REGION PROPOSAL NETWORK)RPN(BASED POSTURE DETECTION SYSTEM TO PREVENT HUNCHED POSTER POSTURE SYNDROMES.

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ABSTRACT-The most people around the world suffer from back pain. The main reason is poor back posture, which later becomes hunched. We always tend to ignore these minor symptoms of back pain, which would lead to serious deformities in the future. It is a condition where the spine in the upper back has excessive curvature. The main focus of this project is about old people, construction work, device testing of a posture warning system developed using an open position. It is the first real-time multi-person system that jointly detects the key points of the human body, hand, face, and leg (a total of 135 key points) in individual images. This software developed and installed in CCTV cameras is reliable and user friendly. Learning about body posture and movement activities is a key focus of their rehabilitation with the aim of restoring or improving the functions and abilities of people with physical disabilities. In this project, we will focus on gross motor skills in adults undergoing rehabilitation after injury and present a method to recognize their posture and activities using a sequence of RGB-D images. Any excessive curvature in the upper back is called kyphosis.

INTRODUCTION

Individuals who may suffer from physical back pain that interferes with their daily activities and can cause a slouched back. Not only can a large number of human beings in different parts of the world develop some kind of compulsion due to wrongly maintaining a proper lifestyle, due to constant sitting in front of the computer, constant standing work, construction work etc. but also due to constantly doing some work it becomes, that you are sitting or standing in the same place. The state of well-being is affected by long-term sitting or standing and posture while sitting or standing. Continuous pressure over a period of time results in restricted blood flow and reduced supply of nutrition and oxygen to the skin tissues, which can lead to bumps. In general, a hunchback can become a big deal. Reasons for slouching can affect the intrapersonal appearance, here people who do the same job, as due to continuous work with the same mindset, as well as the physical modifications that can occur due to slouching, which can also affect the cognitive and musculoskeletal conditions that expose many groups the possibility of developing a hunchback. Resistance to pressure varies from person to

person depending on their work system; a number of research studies have found that an elevated value greater than arterial capillary pressure (32 mm Hg) can lead to occlusion of blood vessels.

OBJECTIVE

The main concept of this project is to identify humpback whales at an early stage.

• It is necessary to identify to avoid such problems as back pain, joint pain and reduced identification. This will also damage your shoulder muscles and your back will hurt.

• Thanks to this application, we realize that sitting and standing upright is very necessary because it improves blood flow, which helps keep our nerves and blood vessels healthy.

• For each employee who has been working in the same position for a long time, we will find out if a person's hunchback is identified, we will immediately change the system at his will to avoid the disadvantage of the hunchback and ensure a healthy environment for all employees.

LITERATURE REVIEW

These methods can detect poses on small, low-quality images of a classroom where students are concentrated and the images collected are of low resolution. However, the use of object detection methods to estimate the position of each individual on this occasion is hindered by two primary obstacles. First, if we need to detect a new pose, it is necessary to retrain the entire network in the model. Second, each method only identifies postures that differ significantly from each other, such as sitting and standing; other less obvious postures, such as reading, chatting, and raising hands, are usually not recognized.

[1] To solve these problems, we propose a location recognition method for classroom use that combines a location estimation algorithm and an object detection algorithm. The contributions of this paper are threefold. First, we use the you-only-look-once (YOLOv3) model to detect human objects and students crouching at desks.

[2] Second, we propose an improved HRNet model as a pose estimation algorithm to reduce the error rate of human body key point estimation. We call our proposed pose estimation algorithm SE-HRNet, which is built by embedding Senet.

[3] This software is designed to run on NVIDIA devices, not just desktop GPUs, but also embedded devices, the NVIDIA Jetson family. So this software is configured, run and tested on different NVIDIA hardware devices belonging to this family. The main purpose of this evaluation is to get the performance metrics of these hardware boards to determine the best platform for the job. It is important to mention that to obtain these evaluation metrics, the pose detection network was trained offline using the MSCOCO dataset.

[4] PyTorch will accurately convert the trained model to a version compatible with the Tensor RT libraries. Reducing the precision of numbers from 32-bit floating point to half precision (Float16) during optimization reduces both computation time and power consumption at the cost of reducing the final accuracy of the model by less than 2%, according to previous studies.

EXISTING SYSTEM

Only the application of a single algorithm was available, resulting in a low level of accuracy of correct detection. Only identification of humpback whales was available, no warning system was implemented. It was only available in both hardware and software, so many results cost a huge amount. Training everything of hunchback will be difficult because sometimes it will show bad detection due to wrong detection of hunchback. It was designed in a huge complex model that is comprehensive in managing this process. The device is designed from this model, so its use will be complex due to both hardware and software implementation. The YoloV3 algorithm used in the software is complex, so it takes a lot of time to understand the algorithm. Because it involves both software and hardware, which will be difficult to implement.

DISADVANTAGES

- Complex implementation as it involves both software and hardware so it will result in problem in the algorithm

- The cost of this equipment will be high and reliable.

PROPOSED SYSTEM

- Live camera monitoring is introduced in the workplace, which will focus on the work of employees at their job position. We implement a system of open positions to detect employee sessions.
- This open position method is implemented by CNN algorithm and Region Proposition Network (RPN).
- Through the open pose method, we train CNN and RPN algorithms to identify each angle of a person.
- If the angle of the human body changes as hunched over, it will be a warning system for that particular person

ADVANTAGE

- By implementing this process, we can provide a healthy environment for employees.
- This implementation of this application will be cheaper because we use a simple algorithm method which is easy to understand and also implement.
- The cost of this project will be lower and its use will be reliable.

ARCHITECTURE DESIGN
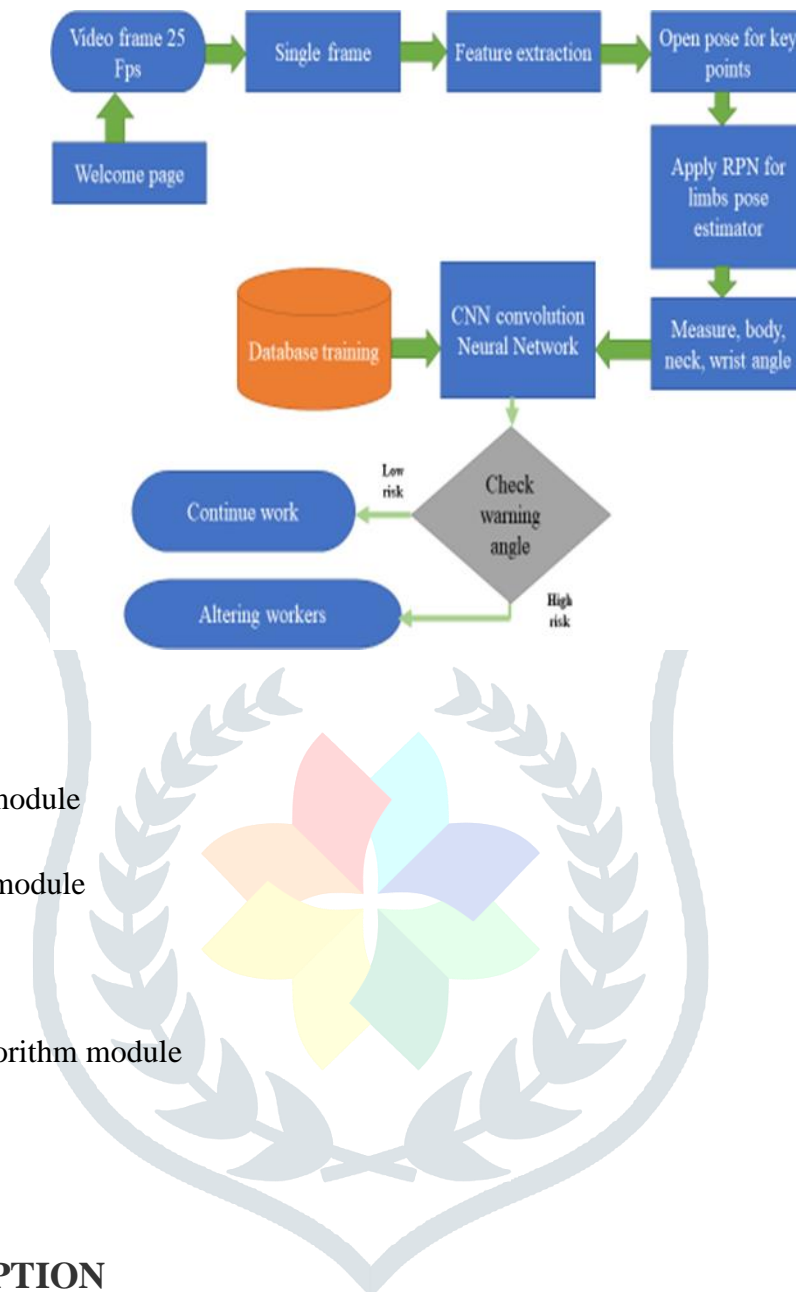
MODULE

- Video processing module

- Open the position module

- Database module

- CNN and RPN algorithm module

- Output module

MODULE DESCRIPTION

1. Video Processing Module: In video processing, it is a filter to extract information or perform video manipulation. Basic video processing techniques include cropping, image resizing, brightness and contrast adjustment, fade-in and black-out, among others.

2. Open pose module: This is a multi-person real-time human pose detection library, which for the first time demonstrated the ability to jointly detect the key points of the human body, foot, hand and face in individual images.

3.Database module: A database is an organized collection of data that can be edited, retrieved or updated, where we will train all things in the dataset for human location accuracy. It is a method to train an algorithm for output accuracy.

4.CNN and RPN Algorithm Module: CNN is a kind of network architecture for deep learning algorithms andis used specifically for image recognition and tasks that involve pixel data processing and Reverse Polish Notation (RPN) is an expression in which the symbol operator is placed after the arguments, which are worked with using the algorithm, and position detection is identified.

5.Output Module: In the output module, we will identify the position of the employee, if any detection of hunched position is identified, a notification method is implemented using a voice process.

SYSTEM FUNCTION

1. CONVOLUTIONAL NEURAL NETWORK

A convolutional neural network (CNN) is a neural network that has one or more convolutional layers and is mainly used for image processing, classification, segmentation and also for other automatically correlated data. A convolution is essentially a sliding filter over the input. Instead of looking at the whole image at once to find certain features, it can be more effective to look at smaller parts of the image. A Convolutional Neural Network (ConvNet/CNN) is a deep learning algorithm that can take an input image, assign importance (learn weights and biases) to different aspects/objects in the image, and be able to distinguish one from the other. The preprocessing required in ConvNet is much lower compared to other classification algorithms. While in primitive methods the filters are created manually, with enough training ConvNets have the ability to learn these filters/characteristics. The architecture of the ConvNet network is analogous to the connection architecture of neurons in the human brain and was inspired by the Visual Cortex organization. Individual neurons respond to stimuli only in a limited area of the visual field known as the Receptive Field.
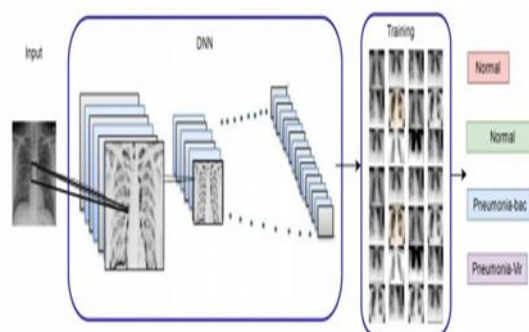

2. VIDEO 25 FPS

Remember those cool little flipbooks where the pad of paper had a picture on each page and when you flipped through the pages it looked like the picture was animating and moving? This is how video works. Whether it's digital or old-school film, video is a series of still images that, when viewed in sequence at a certain speed, create the impression of motion. Each of the images is called a "frame". So, the frame rate is the speed at which these images are displayed, or how fast you "page through" the book. So, if a video is captured and played

back at 24 frames per second, that means each second of the video shows 24 distinct still frames. The speed at which they are displayed will trick your brain into perceiving smooth motion.

3.SINGLE FRAME

The three types of video frames are I-frame, P-frame and B-frame. I is the stand of Intra Coded Frame, P is the stand of Predictive Frame and B is the stand of Bidirectional Predictive Frame. "I" frames are encoded without any motion compensation and are used as a reference for future projected "P" and "B" frames. However, "I" frames require a relatively large number of bits to encode. "P" frames are encoded using motion-compensated prediction from a reference frame, which can be an "I" frame or a "P" frame. P frames are more efficient in terms of the number of bits required compared to I frame, but still require more bits than "B" frame. "B" frame requires the lowest number of bits compared to both "I" and "P" frames, but requires computational complexity. The frames between two consecutive "I" frames, including the opening "I" frame, are collectively called a group of pictures (GOP).
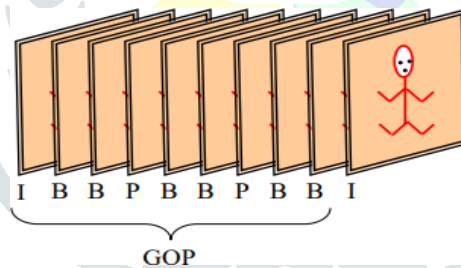
3. OPEN POSE

Open Pose is a real-time multi-person human pose recognition library that for the first time successfully detected the key points of the human body, foot, hand and face in individual photos. Open Pose can detect a total of 135 key points.The basic image skeleton represents the orientation of the individual in a certain structure. It is essentially a collection of data points that can be combined to characterize a person's pose. Each skeletal data point is also known as a component, coordinate, or point. However, it is important to keep in mind that not all combinations of data points result in useful pairs.

5. DATABASE

A Database Management System (DB) is a software system that is designed to manage and organize data in a structured way. It allows users to create, edit, and query a database, as well as manage security and access control of that database.

Some key DB features include:

● Data Modeling: DB provides tools for creating and modifying data models that define the structure and relationships of the data in the database.

● Data storage and retrieval: DB is responsible for storing and retrieving data from the database and can provide various methods for searching and querying the data.

● Concurrency control: DB provides mechanisms to control concurrent access to the database to ensure that multiple users can access the data without conflicting with each other.
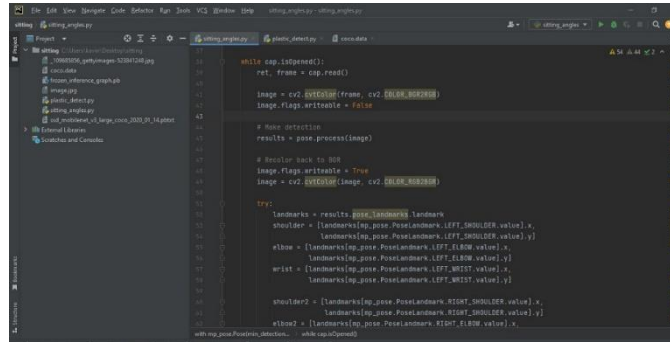
4. REGIONAL PROPOSAL NETWORK (RPN)

In reverse Polish notation, operators follow their operands; for example, to add 3 and 4, one would write 3 4 + instead of 3 + 4. If there are multiple operations, the operators are listed immediately after their final operands (often an operator takes two operands, in which case the operator is written after the second operand); so an expression written $3 - 4 + 5$ in conventional notation would be written $3\ 4 - 5 +$ in reverse Polish notation: 4 is first subtracted from 3, then 5 is added to it An integral part of these events is the stack concept, the last-in/first-out design. So in the example above, 3 is loaded onto the bottom of the stack (the visible level) and a separate special key press (such as the "Enter ↑" button on an HP calculator) terminates that input. Without this action, 4 would join 3, giving 34, which is not desirable. When 4 is entered, 3 is promoted to the second level of the stack; 3 is now above 4, currently visible. The subtraction operator acts immediately on the first two levels of the stack's contents, subtracting the bottom value from the top and giving -1 at level one.
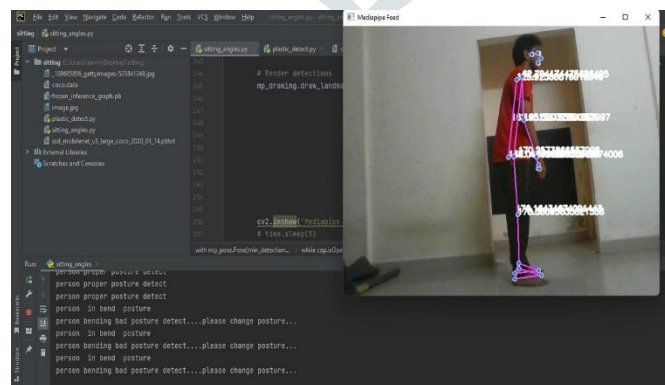
RESULTS

This project to use CNN can be very useful in solving video processing and visual recognition tasks. With high

efficiency, easy implementation, and processing time, CNNs have an advantage over previously used location recognition techniques. Ourproject not only recognizes people's posture using deep learning algorithms, but also informs them whether theyare maintaining proper posture or not. People are informed about their posture using an Android app. This project identified and to alert works.

CONCLUSION

Posture will cause muscle fatigue and tension that ultimately lead to poor posture especially for people who work for a long time in the same position. To reduce this problem, we have come up with this solutionof posture detection. In this project the results showed a posture detection accuracy over 95**%.** On the other hand, the +software application tested allows the systemto run in a real-time environment with low power consumption requirements**.** With these two points in favor, we can conclude that the system can work completely autonomously and with the intervention of acomputer, providing information in real time**.**

REFERENCES

[1]J. Zaletelj, in Proceedings of the 10th International Symposium on Image and Signal Processing and Analysis. Estimation of students' attention in the classroom from kinect features (Ljubljana, 2020).

[2] J. Redmon, A. Farhadi, YOLOv3: An Incremental Improvement. (arXiv, 2018) Accessed 8 April 2021.

[3] J. Hu, L. Shen, G. Sun, in Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2018 Squeeze-and-Excitation Networks (Salt Lake, 2022).

[4] Lin, T.; Maire, M.; Belongie, S.J.; Bourdev, L.D.; Girshick, R.B.; Hays, J.; Perona, P.; Ramanan, D.; Dollár, P.; Zitnick, C.L. Microsoft COCO: Common Objects in Context. CoRR 2019.

[5] Courbariaux, M.; Bengio, Y.; David, J.P. Training Deep Neural Networks with Low Precision Multiplications. arXiv 2020.

[6] Kulikajevas, A.; Maskeliunas, R.; Damaševiˇcius, R. Detection of sitting posture using hierarchical image composition and deep learning. PeerJ Comput. Sci. 2021.

[7] El-mir, Y.; Ivarsson, J. Ergonomic Posture Correction through a Camera Live Feed and Its Applicability in Terms of Usability 2021.

[8] Muppavram, S.; Patel, N.; Nadeem, M. Posture Alert. In Proceedings of the 2018 IEEE Region Ten Symposium (Tensymp), Sydney, 2019.

[9] Chopra, S.; Kumar, M.; Sood, S. Wearable posture detection and alert system. In Proceedings of the 2016 International Conference System Modeling & Advancement in Research Trends (SMART), 2020.

[10] Haller, M.; Richter, C.; Brandl, P.; Gross, S.; Schossleitner, G.; Schrempf, A.; Nii, H.; Sugimoto,

  [11]. Falla, D.; Jull, G.; Russell, T.; Vicenzino, B.; Hodges, P. Effect of neck exercise on sitting posture in patients with chronic neck pain. Phys. Ther. 2019.

  [12].Ma, C.C.; Li, W.; Gravina, R.; Fortino, G. Activity Recognition and Monitoring for Smart Wheelchair Users. In Proceedings of the 2016 IEEE 20th International Conference on Computer Supported Cooperative Work in Design (CSCWD), 2021.

  [13]. Kim, T.-H.; Kwon, S.-J.; Choi, H.-M.; Hong, Y.-S.

Determination of Lying Posture through Recognition of Multitier Body Parts. Wirel. Commun. Mob. Comput. 2019.

[14].Byeon, Y.-H.; Lee, J.-Y.; Kim, D.-H.; Kwak, K.-C.

Posture Recognition Using Ensemble Deep Models under Various Home Environments. Appl. Sci. 2020.

[15]. Pedregosa, F.; Varoquaux, G.; Gramfort, A.; Michel, V.; Thirion, B.; Grisel, O.; Blondel, M.; Prettenhofer, P.; Weiss, R.; Dubourg, V.; et al. Scikit-Learn: Machine Learning in Python. J., 2020.

[16]. Ke, G.; Meng, Q.; Finley, T.; Wang, T.; Chen, W.;Ma, W.; Ye, Q.; Liu, T.-Y. Lightgbm: A Highly EfficientGradient Boosting Decision Tree. In Advances in Neural Information Processing Systems; Guyon, I., Luxburg, U.V., Bengio, S., Wallach, H., Fergus, R., Vishwanathan, S., Garnett, R., Eds.; Curran Associates, 2019.

[17]. Islam, M.J.; Wu, Q.M.J.; Ahmadi, M.;

Sid-Ahmed, M. Investigating the Performance of Naive-Bayes Classifiers and K- Nearest Neighbor Classifiers, 2020.

[18]. Kaghyan, S.; Sarukhanyan, H. Activity Recognition Using K-Nearest Neighbor Algorithm on Smartphone with Tri-Axial Accelerometer. Int. J. Inform. Models Anal. IJIMA ITHEA Int. Sci. Soc. Bulg. 2012, 1, 146–156. 26. Olson, D.L.; Wu, D. New

Frontiers in Enterprise Risk Management; Springer Science & Business Media: Berlin/Heidelberg, Germany, 2020.

[19]. Latoria, A.; Chauhan, A.; Anand, S. Saxena Fuzzy Approach for Pattern Recognition Using Classification Algorithms. Int. J. Comput. Technol. 2021.

[20]. Onel, H. Machine Learning Basics with the K-Nearest Neighbors Algorithm. [Online] Medium. 2021.

[21]. Du, P.; Baldick, R.; Tuohy, A. Integration of Large-Scale Renewable Energy into Bulk Power Systems, 1st ed.; Power Electronics and Power Systems; Springer International Publishing: Cham, Switzerland, 2019.

[22]. Majhi, R.; Thangeda, R.; Sugasi, R.P.; Kumar, N. Analysis and Prediction of COVID-19 Trajectory: A Machine Learning Approach. J, 2020.

[23]. Tahir, M.; Taj, I.A.; Assuncao, P.A.; Asif, M. Fast Video Encoding Based on Random Forests. J. Real-Time Image Process, 2019.