MINOR PROJECT REPORT

PSEcurity - PHOTOSENSITIVE EPILEPSY INDUCING CONTENT DETECTION TOOL

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PROBLEM STATEMENT

PROBLEM

Photosensitive epilepsy is when seizures are triggered by flashing lights or contrasting light and dark patterns. Flashing or patterned effects can make people with or without epilepsy feel disorientated, uncomfortable or unwell. There is no known cure for photo epilepsy.However there are ways in which it can be avoided .

BACKGROUND

Epilepsy is a chronic noncommunicable disease of the brain that affects around 50 million people worldwide. It is characterized by recurrent seizures, which are brief episodes of involuntary movement that may involve a part of the body (partial) or the entire body (generalized) .

Photosensitive epilepsy is when seizures are triggered by flashing lights or contrasting light and dark patterns. Flashing or patterned effects can make people with or without epilepsy feel disorientated, uncomfortable or unwell.

It may sound like an urban myth, but it is possible for video games to cause seizures in children or to adults who are into gaming. This condition is known as photosensitive epilepsy, and affects three percent of children who have seizures.

Exposure to flashing lights at certain intensities or to certain visual patterns can trigger seizures, and is more common in children and adolescents than adults. Some sources, such as strobe lights or emergency lights, may seem obvious as potential triggers. But visual patterns and effects, especially stripes of contrasting colors, in any video medium, can also trigger a seizure.

RELEVANCE

As we know with the advent of social media , technology and the booming gaming industry especially with the concept of 15-second video clips called reels on instagram and a wide variety of content and videos available on youtube there have been instances where certain sections of these videos or parts of video games contain photoepileptic content which may cause photosensitive epilepsy .So it is important at this time to moderate/filter this content or provide proper warnings related to this .

AIMS AND OBJECTIVES

The aim of this project is to detect photoepileptic content in different videos using video processing which works on an algorithm having predefined parameters which are in accordance with the recommended standards with respect to tolerance range of a photoepileptic person. Certain parameters like luminance, brightness and the duration of flashes tolerant to the eyes of a photoepileptic person are considered in the algorithm. As we know till now there has not been any effort with respect to the automatic detection of photoepileptic content in videos available online , in some videos the creator manually puts in a warning at the start of the video which warns the viewer about the presence of photoepileptic content in the video , so it is important in this regard to have a detection tool like this so that people can check if the content they are uploading is safe for viewers suffering from photoepilepsy .

INTRODUCTION

Photosensitive epilepsy is a WHO recognised disease that puts 1 in 4000 people at a sure shot risk in terms of basic life. Like any other seizure it hampers the ability of a person to work in the sense of being a fully functional human being. From minor lightheadedness all the way to death, PSE(Photosensitive Epilepsy) is an obstacle that makes a decent set of people suffer. Fast flashing lights, repetitive patterns or patterns that flash can all induce a seizure with relative ease making it essential to address the concern. With the growing entertainment industry and the clear advancements in technology, it has become easily apparent that flashing lights or symmetrical patterns aren't going anywhere, Be it an action in an anime or recordings of a club all the way to rgb lit keyboards and flashy 3D animations created for events, everything can cause a seizure if not inspected with proper care. The victims often consider seizure inducing videos an equivalent of an assault and the 21st century is no place to stand quietly when someone feels assaulted.PSE related cases have existed for a while now, people don't understand that it's an actual struggle. We can see the cases of people like Zach Eagling who was cyberbullied after doing a walk for a certain epilepsy awareness organization. It is basic cyber assault and if laws to prevent other cyber assaults exist this is a definite matter to look into.

PSEcurity aims to bridge this gap. It aims to provide a safe user experience while viewing videos, an app created to help check links and videos for segments which induce seizures is the basic principle of PSEcurity. A python driven code which checks the frames for different properties like color space, luminance, gamma and saturation and compares it with various parameters set for photoepileptic content making it easier for individuals with laptops and phones to verify the integrity of any clip.

The report goes on to brief us about the basic problem statement, how we plan to tackle it and the basic design of our software. The section after this addresses the literature review which gives an in-depth overview of the background check, legality and a variety of other avenues that were explored in our to come to a conclusive decision in the terms of the directionality of the project.

LITERATURE SURVEY

Population Affected by Photoepilepsy

1 in 4000 people which is 5 percent of the people who are epileptic are photoepileptic, with an approximate figure of the world's population of about 7 billion, this easily brings the net figure to 1.75 million which by no margin is a small number. The WHO recognised epilepsy as an official chronic non-communicable disease and Chronic diseases tend to occur in older adults and can usually be controlled but not cured

Photoepileptic seizures as a burden

They can in a given scenario cause accidents, it can be as simple as lights flickering through trees or disco lights, They can cause people to fall and hit their head or suffer a serious injury. People with epilepsy often have memory problems, or emotional disorders like anxiety or depression, which can be quite disabling.There are longer term dangers, too. People with epilepsy often have memory problems, or emotional disorders like anxiety or depression, which can be quite disabling. Epilepsy can be devastating in terms of quality of life. There is also the specter of sudden unexpected death in epilepsy (SUDEP), in which a person with epilepsy unexpectedly dies, either with or without evidence of a seizure. The cause of SUDEP is unknown, but there are on average 1.16 `cases of it every year for every 1,000 people with epilepsy, according to the U.S. Centers for Disease Control. The risk of death is greater for people with uncontrolled seizures than people with controlled seizures.

The root of Epilepsy warnings

The existence of photoepileptic seizure warnings can be dated back to as early as 1990s when a 9 year old succumbed to a seizure while playing super mario nintendo. She fell to the ground and started jerking and shaking. With nerve wrecking descriptions from Jessica’s father about her eyes rolling up and the panic caused from the scenario, it became obvious that there was a problem to address. Following the incident and a set of similar occurrences Nintendo of America Inc. announced that the company would include

a warning with all its products sold worldwide. Since mid-1991 all games and related hardware in the United States have carried the warning to "consult your physician before playing video games if you have an epileptic condition." Sega soon enough followed Nintendo's footsteps.

Photoepilepsy Gaining Public Attention

Photosensitive epilepsy was again brought to public attention in December 1997 when the *Pokémon* episode "Dennō Senshi Porygon" ("Cyber Soldier Porygon") was broadcast in Japan, showing a sequence of flickering images that triggered seizures simultaneously in hundreds of susceptible viewers (although 12,000 children reported symptoms which may be attributable to mass hysteria).

The incidents only increased henceforth from March 1997, the 25th episode of an anime series called *YAT Anshin! Uchū Ryokō* where red and white flashing lights hospitalized four kids to the Cyberpunk 2020's braindance.

Epilepsy Warnings and the next generation

Sony's Playstation is arguably the biggest console house of the 21st century. Irrespective of the fact that SEGA and Nintendo are not what they used to be, the effect they had on the gaming industry in the photoepilepsy industry is immense as till date Playstation displays an irremovable epilepsy warning each time it is turned on. The current market rival XBox has their own version of the epilepsy warning as well. Many huge game developers ranging from ubisoft to rockstar gaming all have taken responsibility to add epileptic warnings for their games.

The Legality of the matter

Innumerable lawsuits ranging from 1993's 15 year old Laura Moceri's case to 2013's John Ryan Mclaughlin's Elder scrolls 4 case have been seen in action and while No consumer has won a product liability/personal injury case against a game manufacturer whose video game triggered seizures It is visible that there is an issue to be addressed. While some gaming manufactures like steam are yet to introduce warnings of any sort it is slowly becoming a need of the hour.Some laws like Zach's law named after a victim have been

proposed but have seen no recognition i.e. no legal protection exists for the photoepileptic community.

Social Media and Photoepilepsy

In today's day and age a total number of 2.6 billion people use youtube and 1 billion people access instagram, these platforms offer a plethora of videos and short snippets which are very capable of inducing seizures in any and everyone afflicted with the issue. If we were to consider a third of the population had access to youtube it would bring the number to roughly 600 thousand people which is no matter a small unit.

Demands going unheard

Sophie Harries, a 22-year-old dietitian from Somerset, reported a film trailer to Instagram that contained flashing lights, but it said the video did not breach its terms of usage, she said. She went on to describe it as a minefieldThe Epilepsy Society wants the government's new plans to tackle "online harms" to recommend warnings about flashing images on social media.The Epilepsy Society says anyone found guilty of posting harmful images intentionally should be prosecuted for assault.The government said it would consult with the charity on the issue. The government took no major action as we can clearly see instagram is yet to add a report feature for photoepilepsy while one for eating disorders and spam exists(without undermining either as an issue). Neither the victim nor the charity were recognised which is exactly the case of every prevalent cry for help.

The Gap's Existence in the Web Design

The World Wide Web Consortium - Web Content Accessibility Guidelines (WCAG) Version 2.0, produced in 2008, specifies that content should not flash more than 3 times in any 1 second period.[12] However it does allow flashing above this rate if it is below the "general and red flashing thresholds", which means if the effect is small or low-contrast enough it is acceptable which is not the correct approach and requires amendments. A photoepileptic person can be affected by flashing lights with a frequency range of 3-30 hertz and it may go upto 60 hertz as well. A person may also be affected by patterns. The given guidelines provide very little protection against these as a person's seizure can very

easily be triggered by lights that flash 3 times in a second or a pattern which uses the red threshold.

Treatment for Photoepilepsy

No cure is available for PSE, although the sensitivity of some people may diminish over time. Medical treatment is available to reduce sensitivity, with sodium valproate being commonly prescribed. Patients can also learn to avoid situations in which they might be exposed to stimuli that trigger seizures and/or take steps to diminish their sensitivity (as by covering one eye) if they are unavoidably exposed. These actions together can reduce the risk of seizures to almost zero for many PSE patients. Hence to avoid PSE our software will act as a tool for help.

Pre-existing Technology

Some technologies do exist for the protection of the photoepileptic individuals such as the PEAT,harding PFA and more.PEAT help authors determine whether animations or video in their content are likely to cause seizures but the use of PEAT to assess material commercially produced for television broadcast, film, home entertainment, or gaming industries is prohibited. The harding PFA technology has the rights to the the content which PEAT does not, it is a suite of applications for compliance with international guidelines on Flashing and Spatial Patterns in Broadcast Video, including Ofcom, ITU, NAB-J and ISO.

Our Approach

None of the existent technologies do what we aim to, our software aims to not only provide a user friendly interface but rather aims to bring photoepilepsy detection to mobile phones, using python for our source code, apps like flutter for app development and softwares like firebase for backend support and creation of custom api’s we plan to implement safe detection of PSE inducing content based on the relative luminescence of consecutive frames.

DESIGN

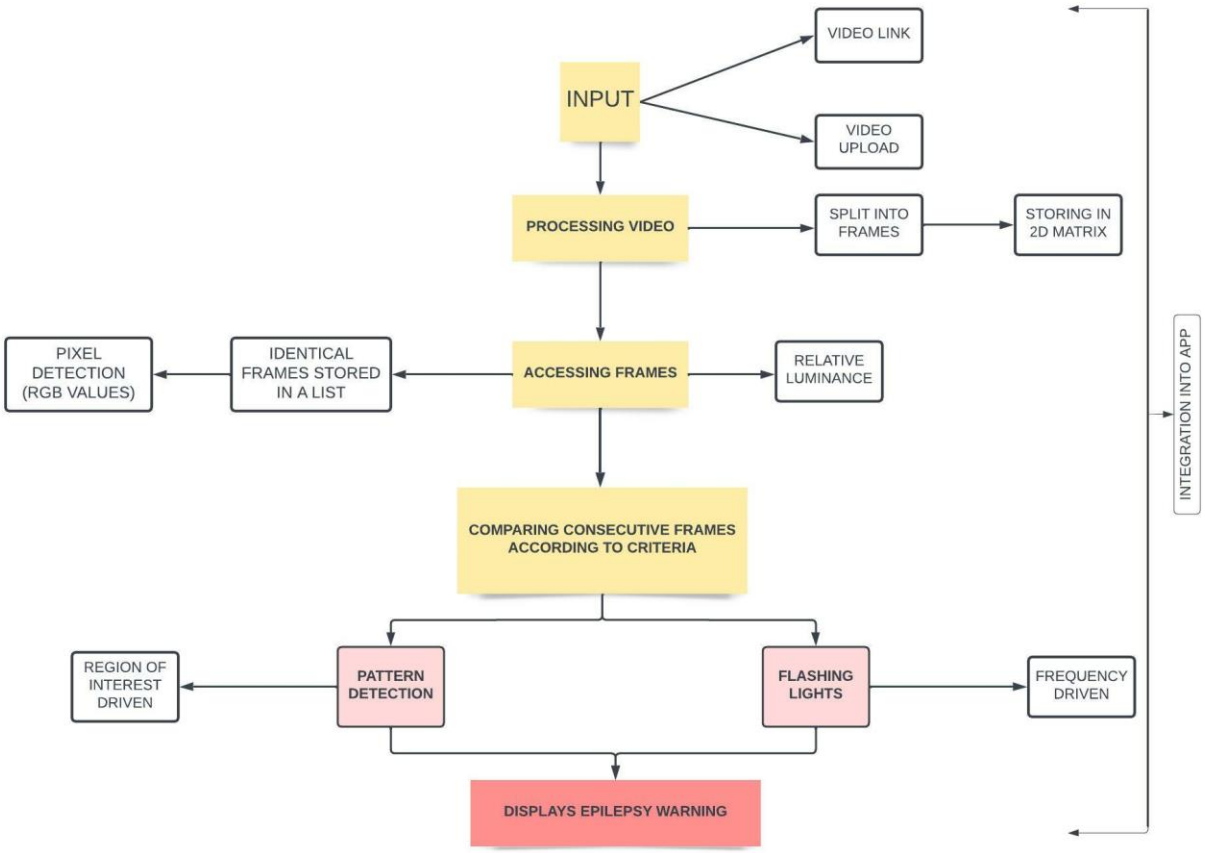

Figure 1: Flowchart Representing the Basic working of the program

CONCLUSION

Photosensitive epilepsy is as much of an issue as any other disease. Our vision is one of the basic human senses, PSE is a mountain of an obstacle for the same. Ask any person prescribed to wear glasses how inconvenient it gets when you can't find your glasses and ask any individual suffering from migraines what a severe headache does to them, now imagine your sight being the reason for a seizure, inconvenient does not begin to describe it.

All the events of the past, the absence of laws for the regulation, the number of afflicted people and numerous factors have made it a necessity to not only talk about the problem but to deal with it as well.

PSEcurity will help people struggling with the issue and will help put their minds at ease, they will have something to turn to until someone steps in and recognises their cries. The software will use newer technology and help put the patients. It will bring ease by introducing the content in the form of an app. Mobile sites are accessible but we can not deny the ease that apps bring.

To conclude, addressing a real problem with better technology will help us develop a software that will stand out and help individuals who aren’t yet recognised by wide sections of the society as people with issues. PSEcurity will help its users view the world through rose eyed glasses.