

Sleep Posture Optimization based on Artificial Intelligence

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Abstract. The wrong sleep posture is a common problem in the sleep process, and the sleep quality will also be greatly affected. There are two main ways to improve sleep posture. One is to control by force through one's own willpower, and the other is to change by artificial intelligence, that is, by means of external force. The first method requires a strong sense of autonomy to control in the process of self-control. It is not worth spending a lot of extra energy to invest. So this paper introduces a new method. By adding artificial intelligence application experiments to sleep facilities, it can alleviate the anxiety of people who work hard every day to a certain extent, so that they can devote themselves to the work of the new day with full spirit.

Keywords: Artificial intelligence; Sleep posture; Sleep quality.

1. Introduction

With the rapid development of artificial intelligence technology, people's quality of life is steadily improving. Since the introduction of artificial intelligence in 1956, artificial intelligence has constantly penetrated into our daily life, including medicine, diagnosis, robot control, etc. For example, today's handwritten version of Apple's system and biometric recognition system are both applications of artificial intelligence, which have significantly improved the quality of human life. Research shows that inappropriate sleep posture not only affects the sleep quality of patients with different physical conditions, but also may cause secondary injury or aggravate the original diseases, such as chronic heart and cerebrovascular diseases, respiratory diseases, digestive tract diseases, eye diseases, vertebral muscle and nerve diseases, elbow ulnar nerve diseases, arm radial nerve diseases, and so on. In this regard, artificial intelligence control is added to the bedding for sleep, It can greatly reduce the probability of disease occurrence, and artificial intelligence can work continuously. Unlike humans, machines are not tired and can work without interruption.

2. Main Argument

With the continuous progress of science and technology, more and more smart home products are pushed to the market. Among them, the artificial intelligence bed is one of the products that have recently attracted people's attention. The emergence of artificial intelligence bed aims to improve people's sleep quality through scientific and technological means. First, the AI bed can analyze the user's sleep posture through OpenPose algorithm. The OpenPose key node extraction algorithm is used to extract the features of the sleeping posture image, including the features of partial occlusion and complex sleeping posture. Finally, the BP neural network is used to recognize the sleeping posture, and good recognition results are obtained. The algorithm flow of OpenPose is shown as follows: first, the input image (a) is transformed into image features through the 10-layer VGG19 network, and then the obtained image features are divided into two branches and sent into the deep convolution network respectively to predict the confidence S diagram (b) and affinity vector L diagram (c) of each key point, and then the confidence S and affinity vector L of each key point are analyzed through greedy reasoning to achieve the clustering diagram of key points (d), Finally, the skeleton assembly diagram (e) is implemented. [1]

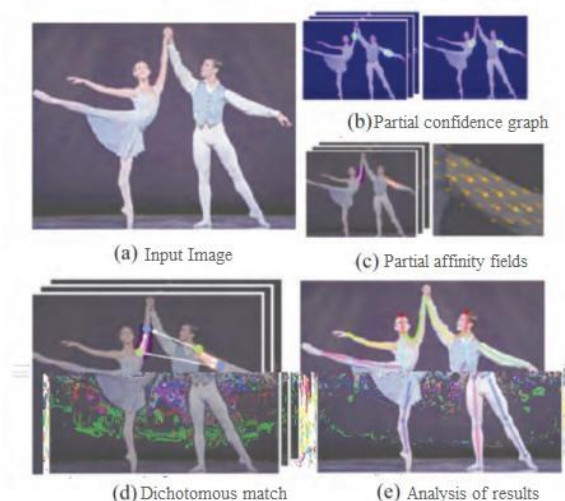


Fig. 1 Two or more references

According to the weight and depth of sleep, the bed can automatically adjust the hardness and height, so that the sleep posture can be slightly adjusted to form a comfortable sleep posture. In addition, the bed can also automatically adjust the temperature and humidity to adapt to the user's physical condition and environmental changes[2]. These automatic adjustments can reduce the user's interference and discomfort in sleep, thus improving the quality of sleep. Secondly, the AI bed can also record and analyze the user's sleep data through the application. For example, the bed can record the user's sleep time, sleep quality, sleep posture and other data, and analyze these data through algorithms to help users optimize their sleep habits. Users can view their sleep data through the application and get suggestions on how to improve sleep quality.

3. Conclusion

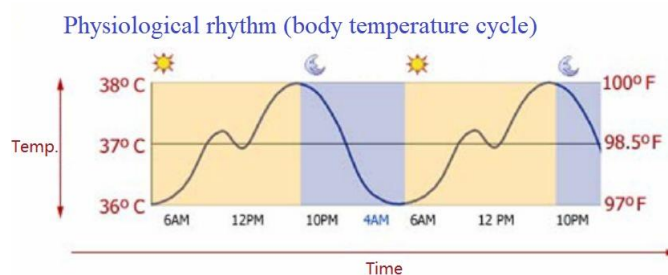


Fig. 2 Body Temperature Line Chart for Deep Sleep

According to the body temperature experiment during human sleep, the optimal temperature for human deep sleep is about 36 °C, so if the body temperature is controlled at 36 °C, the adjustment of artificial intelligence bed will not have a great impact on the depth of sleep[3]. Next, analyze the user's sleep posture through OpenPose algorithm and adjust it to the following two sleep postures:

1. Horizontal position: This sleeping position can spread the weight of the body to the back, and will not compress the internal organs. The body stress is relatively uniform, which is conducive to blood circulation, can effectively relieve the pain in the neck and back, and is also conducive to the transportation and digestion of food in the gastrointestinal tract. However, people who sleep and snore are not recommended to sleep in a flat position for a long time, because when they are asleep, it is easy to fall back on the tongue and cause apnea.



Fig. 3 Presentation of horizontal position

2.Side lying position: In the side lying position, the legs are bent, the body is bent, and the whole body is in a relaxed state, which is conducive to relieving fatigue. It is a relatively comfortable sleeping position. Generally, the right recumbent position is more healthy and will not oppress the heart and reduce the heart burden. For obese people, especially those with central obesity, the horizontal position is not suitable, and the lateral position can be selected, which is beneficial to keep breathing smooth while sleeping. In addition, sleeping on the left side of the pregnant woman in the late pregnancy is beneficial to relieve the pressure of the abdomen on the lumbar spine, improve the sense of comfort, and reduce the pressure of the uterus on the artery, which is beneficial to the blood supply of the placenta. Sleeping on the side of the baby can also prevent vomiting and reflux of stomach contents.



Fig. 4 Presentation of Side lying position

Based on the above analysis, the artificial intelligence bed[2] can significantly improve people's sleep quality through automatic adjustment and sleep data analysis. To a certain extent, the artificial intelligence bed will not occupy additional space like the massage chair, and can scientifically reduce the probability of cervical vertebra, kidney and other diseases from the root. However, AI beds are still in the early stage of development, with high prices and limited penetration. Therefore, more mature technologies and price strategies are needed in the future to further promote artificial intelligence beds and improve people's sleep quality.

References

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