Ggot-Ggot:An Pose Correction System Proposal

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Abstract. Posture discrimination and posture correction through machine learning techniques to solve postural imbalances exposed to most modern people

Keywords: Pose Correction · Pose Estimation · Machine Learning

1 Introduction

In modern society, people are required to use computers frequently and study for a long time. Due to this, many modern people have postural imbalance. Taking an unbalanced posture for a long time causes serious damage to the human body. In mild cases, it causes symptoms such as scoliosis, but in severe cases, it can develop into diseases such as disc or temporomandibular joint [1] disorders. To solve this problem, we tried to devise a method to monitor and correct human posture in real time using image data. The core technologies required for this can be broadly classified into two categories. The first technique is Pose Estimation. This technology extracts human posture from image and video data. The second technology is Machine Learning using Convolutional Neural Network (CNN). This technology creates a model through iterative learning and makes it possible to make specific decisions by inputting image and video data. We use these two core technologies to develop a pose-correction system, and aims to enable more users to use it to correct their posture.

[1] the temporomandibular (TMJ) are the two joints connecting the jawbone to the skull.

2 Motivation & Objective

2.1 Increase of Pose Unbalance Patients

Modern people living in the 21st century are exposed to serious posture imbalance. There are reasons such as weakness in the muscles that correct body posture due to lack of exercise or carrying a heavy bag, but the biggest cause is sitting for most of the day. Whether you are studying or working on a computer, if you focus on the same posture, your body gets tired easily. As a result, humans like to sit in a comfortable position, and sometimes sit in an unhealthy posture. For example, the posture of tucking the chin or sticking the neck forward is a typical bad situation.This is because our body seeks comfort, and if it develops as a chronic habit, it can cause scoliosis[2] or mild facial asymmetry, or turtleneck[3]. In more serious cases, it can cause serious diseases such as cervical disc, herniated disc, and temporomandibular joint disorder. The chart below shows the trends in the number of patients with cervical pain, temporomandibular joint disorder, and cervical disc herniation (disc) in the order of recent years. As the number of patients with diseases caused by such posture imbalance increases, the need for healthy people to have good habits to prevent these diseases is also increasing.

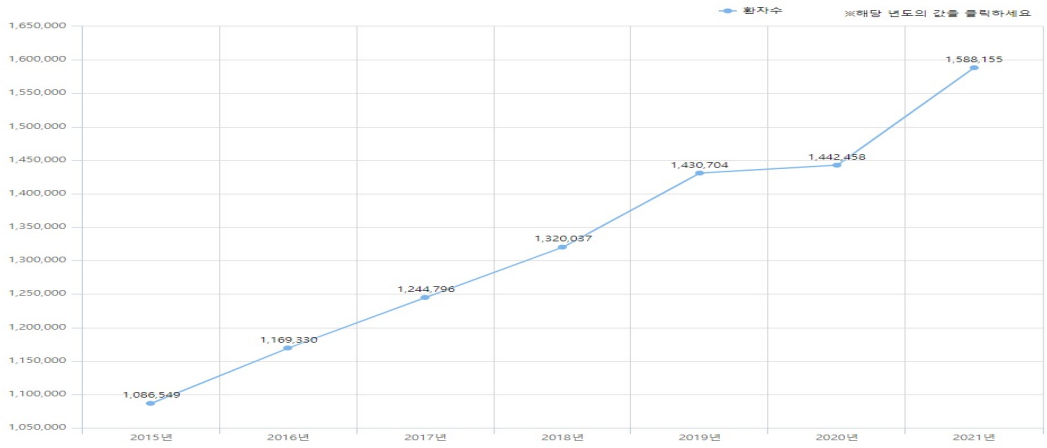


Fig. 1. This chart shows cervical pain[4]from 2015 to 2020

[2] Scoliosis is where the spine twists and curves to the side.
[3] Turtle neck syndrome is a posture in which the head is forward compared to the torso due to longer front muscles in the neck and shorter upper muscles.[2]
[4] Disease code: M542
[5] Disease code: K076
[6] Disease code: M50 M51

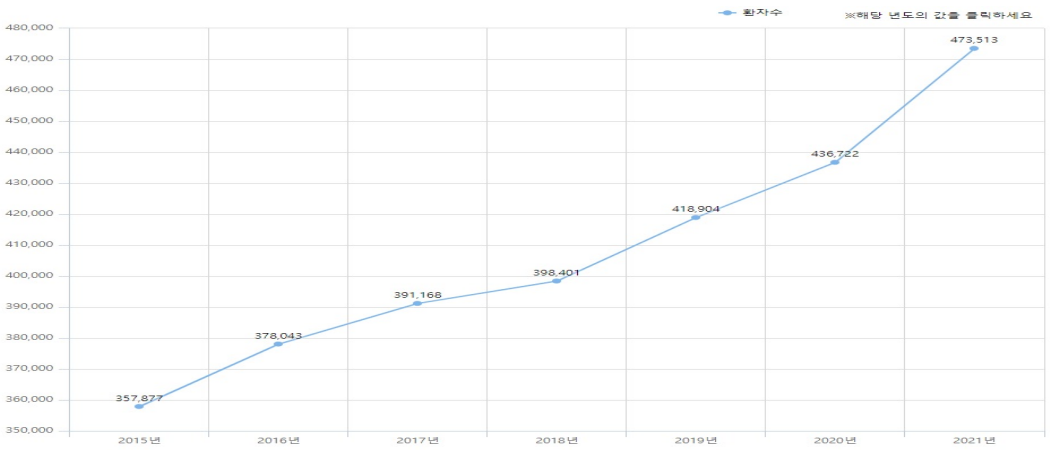


Fig. 2. This chart shows temporomandibular[5]disorder from 2015 to 2020

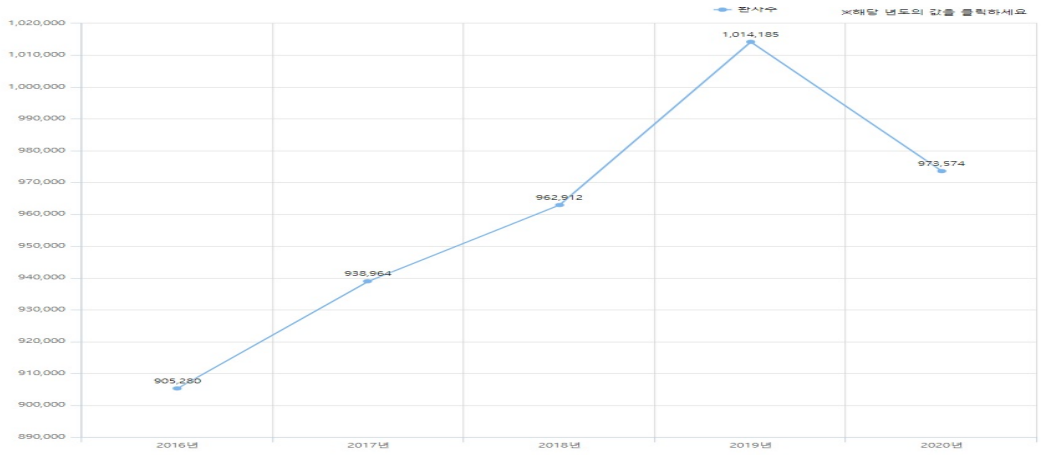


Fig. 3. This chart shows cervical herniated nucleus[6]from 2016 to 2020

2.2 Realtime Pose Monitoring

With the increasing incidence of diseases caused by unbalanced posture, numerous methods for correcting posture have emerged. As a method of receiving posture correction treatment with the help of others, there are methods such as manual therapy and chuna[7] therapy provided by medical institutions, and there are methods such as massage provided by non-medical institutions. The following corrective bands are folk remedies that can be performed alone at home without the help of others. What we should note here is that all of the things mentioned so far are difficult to do during the time we actually maintain the wrong posture (i.e the time we sit and work). In other words, it's not enough to change our habit of avoiding bad posture. Therefore, real-time monitoring that can remind us of correct posture at the very moment when we actually do wrong can be very effective in improving our habits. That is what differentiates our system from other methods, which works as follows[Fig. 4].

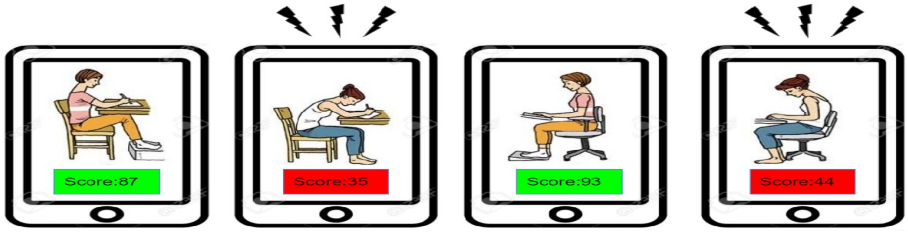


Fig. 4. Pose-Mornitoring system

3 Background / Related Work

Human pose estimation is a questioning to find the position of a human body part from images/videos taken with an RGB camera or a depth camera, and it is a fusion technology of Deep Learning and Computer Vision. It is basis of HCI and AR/VR, and it is a very valuable technology that can be applied to various fields such as autonomous driving, robots, and games.[3] The system to be mentioned here is to measure and analyze the user's posture in real time using a smartphone or webcam without radiography or specialized sensors. Several studies and services have emerged that use this to diagnose whether a user is in a turtle neck state or whether they are taking the correct exercise posture in real time. Modern people, especially when using a laptop, often take the wrong posture, such as a round shoulder or turtle neck. With this in mind, several studies have been conducted to diagnose the turtle neck state by continuously

[7] Chuna is a therapeutic modality that addresses biomechanical function, pathology, diagnostics, and theories related to treatment in order to create a balance in orthopedic structure and function[1]

monitoring the user's frontal posture using the laptop's webcam. In order to analyze a user's posture using only the front image taken using only the RGB camera without any special equipment, it is necessary to first find out the exact position of the body part required for analysis in the image. In a study conducted at Dongshin University in 2022, the data set provided by MS COCO was pre-processed using Torchvision and learning was conducted using CNN.[4] There are also studies on pose recognition using MediaPipe API, an AI framework provided by Google.[5] A similar domestic service is the Pose API provided by Kakao. Kakao's Pose API can quickly and easily find 17 body parts, such as eyes, ears, and shoulders, simply by uploading an image.Similarly, another service provided by Google is Teachable Machine 2.0. It supports users to create and utilize a learning model without prior knowledge of machine learning just by uploading an image.[7] If you succeed in finding the user's body part positions (Keypoints), you should be able to determine whether or not it is in a turtle neck state using the corresponding keypoints. Since all of the previously defined criteria for determining the turtle neck can be applied only from the side, in the case of an image taken from an angle other than the side appropriate body part and criteria must be carefully selected. Deep learning can be used for this as well. For this, a CNN-based learning model can be used. The covolution layer extracts features from the input data through a filter, and the max-pooling layer reduces the size through the subsampling process of the extracted features.[8] There is also a study using SVM. To find the optimal hyper parameter during SVM learning, a grid search method through 5-fold cross-validation was applied as a learning dataset. Through this, when the most appropriate parameters were selected and the performance of the model was checked, the accuracy of 90 percent was shown. In this study, a problem-solving method was presented to induce users to naturally correct their posture by adjusting a specially designed laptop holder.[9]

4 Problem Statement / Proposed Solution

How to get Datasets Dataset for pose estimation is abundantly provided through the Internet.

Table 1. Various Dataset provided on the Internet .

Name	Explanation	2D/3D
MPII	*25,000 dataset including about 40,000 people*	2D
MS COCO	*60,000 datasets containing 150,000 people. Provides labeling for 17 keypoint*	2D
Human3.6M	3.6 million images of 11 experimenters wearing motion capture systems	3D
MIP-INF-3DHP	*1.3 million images taken by a total of 11 experimenters with 14 cameras.* Text follows	3D

The problem of obtaining a dataset on what is correct posture and what is wrong posture remains a challenge. To solve this problem, we are considering creating data ourselves and then using data augmentation. For image data,

techniques such as Gaussian noise addition, cropping, contrast, segmentation, flipping, and blur can be used. [**?**]

Pose Estimation We are going to use the OpenPose library to proceed. OpenPose is an open source library used to find multi-person body parts, such as body, face, and foot, by inputting images and images. Find human keypoints in 2D or 3D with depth information in real time. If you succeed in finding keypoints smoothly in 3D, you will have more degrees of freedom in determining the user's posture. If it becomes difficult to use OpenPose due to other circumstances, we are considering using services such as Kakao pose API.

How to analyze user's posture We plan to proceed with deep learning by using simple models such as SVM or by selecting an appropriate CNN model. If it is not feasible to use deep learning, we are also considering developing our own algorithm by selecting appropriate criteria. Rather than determining a specific wrong posture such as a turtle neck, we are thinking of a system that defines the correct posture and informs the user when it is determined that the posture is wrong.

The angle between the subject and the camera If the angle between the subject and the camera is misaligned, a technology that compensates for this may be applied, or measures such as strictly limiting the angle may be taken.

Misinterpretation of the movement as a bad posture Because the user's posture is monitored for a long time in real time, simple movements such as stretching may be mistakenly recognized as a wrong posture. This requires the ability to distinguish between short-duration movements and longer-lasting postures.

5 Project Planning

5.1 Roles

1. Data Preprocessing

- Dongwoo, Jongwon -Receive images from your phone camera or webcam and preprocess them into usta.

2. Pose estimation

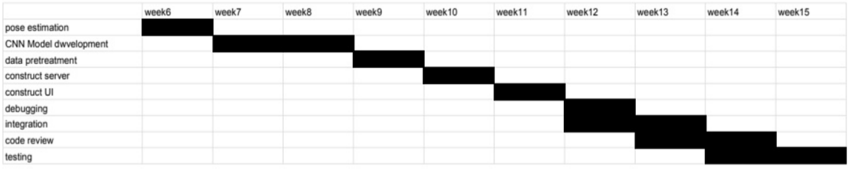
- Dongwoo, Jongwon
- Find the coordinate values of key points in image data by referring to existing open sources.

3. Posture measurement model (algorithm/svm model)

- Geunho, Hyunjin
- By analyzing the coordinates of the found key points, the upright posture and the dissatisfied posture are distinguished.

- Determine the location by analyzing the relationship between key points.
-or use the svm model to determine the posture.
4.UI
- Geunho, Hyunjin
- Organize the UI so that users can easily access and use our system comfortably.
5. Server Management
- Dongwoo, Jongwon
- Manages the server required for data transmission between each part and saving the result value.

5.2 Development Plan



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