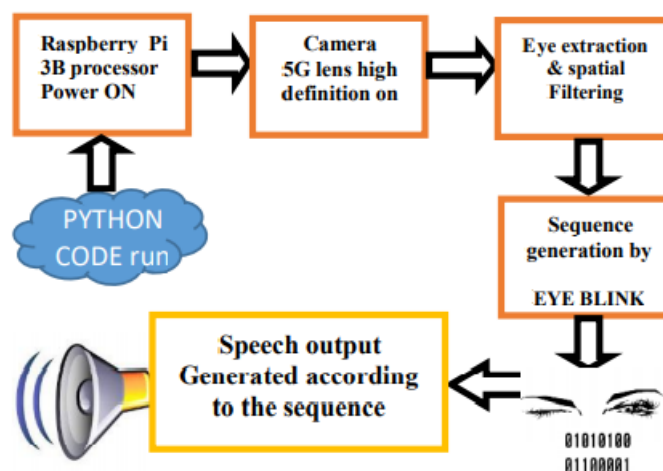


Figure 1



A facial recognition system is a technology that can match human faces in digital images or video frames with facial databases commonly used to authenticate users through identity verification services by identifying and measuring facial features in specific images. ...Used in computer vision was originally written in C/C++, now it provides bindings for Python. Use machine learning algorithms to find faces in images. Because faces are so complex, there is no simple test to tell you whether you found a face. Instead, thousands of small templates and functions must be matched. The algorithm divides the face recognition problem into thousands of smaller and smaller problems, each of which is easy to solve.

II. METHODOLOGY

The methodology used in our work is simple and effective. Using different library packages was the main part. When the camera video starts, it will result in live image capture. Face recognition starts with face marking. NumPy Library Help and Dliblibrary. NumPy is a Python package used in faster complex math calculations, and Dlib is a special kit that includes Machine Learning Algorithms. With the help of these libraries, we can locate and display the most important features of the face such as eyes, eyebrows, nose, mouth, and jaw, which are essentially marked with 68 x-y points, and finally, the area of interest is captured. Then we concentrate on the spatial filtering of the live image. This is basically done with the help of the 'scipy.spatial' library. The aspect ratio is very important to know if the eye is open or closed. Therefore, after the RoI (Region of Interest) that is the part of the eye is obtained, more images are displayed and marked on a 6-point scale that is p1-p6. The formula for the EAR (Eye Aspect Ratio) is:

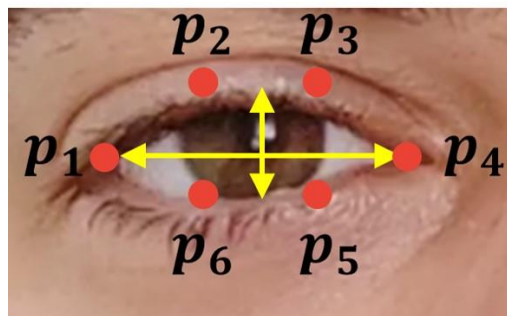


Figure 2

$$EAR = [(p2-p6) + (p3-p5)] / [2*(p1-p4)]$$

Therefore, whenever eye is closed the points p2 & p6 coincides and points p3 & p5 coincides and making the numerator zero. So the eye aspect ratio becomes zero which means eye closed. If the above mentioned points i.e. p2 with p6 and p3 with p5 does not coincides, it makes the numerator a non-zero value so that means the eye is opened. Accordingly, the winking of eye is further detected and sequences are generated.

Pattern	Right Eye Blink	Left Eye Blink	Output
Pattern	0	2	"Hello"
Pattern 1	1(2nd)	1(1st)	"I am hungry"
Pattern 2	1(1st)	2(2nd)	"Give me water"
Pattern 3	2	0	"Give me water"
Pattern 4	1(same time)	1(same time)	"thank you"



III. PREVIOUS WORKS

Many publications are reporting the relationship between neuronal activity and neuropathy such as Alzheimer's disease. Video eye movement is a non-invasive video-based method that uses a hood equipped with a small camera to measure the vertical, torsional, and horizontal components of blinking (gaze tracking). The threshold for detecting the blinking area is reached. Therefore, it is difficult to measure the exact transition of blinking. In this article, a video eye diagram system with a blinking algorithm is developed. The accuracy of the video eye tracker is 968. Compared to other methods, it shows more consistent eyelid coverage. Confirmed that the system can evaluate light. The reflection parameter of blinking is about [6]. A technique called video eye movement (VOG) is commonly used to capture eye movements. In this article, a small camera is installed on the head and an infrared illuminator is used to take images of the eyes. Horizontal and horizontal eye movements in video images. It is more difficult to develop a method to detect blinking. For illumination with low image contrast, infrared wavelengths need to be used. It is implemented in clinical equipment and has excellent performance compared with other methods [7]. The Video Eye Tracking System (VOG) is a non-invasive video-based method that measures the vertical, torsional, and horizontal position components of two blinks (gaze tracking) using the hood that comes with a small camera. Close your eyes and recognize the movement of your eyes. The technique used in this article is simple and takes less time. Links are converted into phrases or words that have not been used before. A camera focused on the user's face records blinks and is treated as a video sequence. Then think of it as an input for blink detection and code counting. Count the number of eyebrows and significantly correspond to the quotation by quantity. Work with fewer specifications. It also helps reduce costs. Use different methods to detect blinking and blinking. The method used in this document reduces the time required to detect flicker and also reduces costs. Largely. Fshows the general description of the proposed system from camera to recording to voice output [8]. Electrooculography is a technique that uses a biological signal called electrooculogram (EOG) to determine the gaze interface. This surface can help the user to move the computer cursor in the graphical user interface i. Graphical user interface with eye movement function. This is useful because it helps communication. This EOG can be easily recorded. To make the user interface look real, the movement and flickering problems of these people need to be solved. Due to the use of electrode. These electrodes are placed on the top layer of the skin around the eyes to measure the potential difference and record blinks. The system proposed in this paper is called Video Eye Diagram [9]. The most useful organ of the human body is the eye, which helps to make it invisible to the outside world. Eye-tracking analysis reveals a lot of knowledge about people. Eye movement analysis is used in disease diagnosis, mental state detection, activity detection, human body recognition, and other applications. This article introduces an algorithm that can be used to make the eyes move. Flicker can be detected, and it can be used for communication. This technique of using blinking to communicate is useful for people with motor neuron disease, which makes it difficult for patients to communicate with people around them. Proposed an algorithm that first recognizes the face area, and then recognizes blinks. The algorithm was designed and developed here for Spartan 3e FPGA and then tested using MATLAB r2011b software. The experiment conducted here examined different conditions for different groups of people and determined different blinking eyes with an accuracy of 92%. Figure 3 shows a block diagram. Proposed system [10].

IV. DESIGN APPROACH

Under this section we'll be discussing the look approach taken for the planned system. therefore essentially this section are going to be again divided into 2 section. One are going to be the hardware modules planned to be used and also the softwares that may be used for coding.

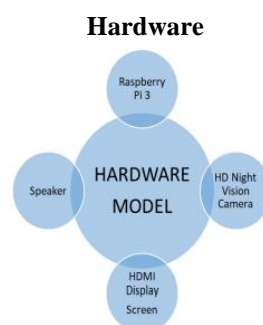


Figure 3

The Raspberry Pi processor is nothing however a series of little single-board computers developed in UK. The processor encompasses a speed starting from 700MHz to 1.2GHz with Associate in Nursing on-board memory vary from 256MB to 1GB. Secure Coyote State slot is given and comes with constitutional WiFi. The speaker for the Raspberry Pi



offers a voice and sound. The speaker is connected to a aux jack on the Raspberry Pi. it's its own power offer that may be charged with the USB port. The volume will be controlled with a button on the speaker or from Raspberry Pi. The visual {display unit|computer screen|video display} is employed so as to display the attention blinking and trailing motion. The screen is usually vital for the caretaker. It will guide him on the right setup of the product. For the right display, we've got chosen to use 7'inch HDMI alphanumeric display display screen. The iBall Face2Face HD night-sight camera is employed for video and picture capturing. This camera comes with the 5G wide angle lens that helps in providing the sleek video and lets to make the standard of video capturing high.

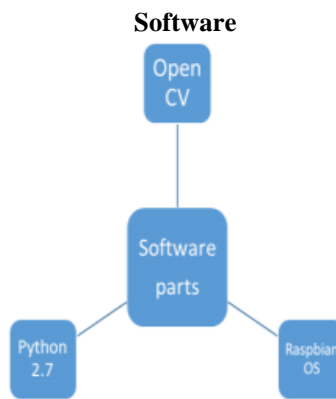


Figure 4

This section is additionally divided into three parts. The primary part is that the OS. The package on that the processor works is that the Raspbian OS. The second half explains the python secret writing environments and therefore the third part tells regarding the Open CV library that is an ASCII text file library. Open CV may be a library of programming functions primarily aimed at the time period vision. it had been originally developed by Intel and it was later supported by WILLOW GARAGE and is currently maintained by IITSSEZ. The library is that the cross-platform and free to be used beneath the ASCII text file BSD license. Open CV is written in C++ and it's the first interface is in C++.

Open CV application areas include:

- 1) 2D and 3D features tool-kits
- 2) Egomotion estimation
- 3) Facial recognition system
- 4) Gesture Recognition
- 5) Human Computer Interaction
- 6) Mobile Robot
- 7) Segmentation and Recognition
- 8) Augmented reality and Motion Tracking

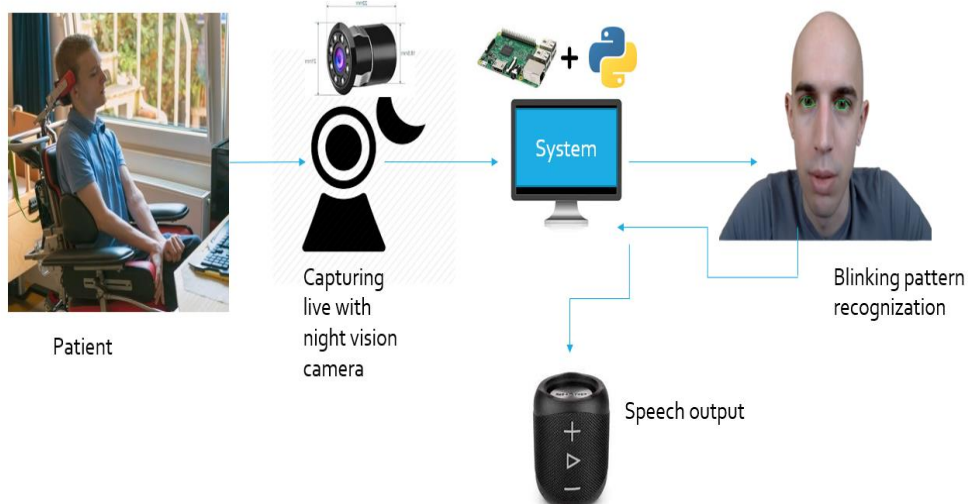


Figure 5



V. SYSTEM DEVELOPMENT

As the way forward for this method is concerned, the microcontroller is interfaced with associate degree alphanumeric display module to display the speech output as text simultaneously. In case, the caretaker misses out on being attentive to the speech output, he will just see it on the show and assist the patient. any on, to avoid the clause of dependency of the patient, Blink-Lator will be developed into a human-machine interface where completely different devices will be interfaced and therefore the microcontroller can be programmed for a means that supports the attention blinks, the corresponding operation is additionally performed. For example, if the patient blinks the correct eye once followed by the left eye once, beside the corresponding text show and speech output as "hello", the speaker will play the pre recorded audio which has a greeting personalised. In this manner, the patient can manage basic communication with people around him. With feature of IoT returning into picture, we can handle the requirements of the MND patients from any place. It is as straightforward as this that the demand signal generated will be passed on mechanically through associate degree alert signal to the caretaker and he will with aid of IoT, can do the communication

VI. RESULT

In this section, we mainly focus on analyzing the results. Each module must be correctly connected to the processor unit and adequate synchronization must be ensured. Before coding the module, the examination of patients with MND must be performed correctly. , Eye extraction and finally the calculation of the eye aspect ratio must be included in the code. The output timing must be done carefully to keep the delay as short as possible. After final testing and integration of the modules, the whole system looks very portable, easy fitting, user-friendly. This is the small segment of the code depicting the various sequence generating speech output code.

```

if eyeStateSequence == pattern:
    time.sleep(3)
    tts = gTTS(text="Hello", lang='en')
    print("Hello")
    ttsname=("name1.mp3")
    tts.save(ttsname)
    playsound.playsound(ttsname,True)
    break

elif eyeStateSequence == pattern1:
    time.sleep(3)
    tts = gTTS(text="I am hungry", lang='en')
    print("I am hungry")
    ttsname=("name2.mp3")
    tts.save(ttsname)
    playsound.playsound(ttsname,True)
    break

elif eyeStateSequence == pattern2:
    time.sleep(3)
    tts = gTTS(text="Give me water", lang='en')
    print("Give me water")
    ttsname=("name3.mp3")
    tts.save(ttsname)
    playsound.playsound(ttsname,True)
    break

elif eyeStateSequence == pattern3:
    time.sleep(3)
    tts = gTTS(text="I want to play", lang='en')
    print("i want to play")
    ttsname=("name4.mp3")
    tts.save(ttsname)
    playsound.playsound(ttsname,True)
    break

elif eyeStateSequence == pattern4:
    time.sleep(3)
    tts = gTTS(text="thank you", lang='en')
    print("thank you")
    ttsname=("name5.mp3")
    tts.save(ttsname)

```

Figure 6

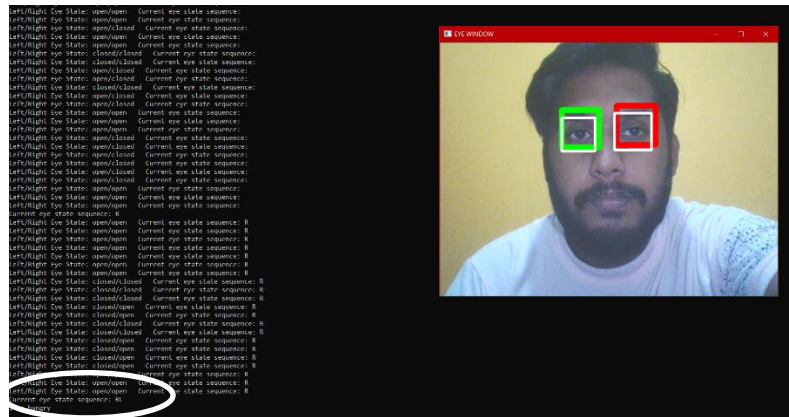


Figure 6

For the sequence RL it generates speech output as "I am Hungry"

VII. CONCLUSION

As mentioned above, our device is unique compared to conventional devices that are already on the market. There is no need to prick electrodes through the epidemics of the patient's skin, so it is very easy to use. In addition, by using the camera mount in our prototype, we can achieve flexibility, which means that the device can be annoyed anytime and anywhere without much effort. But it belongs to the family or the carer. Responsibility for training the MND / paralyzed patient on the different combinations of blinks required for different types of speaker outputs.

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