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Focus Assistant: Identifying the level of motivation in computer users.

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Abstract: Focus Assistant is a software that will help the user to be concerned about their health and refrain them from overworking and also will guide them back to work when they get distracted for a prolonged time. The system consists of two specific parts as the user should be alerted when distracted and the user should be notified to take a break if overworking. One of the main objectives of this paper is to identify the features and requirements that should be implemented in the system. The aim of this research was to reviews articles and other works related to the topic to get an understanding of the features that could be implemented in the system, and technologies that could be used regarding the system. By gaining a thorough understanding of the related work the expected results of the system would be that it helps the user to be focus on work by alerting them when they are distracted and as well as keeping their health unaffected in stressful work environments by asking them to practice some tasks such as to have water breaks, to move stretch and relax their muscles and take eye rests. There are software applications and systems that guide the user to take breaks if overworking and to practice ergonomic guidelines and also there are tools and chrome extensions that keep the user from getting distracted from their tasks. But Focus Assistant will be the first desktop application that would have both the options, so the user can focus on their health as well as not be distracted from their tasks for long periods. Finally, suitable features for the system are reviewed based on the information gathered from the related work.

Keywords: Focus Assistant, distracted, overworking

Introduction

As technology has woven itself into the everyday lives of the people, it has transformed the mediums through which we interact, learn, and consume information. The use of computers as a tool in workplaces, academic institutions, recreation facilities, and homes has become very common. Undergraduates and especially people who work in the IT field spend most of their time in front of a computer or a laptop staring at the video display terminal popularly known as the computer screen. It is estimated that nearly 150 million computer users sit in front of a computer screen for hours each day. Unbeknownst to them, this extensive viewing of the computer screen can lead to serious health issues. Studies have shown an association between such prolonged computer usage could cause visual health- related symptoms such as Computer Vision Syndrome (CVS), and Musculoskeletal Problems, along with Repetitive Stress Injuries. Necessary precautions need to be taken to avoid these health issues that might impair the person for his/her lifetime.

Focus Assistant provides the user with the option of alerting themselves of such extensive computer usage. The purpose of this system is to prevent computer users from sitting in front of a computer or a laptop screen for a long period of time. The main focus is to develop a desktop application that reminds the user to get breaks while working, to follow proper ergonomic guidelines by prompting notifications to maintain correct postures and reminding them to keep themselves

hydrated by intaking water regularly.

Focus Assistant mainly focuses on the young generation who tend to use computers and laptops regularly for studying, gaming, and other related work.

The system would also provide users with the option of improving concentration while on the computer. The user may get distracted for a while, lose track of time, and will spend a lot of their time away from the work that must be completed. One cause of such distraction could be the other entertainment apps on the computer or the message apps. Focus Assistant would keep track of 'unnecessary' trips to these apps and take steps to alert the user of their distraction. Re-focussing will be prompted by notifications denoting the consequences of not finishing their work. For this, the user can adjust the desktop application to remind them in notifications when they get distracted from their respective work to something else in the device or to a different device like his/her mobile and also to ring an alarm when they been away from the computer for a long time, here the user can adjust the alarm to ring after a time duration.

Therefore the purpose of this study is to review the health issues that could cause by overworking in front of a computer and review existing software that has been implemented and gain a thorough understanding of how to implement a desktop application that addresses the both above-mentioned areas.

Objectives of this study:

- To identify what kind of systems are developed.
- To get a better understanding of the technologies that have been used when implementing these kinds of systems.
- To identify the features from the systems that have been developed.

Literature Review

When an extended amount of time is spent in front of the computer, users are most likely to be at risk of developing certain health-related problems. Spending more than 4 hours each day in front of a computer screen may have the risk of dying from a heart problem or being hospitalized according to a study conducted in 2011. (Julius and Mustapha, 2014)

Listed below are some of the health-related problems that may develop into greater issues if not dealt carefully; (Tucker, 2016)

Musculoskeletal Problems

Can occur in areas of the body such as back, neck, chest, arms, shoulders, and feet. Numbness may occur in the arms and hands. Happens because of the user's posture when using the computer being incorrect. When computer users attempt to interact with images or other sensitive content on a task, they tend to hold their heads off in bad postures which leads to neck, back, and shoulder pains.

Vision Problems

Constantly focusing on the screen with delays in blinking can result in dry eyes. Looking at the screen for an extended period can cause Computer Vision Syndrome, which is the eye muscles being unable to recover from the strain due to lack of rest. Eye strain results in a combination of various symptoms such as dry eyes, eye fatigue, headache, blurred vision, and also changes in the perception of color.

Repetitive Stress Injuries

Pain in the neck, shoulders, or from the shoulders to fingers due to repetitive muscle use. A most common condition related to repetitive use of muscles when using the computer is Carpel Tunnel Syndrome which is a common condition that causes pain, numbness, and tingling in the hand and arm.

Stress Disorders

Using tech devices every day has an impact on the emotions and behaviors of the user. Prolonged use of computers may develop poor health and increase the pressure placed on the user in their workplace, both of which could lead to stress. Stress leads to decreased attention span, lack of concentration, and dizziness (Tucker, 2016

Longer the stress occurs and is left

untreated, the greater the chances of developing more serious health-related problems.

The above-mentioned health issues can be controlled by taking necessary steps to minimize the effects, such as;

- Taking small breaks from the computer work to move, stretch, and relax the muscles to keep the blood flowing every 30 minutes (York, 2017)
- Resting eyes by taking blink breaks from the screen every 20 minutes by gazing into a distance.

Taking 5 minutes to break from intensive computer operation in each hour is encouraged as a good practice (Julius and Mustapha, 2014)

- By following correct ergonomic practices.
- Taking a small water break to free your mind from stress at work and also as a practice to stay hydrated.
- If sitting for an extended time cannot be avoided, it is better to bend and move the body even while sitting.

One of the main purposes of the software that is to be implemented is for the user to focus on their health as much as the work that is needed to be done. So, the system that is yet to be implemented tries to grasp the above steps for the benefit of the user and by doing so it will increase the productivity and the efficiency of computer users.

Some of the existing apps and software that urge users to take a break from working are listed below;

Take-A-Break Notification: An Ergonomic Application

(Julius and Mustapha, 2014)

This is a software designed to reduce Computer Vision Syndrome (CVS) on office workers who are more likely to spend most of their time in front of a computer screen. The main purpose of this work is to prevent computer users from looking in front of a computer screen for a long period of time. The project development phase has used Rapid Application Development as its methodology. It encourages the users to apply the ergonomic practices and to be able to reduce the increasing rate of CVS. This software allows the user to take a 5-minute break every two hours.

Eye Defender (Nova Vozrak, 2014)

The user can set periods of time between breaks and the duration of the breaks. When the set time gets triggered, the program activates a default screen saver according to the user's preferences, from its library or from a folder the user chooses as a reminder to stop working and take a break. It helps to prevent computer vision syndrome which causes from working on computers for long hours.

Off4Fit (Bjerke, 2014)

The software will remind the user to take rest and to do some exercises in front of the computer. A computer- generated image of a girl will demonstrate a set of various exercises for eyes, hands, and body, each repeated several times. The program allows the user to choose intervals between pieces of training, advised to keep the interval set to 60 minutes. The user can choose not to do the exercises if they don't feel like it, the breaks alone are helpful to the user.

Smart Break (Bjerke, 2014)

Monitors the time spent on a computer and prompts the user to rest at a specific time duration. This means the user can spend more time in front of a computer in a more efficient way by utilizing the break time.

Scirocco Take A Break (Nova Vozrak, 2014)

A software that reminds the user when to take a break. The features include customization of work, break times and snooze, audio or visual notifications, type of timer display, screen saver, the locking mechanism on break, time spent statistics, an average of break time per hour, and

motivational pie charts.

Above mentioned software are solutions to make users be more aware of their health to mitigate injuries or issues caused by working in front of the computer for long hours.

The other important section is to keep the user from getting distracted from their tasks for a prolonged period of time, so they can focus on their respected work and be efficient and productive with their work. Mostly university students tend to get distracted from their work often, some of the distractions can be listed as follows;

- Sleepiness
- Outside sounds/events
- Mobile phone
- Mind elsewhere
- A tendency toward some other task on the computer. Eg: social media, gaming
- Taking a break for a long time

Above mentioned distractions mainly occur due to less interest in the ongoing task that needs to be completed or by getting involved with some other activity during the short break. To minimize this type of occurrence software has been implemented for the benefit of the user's productivity.

Discussed below are some of the existing software that helps the user to work without getting distracted from their task;

Simpleology (Jacob Laguerre, 2017)

Is a digital productivity planner that helps the user to efficiently organize their day and stay on task despite many distractions. It is an online productivity tool with following features; it can block the access to social media sites and is consistent with a chrome extension called Dream Catcher which saves the random thoughts that comes to the user's head (Eg: what to buy at the store, what tomorrow holds, etc.).

Simpleology has two different modes: Simple Mode and Advanced Mode. In Simple Mode, it consisted of The Dream Catcher, Start My Day, and Daily Targets. It also has a vision board where the user can add audios, videos, pictures, and gifs to help the user stay focused on their goals.

Inbox Pause (Connell, 2013)

A chrome extension which allows the user to pause incoming mail. The user can pause the inbox, answer the existing emails, and move onto their next task. The user can create a time to receive emails automatically so the user can block out time for productive work. Can get notified only about important emails.

Timers *(Pomodoro Technique)* (Connell, 2013)

The user can choose their task, set the timer for 25 minutes, and work on the chosen task. At the end of the 25 minutes, the user can take a break for 5 minutes.

Focus@Will (Connell, 2013)

A neuroscience-based music service that helps the user to focus, reduce distractions, and retain information when working, studying, writing, and reading.

The above-discussed software applications help the user to stay focused on their work without being distracted from the task.

Other related research works that can be used when developing the system are discussed below.

A non-intrusive method for user focus of attention estimation in front of a computer monitor. (Asteriadis et al., 2008)

This system estimates a user's focus of attention in front of the computer screen, by detecting and tracking the user's head position and eye movement using the web camera. It uses machine learning concepts to give real-time feedback on the user's attention by estimating the head position, eye gaze, and the distance of the user from the screen.

Mitigating distractions during online reading: an explorative study. (Copeland et al., 2016)

This paper presents a user study where

participants' eye gaze was recorded as they read the text in a visually distracting environment. Two distraction mitigation signals using real-time eye gaze data to investigate whether the effects help in reducing distraction rate and also aid recovery from distraction were explored. To show the reader where they have read up to, the signals involved adds a signal to the last word read before the distraction occurred.

The results demonstrate that the mitigation signals helped recovery from a distraction by drawing participants' attention back to the text as well as indicating where to recommence reading. (Copeland et al., 2016)

Detecting Cognitive Stress from Keyboard and Mouse Dynamics during Mental Arithmetic (Lim et al., 2014) Investigates how both keyboard and mouse features can be combined to detect human stress, particularly cognitive stress induced by time pressure and mental arithmetic problems.

The technology that has been used in this project is Statistical analysis of how the keyboard and mouse behavioral patterns change according to task demands.

Results: Shows the complexity of the mental arithmetic problem and time pressure affects the user's behavior, mouse behavior, and keyboard behavior. This indicates that the automatic analysis of human stress from keyboard and mouse input is useful for providing adaptation in interactive systems such as the e-learning system.

Eye Gaze as an Indicator for Stress Level Analysis in Students (Jyotsna and Amudha, 2018)

Demonstrating a system for the indication of mental stress using; the number of blinks, pupil diameter, and an indication of eye fatigue.

Two research questions were formulated and it has been tested against three hypotheses. Each hypothesis is validated with statistical analysis

When there is a large variation in the stress level it can be indicated with a warning message and the corresponding participant can strengthen their stress management ability.

Camera-based Driver Distraction System using Image Processing (Rathod and Agrawal, 2018)

To reduce road accidents which is the main cause of driver distraction.

Haar cascade algorithm has been used for object detection in real-time.

Choose an efficient method to reduce road accidents due to driver's tiredness. Also increases passenger safety and gives information about the driver's behavior while driving and detects if the driver is intoxicated or not.

Methodology

The system to be implemented consists of two specific parts; the user should be alerted when they get distracted from their work and the user should be notified to take a break when working for a prolonged period of time. The thought is to implement the systems separately and connect them to make a whole system that works separately.

A. Phase I

Is to implement the system which alerts the user when they get distracted from their work for a long period. By identifying the keystroke durations it can be detected whether the user is engaged on a task or not. But still, the user may be present but might be engaged in other related/non-related work on the device, to identify this the webcam is used to recognize whether the user is present in front of the device or not. Whether the user is doing some other work related to the main activity or whether he is distracted by something else on the device needed to be checked too. This can be a tricky situation to work on when developing the system.

The outcome of this system is to alert the user if they are distracted, by making an alarm sound, if the user is not present or by

notifying the consequences when they get distracted from their work for a long time. The user can keep a timer for a certain task and get a small break or they can set a timer for a few minutes to take a break from their work. The user can also keep notes of their work to be done (Eg: Deadlines, assignments) so they can get notified when they get too distracted.

B. Phase II

This phase consists of the implementation of the health concerned side of the Focus Assistant. When getting stuck on a task for a period the users tend to finish the task without taking a break or if the user is an office worker who has to be on their seats working for a long period, they hardly concentrate on their health as they want to get the work done somehow.

By monitoring the keystrokes of the user it can be identified whether they have been working for a long time without a break. Even if the keystrokes are not active by using the webcam of the device, the user's presence can be known.

The outcome of this system is to notify the user to take breaks from their work after a specific duration of time to practice minor exercises which doesn't take much of their time but will affect a great deal on their health.

Asking the user to do the following activities is the output from this phase of the system.

- Take small breaks from the computer work to move, stretch, and relax the muscles every 30 minutes.
- To rest their eyes by taking blink breaks from the screen every 20 minutes for 30 seconds.
- By asking to follow correct ergonomic practices such as stretching, standing up, moving your body time to time even while seated.
- Asking to take a small water break to free your mind from stress at work and also as a practice to stay hydrated.
- If the user is sensed to be stressed, ask the user to listen to a song or to have a small walk to get their mind off the stress and to make them work with a fresh mind again.

Finally, the overall system needs to be tested for errors and system touch-ups.

Discussion

From the review papers that were referred to during the conduct of the research, the most suitable features for the desktop application system are;

- Having an alert system to notify the user when they get distracted as well as when they are overworking.
- Keeping a notepad to keep track of the tasks they have.
- Notification prompter to notify the user to take breaks, exercise, or drink water.
- A timer, so the user could break their tasks into time frames to increase efficiency.

There are software systems that help and guide the users to take breaks and practice ergonomic practices in between their tasks and also there are tools that keep the user from not getting distracted for a prolonged period of time. But the system to be implemented will be the first system that would have both the options on, so the user can focus on their health if they are working too much or the user can keep themself from not being distracted for periods of time. This research will be continued to produce the system.

Conclusion

When working on a laptop or a computer the user may get distracted for a while, lose track of time, and will spend a lot of their time away from the work that must be completed.

Distraction mainly happens because of the lack of attention towards doing a certain task. When get piled up with work, people lose interest to get them finished, which ultimately leads them to be panicked because of the less work that they have done, or sometimes they might get distracted because some other work with a high priority came up. Either way, the user gets mentally affected due to the lack of work they have performed.

In another case, the user might be working on their laptop without a break unaware of the time they have to spend in front of it, causing them to be physically and mentally tired.

The solution is to help them keep their physical and mental health unaffected while doing work, by alerting them on whether they need to rest or keep working. If the user has done enough work for some time then help them get a break from all the stress and help to get some small mental and physical exercises, to have them work more efficiently again. And if the user gets distracted from their work, then help by alerting the consequences they would have if the task isn't finished on time.

Focus Assistant is a software that will run on the background of the computer without hindering the user's work but will be monitoring the user with the users' consent. The system to be implemented is designed for the user to be focused on their work and also to help them be more vigilant on their health when working for a prolonged period of time

The user will be monitored with their consent, by the keystrokes on the keyboard and also using the web camera of their device to know whether the user is present in front of the device. If the user has been working for a long period of time then the system will send a message for the user to take a break from the work for a few minutes. If the user is not present in front of the device, or if the user is there using the device but distracted from their work for a time period then the system will alert the user to get back to work that needed to be completed.

References

Asteriadis, S., Tzouveli, P., Karpouzis, K., Kollias, S., 2008. A non-intrusive method for user focus of attention estimation in front of a computer monitor, in: 2008 8th IEEE International Conference on Automatic Face & Gesture Recognition. Presented at the Gesture Recognition (FG), IEEE, Amsterdam, Netherlands, pp. 1–2. https://doi.org/10.1109/AFGR.2008.4813330

Bjerke, N., 2014. Time to Take a Break. Time Take Break. URL https://articles.informer.com/time_to_take_a_break.ht ml

Connell, D., 2013. 6 Tools That Stop Computer Distractions and Help You Stay on Task. 6 Tools Stop Comput. Distractions Help You Stay Task. URL https://www.wisebread.com/6-tools-that-stop-computer-distractions-and-help-you-stay-on-task

Copeland, L., Gedeon, T., Caldwell, S., 2016. Mitigating distractions during online reading: An explorative study, in: 2016 IEEE International Conference on Systems, Man, and Cybernetics (SMC). Presented at the 2016 IEEE International Conference on Systems, Man, and Cybernetics (SMC), IEEE, Budapest, Hungary, pp. 004830–004835.https://doi.org/10.1109/SMC.2016.7844993

Jacob Laguerre, 2017. Double Your Productivity With Simpleology! Double Your Product. Simpleology. URL https://www.pciinstitute.net/reviews/simpleology- review/

Julius, N., Mustapha, E.E., 2014. Take-A-Break Notification: An ergonomic application, in: Proceedings of the 6th International Conference on Information Technology and Multimedia. Presented at the 2014 International Conference on Information Technology and Multimedia (ICIMU), IEEE, Putrajaya, Malaysia, pp. 390–395.https://doi.org/10.1109/ICIMU.2014.7066665

Jyotsna, C., Amudha, J., 2018. Eye Gaze as an Indicator for Stress Level Analysis in Students, in: 2018 International Conference on Advances in Computing, Communications and Informatics (ICACCI). Presented at the 2018 International Conference on Advances in Computing, Communications and Informatics (ICACCI), IEEE, Bangalore, pp. 1588–1593.https://doi.org/10.1109/ICACCI.2018.8554715

Lim, Y.M., Ayesh, A., Stacey, M., 2014. Detecting cognitive stress from keyboard and mouse dynamics during mental arithmetic, in: 2014 Science and Information Conference. Presented at the 2014 Science and Information Conference (SAI), IEEE, London, UK, pp. 146–152. https://doi.org/10.1109/SAI.2014.6918183

Nova Vozrak, 2014. How to Prevent Eye Strain. Prev. Eye Strain. URL https://articles.informer.com/how-to-prevent-eye- strain.html

Rathod, V., Agrawal, R., 2018. Camera Based Driver Distraction System Using Image Processing, in: 2018 Fourth International Conference on Computing Communication Control and Automation (ICCUBEA). Presented at the 2018 Fourth International Conference on Computing Communication Control and Automation (ICCUBEA), IEEE, Pune, India, pp. 1–6.https://doi.org/10.1109/ICCUBEA.2018.8697463

Tucker, F., 2016. Top 10 Computer Related Health Problems.MicroHealth.

York, N., 2017. The Dangers of Sitting to Work: How Too Much Time in Front of the Computer Could Be Putting Photographers' Health at Risk. URL https://fstoppers.com/business/dangers-sitting-work- how-too-much-time-front-computer-could-be-putting- 209431

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