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HUMAN POSITION RECOGNITION

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ABSTRACT

The use of skeleton data for human posture recognition is a key research topic in the human-computer interaction field.

Specifically, the angle and distance features are defined in terms of the local relationship between joints and the global spatial location of joints. Then, during human posture classification, the rule learning method is used together with the Bagging and random subspace methods to create different samples and features for improved classification performance of sub-classifiers for different samples. Finally, the performance of our proposed algorithm is evaluated on four human posture datasets.

The experimental results show that our algorithm can recognize many kinds of human postures effectively, and the results obtained by the project are of higher interpretability.

Deep learning is a subset of Machine Learning and Artificial Intelligence that imitates the way humans gain certain types of knowledge. It is essentially a neural network with three or more layers. deep-learning helps to solve many artificial intelligence applications that help improving automation, performing analytical and physical tasks without human intervention, thus creates disruptive applications amid techniques. One such application is Human Pose detection where deep learning takes its place

Keywords: *Human posture Analysis · Tensor flow · Machine learning Introduction*

1. INTRODUCTION

a. About Project

In recent years, the use of skeleton data for human posture recognition has emerged as a popular research topic in the computer vision field. This technology shows good prospects for application in human-computer interaction.

Medicine, multimedia applications, virtual reality, robot control, and others. In general, postures are different from actions, with the former being static and the latter dynamic. A human posture is a base of actions, and is often taken as the key frame in various action recognition algorithms. Moreover, in some fields, such as physical training, rehabilitation training and sign language communication, a human posture is more important than an action. In noisy workshops and dangerous working environments, posture recognition, as a human-computer interaction mode, is much superior to keystroke control and voice interaction in that its more accurate, efficient and more natural in interaction.

b. About posture

Posture is a way in which a human holds his body so that there is less strain on muscles during movement. Poor body posture leads to many health issues. Incorrect posture problems, which range from back pain to fatigue may rise up and affect our daily activities. The Nowadays maximum population suffers from back pain, injuries, neck pain and shoulder problems etc., hence a need to develop a device is increased.

c. The main aim

The main aim of the system is to detect the correct or incorrect posture by detecting the changes occur in human posture. The changes occur in different directions (i.e., right, left, forward, backward) are detected, by calculating the angles according to the tiltation of a body and time for which stress applies on particular back area is detected using push buttons. Also, there will be indication of the incorrect posture is provided to the user and the results are displayed on the screen. The Device is designed for human comfort and good body posture, which is required to maintain body and mind healthy.

2. TECHNOLOGIES USED

a. Tensorflow.js:

Tensorflow.js is a JavaScript library developed by Google for training and using machine learning (ML) models in the browser. It's a companion library to Tensorflow, a popular ML library for Python. Read on to learn about its features, its future, and how it can help you..

TensorFlow.js lets you develop or execute ML models in JavaScript, and use ML directly in the browser client side, server side via Node.js, mobile native via React Native, desktop native via Electron, and even on IoT devices via Node.js on Raspberry Pi.

b. posenet.js

PoseNet can be used to estimate either a single pose or multiple poses, meaning there is a version of the algorithm that can detect only one person in an image/video and one version that can detect multiple persons in an image/video. Why are there two versions? The single person pose detector is faster and simpler but requires only one subject present in the image (more on that later). We cover the single-pose one first because it's easier to follow. At a high-level pose estimation happens in two phases:

- An input RGB image is fed through a convolutional neural network.
- Either a single-pose or multi-pose decoding algorithm is used to decode poses, pose confidence scores, key point positions, and key point confidence scores from the model outputs.

c. ml5.js:

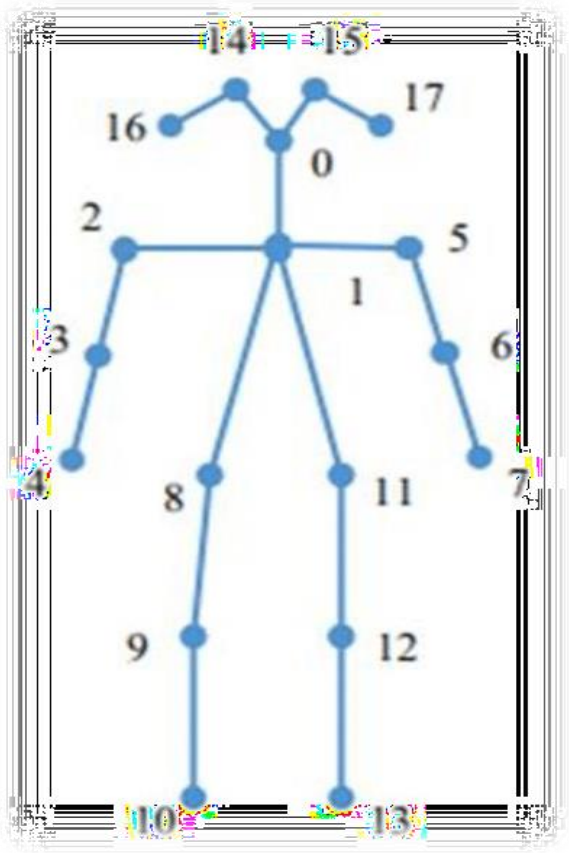
ml5.js is an open source, friendly high-level interface to TensorFlow.js, a library for handling GPU-accelerated mathematical operations and memory management for machine learning algorithms. Also, it is a high-level JS library that uses TensorFlow.js behind the scenes and aims to make machine learning easier for beginners.

d. P5.js:

p5.js is a JavaScript library for creative coding, with a focus on making coding accessible and inclusive for artists, designers, educators, beginners, and anyone else! p5.js is free and open-source because we believe software, and the tools to learn it, should be accessible to everyone.

Using the metaphor of a sketch, p5.js has a full set of drawing functionality. However, you're not limited to your drawing canvas. You can think of your whole browser page as your sketch, including HTML5 objects for text, input, video, webcam, and sound.

3. PROPOSED APPROACH



1. The label of each joint points

The proposed approach for human posture recognition is based on the skeleton information extracted from a Kinect sensor. Figure 1 illustrates the stages involved in this approach. First, multiple features were defined, including the angle features and the distance features between joints. Then bagging and random subspace methods were used to create rule ensembles based on the RIPPER rule learning algorithm, which allowed training 100 rule sets that make up a rule ensemble for final classification by majority voting

Pose Estimation Technique

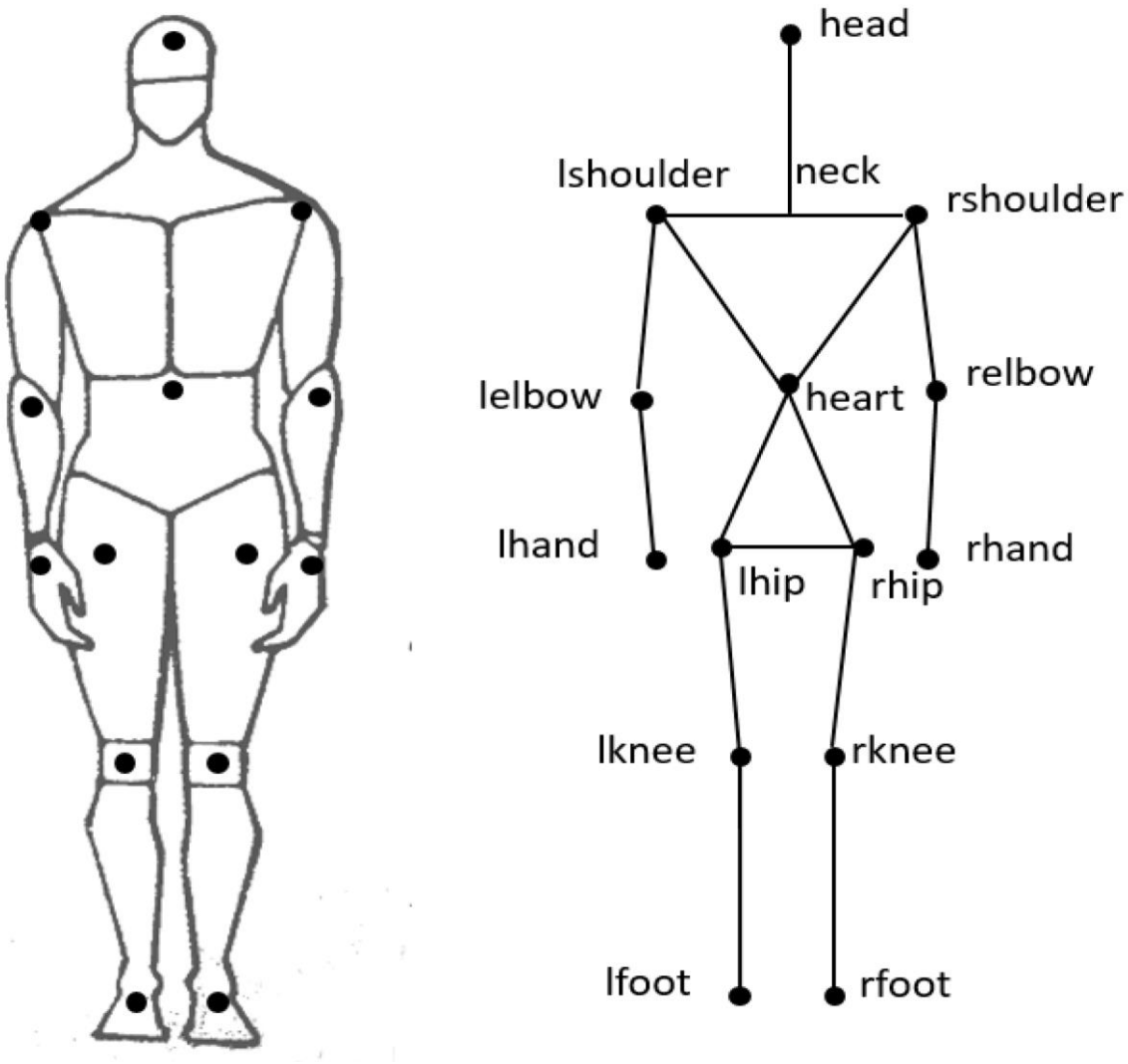
Id	Part
0	nose
1	leftEye
2	rightEye
3	leftEar
4	rightEar
5	leftShoulder
6	rightShoulder
7	leftElbow
8	rightElbow
9	leftWrist
10	rightWrist
11	leftHip
12	rightHip
13	leftKnee
14	rightKnee
15	leftAnkle
16	rightAnkle

Human pose estimation and tracking is a computer vision task that includes detecting, associating, and tracking semantic key points. Examples of semantic key points are “right shoulders,” “left knees,” or the “left brake lights of vehicles.”

The performance of semantic key point tracking in live video footage requires high computational resources what has been limiting the accuracy of pose estimation. With the latest advances, new applications with real-time requirements become possible, such as self-driving cars and last-mile delivery robots.

Today, the most powerful image processing models are based on convolutional neural networks (CNNs). Hence, state-of-the-art methods are typically based on designing the CNN architecture tailored particularly for human pose inference

Pose estimation is the task of using an ML model to estimate the pose of a person from an image or a video by estimating the spatial locations of key body joints (key points).

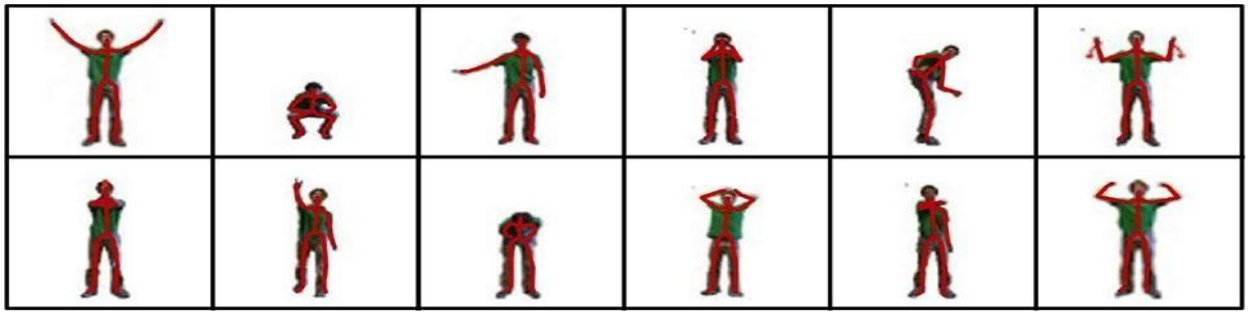


2. The label of each joint points

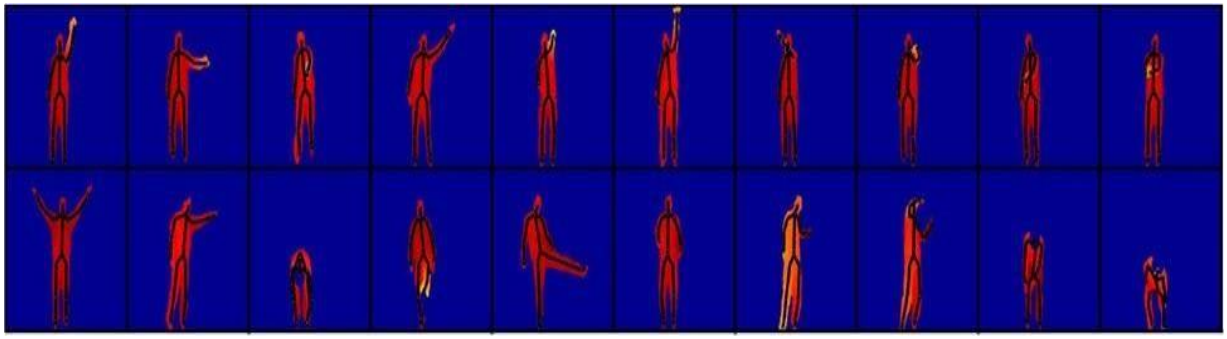
4. DATASETS

This section contains all the data and the images which can be used to perform the testing one the project.

We have performed an extensive evaluation on our proposed method using four datasets. All four datasets were extracted from the public action databases MSR-Action3D, Microsoft MSRC-12, UT Kinect-Action and Baduanjin posture.

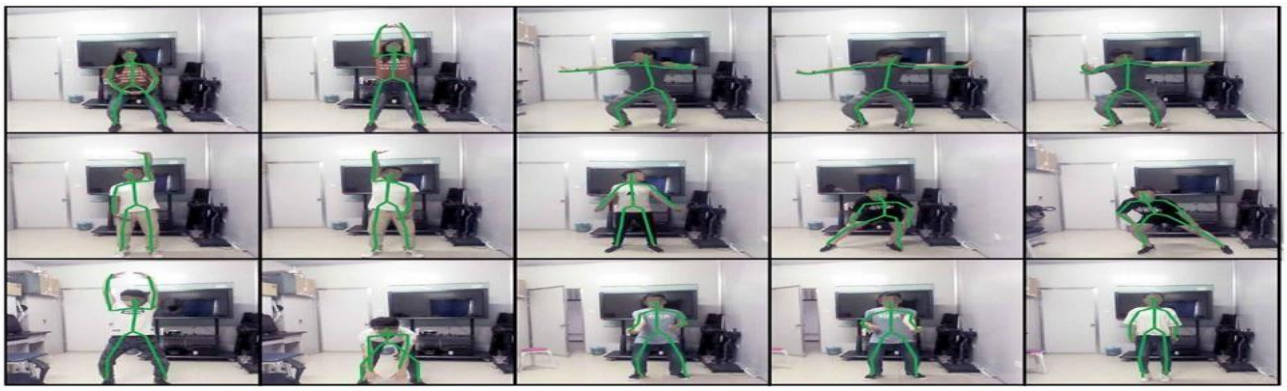


3) MSRC-12 posture RGB image



4) MSR-action3D posture depth image

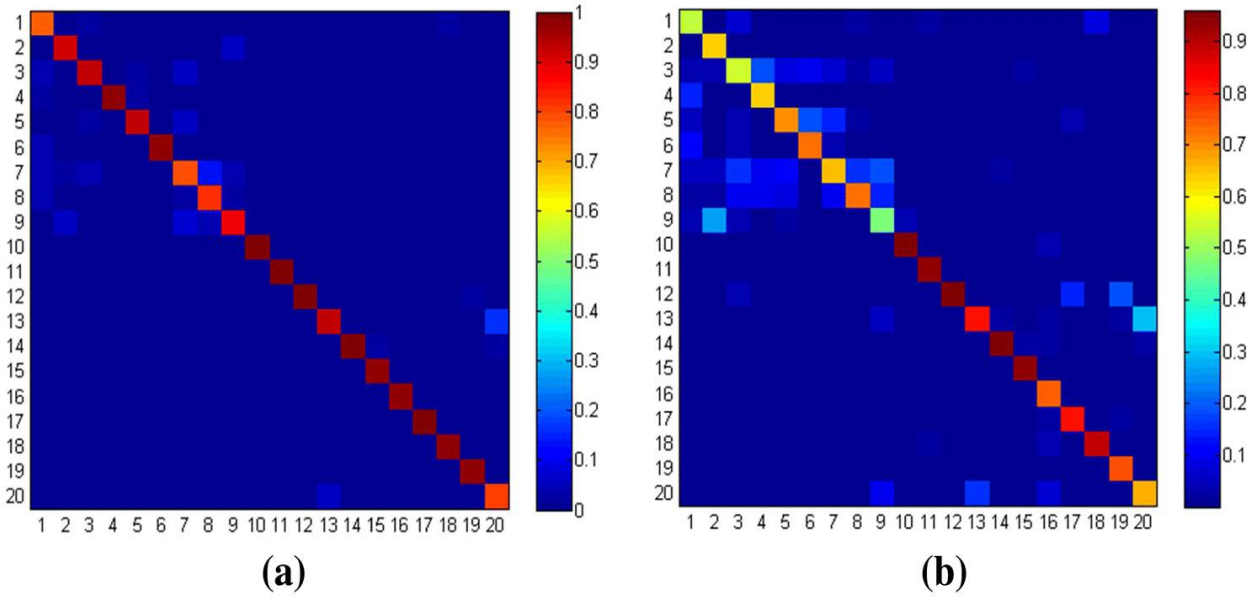
5) UT Kinect action posture RGB image



6) Baduanjin action posture RGB image

5. RESULTS

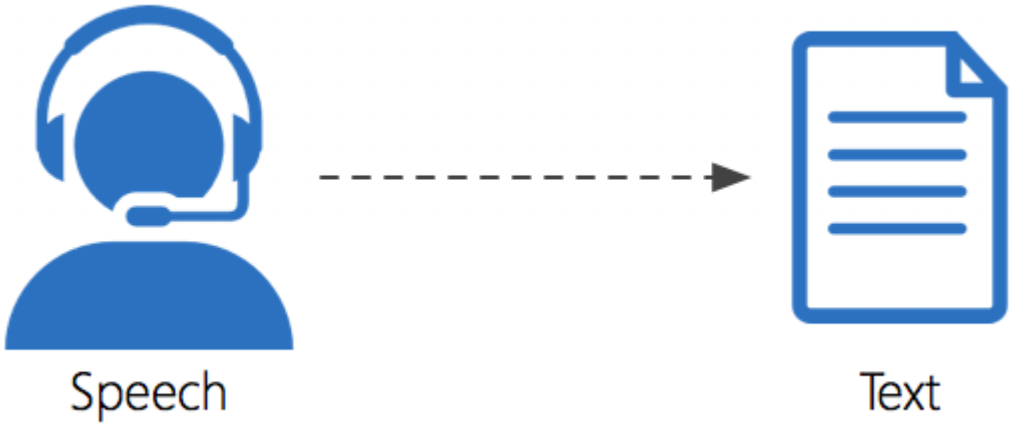
Contrast matrix between Baduanjin algorithm and the SVM algorithm



7) Result Images

6. CONCLUSION

Azure Cognitive Services Speech-to-Text API was also used to enable the application to be accessible by the visually impaired. The user can start their exercises via speech in various languages using Azure Translator Speech API remotely and this is more convenient and easier to use for our target audience. The application utilizes Azure Cognitive Services for text-to-speech. This is useful for the visually impaired as they can hear if they are in the right position as the application will tell them to adjust their posture if incorrect.



8) Text to Speech and Speech to Text Future Scope

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