e-Yoga Prescription Designed for Computer Users using e-Yoga Environment for Posture

A Study on Information Technology (IT) Professionals to Help Them Improve Their Spine Health

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Abstract: The paper presents the next generation health protection techniques using postures and exercises of Yoga specially designed for IT professionals suffering with sever Spine related health issues. On a short survey conducted on major health issue concerning the Information Technology - IT professionals here in Bangalore, India. The result shows Posture and Spine related issues made the work delay and employee well-being is disturbed at higher levels dragging the employees into chronic pain and depression producing less creativity. We formulated a general health check up to understand the nature of Yoga needed to help the employees or users to improve their Gait and posture. Using Video Analysis techniques for simple Yoga and motion analysis techniques for advanced yoga, we have designed a prototype where the user can reap benefits of Yoga by creating a Virtual Yoga Environment at the work place or wherever the employee uses the computer for a long time. The environment alerts the user at regular intervals depending on user Yoga Prescription that is generated by the environment at the time of user requirement, inputs and accessibility. The alerts for healthy users and young IT professionals will be blinking their eyes very often, standing up from the work chair, stretch, a standing twist and some basic neck movements again depending on the body size of the user. However performing these simple Yoga exercises on the whole in a day would be approximately 5 to 7 minutes for a6 to 8 hours Computer user that would promote better health.

1 INTRODUCTION

In this paper we have made an effort to design an e-yoga tutor for the health issues of computer users especially in the Information technology - IT industry for whom we have designed a real time Yoga prescription to improve the chronic health conditions like of those suffering from Spine related, posture issues and other psychological problems like depression. It not only helps in treating their health conditions alternatively it helps users to improve concentration levels and beat stress levels at work.

The primary work of our research was to investigate the health issues among the IT users. Based on the age of the users and duration of work hours the employee used a computer, the results were tabulated. Using this data we categorised the health issues for which suitable Yoga treatment is

designed. During the work hours we tried to imbibe the yoga exercises to be performed and hence the need of an effective intelligence system that interfaced human and computer was essential. This is well explained in the further sections.

2 GENERAL HEALTH CHECK

The general health check details consist of basic details mentioned in Table 1. These details act as input for yoga prescription. Yoga prescription is letting the user know which Yoga asana or exercise of yoga is suitable for the cure if any ailment present or for general well-being. The health check for IT professionals under different categories of computer usage are been categorised making use of the table for general Yoga prescription. These basic details

are used for creating a Yoga Avatar that is used for interfacing between real and virtual environment.

Table 1: Preliminary Database of general health check for yoga prescription.

Age Group	(20 – 25, 25 – 30, 30-45)
sex	(Male/Female)
No of hours Computer used per day	(2-5, 6-9, >9)
No of hours sleep	(<4, 5-7, 8-10, >10)
Height	In Inches
weight	In Kilo Grams
Eye Sight	(Normal/ Prescription)
Undergoing Treatment	Details
surgery undergone	If any
No of years' Experience	(0-25)
Current Domain Experience	(0-25)
Need any help	Health Related

3 YOGA AVATAR

The size of the human is taken into consideration for creating a human avatar virtually hence we refer here it as Yoga Avatar. The need of Yoga Avatar is very much essential for yoga prescription for the following:

▪ Yoga Asana should always be performed under guidance. The steps beginning from inhaling and exhaling during the exercise to proper level of stretching and bending plays a vital role for which the Yoga Avatar is mandatory to determine the level of stretch. Not all have a unique body size that Yoga can be performed at the same level.

▪ It acts like a watermark animated picture that does the asana virtually on screen depending upon the human size where even a person weighing 120 Kilos can twist to a certain degree that the avatar knows while a person weighing 50 kilos can do it more. This helps that helps the user perform along the Yoga Avatar do a better Yoga Asana.
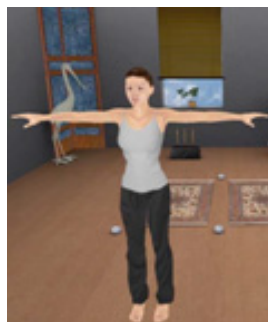

Figure 1: Yoga Avatar.

▪ The human body size changes constantly and it would be tough to measure the sizes every day or very often to update into the software to change the yoga avatar. Hence we have created an option of live yoga Avatar that captures your present moment and suggests you the degree of twist or turn or bending for the asana.

4 VIRTUAL YOGA ARCHITECTURE

Analysing the motion of the human body includes the extraction of the low-level features like body part segregation, body parts detection and identification, and the recovery of 3D structure from the 2D projections in an image sequence. To trackan individual moving using a single camera that is preferably a webcam or a mobile camera involves applying visual features to detect the presence of human directly with considering only the geometric structure of the body parts.

Motion information such as change in position can be captured constantly to match the needed change in the virtual environment, incorporating with intensity values that can be employed to establish matching between consecutive frames. The correspondence between successive frames from real world and virtual world are solved throughout using the image sequence.

The SIFT (Scale Invariant Feature Transform) algorithm can be used for comparing the two videos the reference or virtual video and the actual video. This technique was originally devised for object recognition. The features like good variance, rotation and illumination SIFT descriptor was commonly used in image matching. (Daixian, 2010) Applications of SIFT include object recognition, robotic mapping and navigation, image stitching, 3D modelling, gesture recognition, video tracking, and match moving. Using SIFT as base for Virtual Yoga Architecture SURF (Speeded Up Robust Feature) Algorithm the advanced version can be looked upon. The major advancement is 3D reconstruction.

SIFT and SURF algorithms employ slightly different ways of detecting features. SIFT builds an image pyramids, filtering each layer with Gaussians of increasing sigma values and taking the difference. On the other hand, SURF creates a "stack" without 2:1 down sampling for higher levels in the pyramid resulting in images of the same resolution. Due to the use of integral images, SURF filters the stack using a box filter approximation of second-order Gaussian partial derivatives, since integral images

allow the computation of rectangular box filters in near constant time. (Juan and Gwun, 2009).

Figure 2: This caption has one line so it is centred.

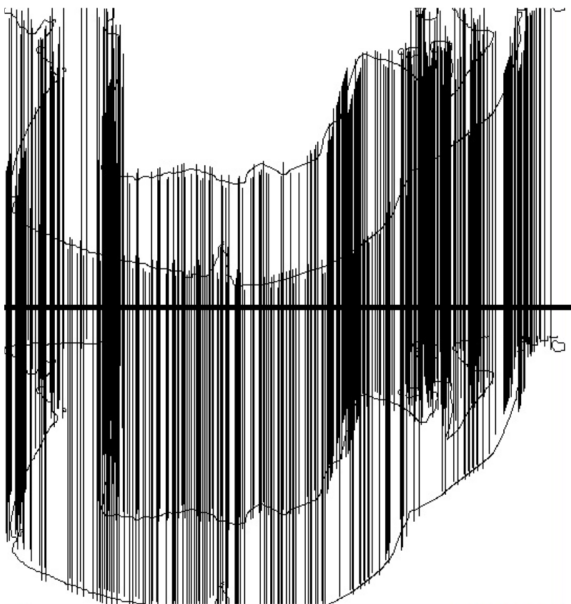Figure 3: Video frame after thresholding.

Figure 4: Comparison lines between frames of two videos after SURF algorithm.
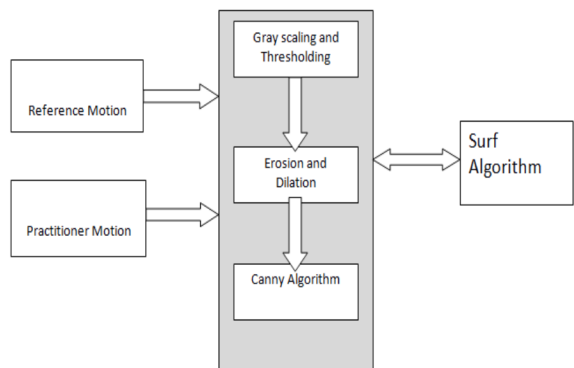

Figure 5: Implementation using SURF (Patil et al., 2011).

4.1 Motion Replication

Motion Replication ensures the understanding of the user's motion by matching the user's posture with the Yoga Avatar posture. This replication is done by analysing key nodes of body parts as shown in the figure 6. This recognition of body parts that are not replicating the corresponding ones shows the difference in posture and need to complete the sequence as mentioned in the virtual environment. The methodology for determining the similarity of two postures is by comparing the joint angles of fifteen joints, including head, shoulders, elbows, wrists, chest, pelvis, hips, knees, and ankles, and by calculating the distance of end points required in each Yoga posture. (Zhiqiang et al., 2011).
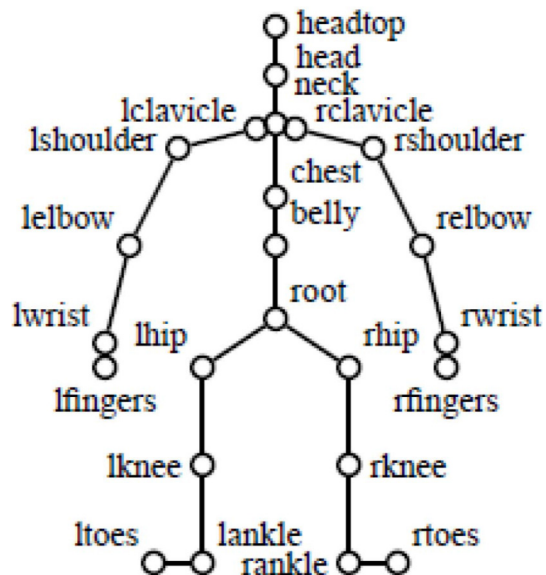

Figure 6: KEY nodes of body parts to Understand Motion.

4.2 Yoga Tools

Yoga tools are extended products that are interface suits that connect the real human with the Virtual Yoga environment. In Video analysis the image is captured of the user and matched with its yoga Avatar animation in which the computer or the environment cannot understand the intensity and pressure required for the posture. With the help of yoga tools that use hardware encompassed of sensors and motors to measure the real environment vibrations, pressure, and velocity of the posture to measure the accuracy and use of the posture.

Devices with sensors can measure Roll-Pitch-Yaw orientations, which is used to detect the orientation of human body part. The tactor is attached on four human limbs and can generate the vibration on human skin to provide the haptic sense to user. (Zhiqiang Luo et al., 2011)

4.3 e-Yoga Development

The e-Yoga Environment can be run on a computer, Mobile Phone, Tablet. We have created an e- yoga version with General Health Check database that collects the user basic data to generate an e-Yoga Prescription that helps user perform basic yoga asana's. The technical requirements are that it should be installed in the hard drive that gives regular alerts at intervals asking the user to perform the Yoga.

4.4 Side Effects

It is difficult to change the mind suddenly from a focused state, when the software from the system alerts to perform a regular bit of Yoga it could be a little burden and distracting sometimes. However the user can mute the Virtual Yoga off. The user can be aware and can be prepared to perform yoga even before the environment alerts so that it will help the user in a long run even without a virtual yoga tutor or environment.

5 CONCLUSIONS

The e-Yoga environment is a next generation intelligence that is designed to meet the requirement of a traditional Yoga Guru (tutor) who helps an individual maintain a good health, body and mind. This environment creates alerts at regular intervals on the device used be it on a computer, mobile phone, tablet or a PlayStation. The alert depends on users Yoga Prescription that is generated by the E-yoga environment at the time of user requirement, inputs and accessibility. The alerts for users with no health issues and young IT professionals the yoga prescription is simple like blinking their eyes very often, standing up from the work chair and stretch, a standing twist and some basic neck movements which again is depending on the body size of the user. However performing these simple Yoga exercises on the whole in a day would be approximately be 5 to 7 minutes for a 6 to 8 hours Computer user. Hence it would not be a tedious process to keep oneself fit and healthy and prevent from further complications. The application under development can be designed for mobile, Tablet and PlayStation users equally to maintain their gait and posture. Our mission is to promote a healthy society.

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