

Project Sketch

CS 562 - Software Project Management

Project Title : Posture Guidance

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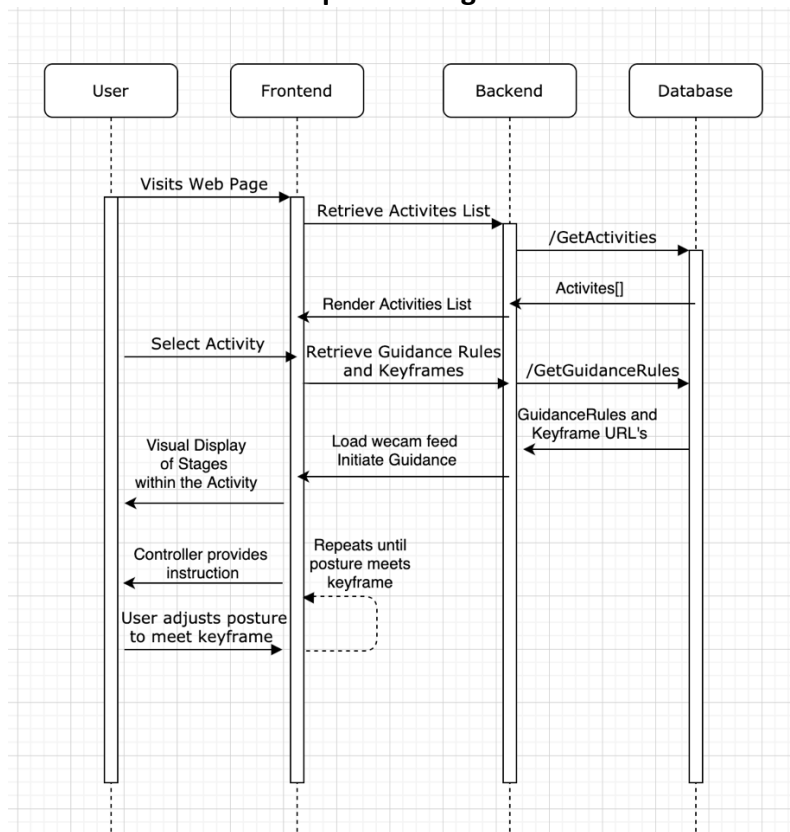
Description:

Maintaining correct posture while performing physical tasks like following an involved Yoga pose routine, doing Squats or Push-ups for the first time is a difficult task for beginners. When following through online videos we get an idea of what to do but lack feedback in terms of 'but am I doing it right?'. The project idea comes from the thought, if you had a coach/master watching, how would they guide you.

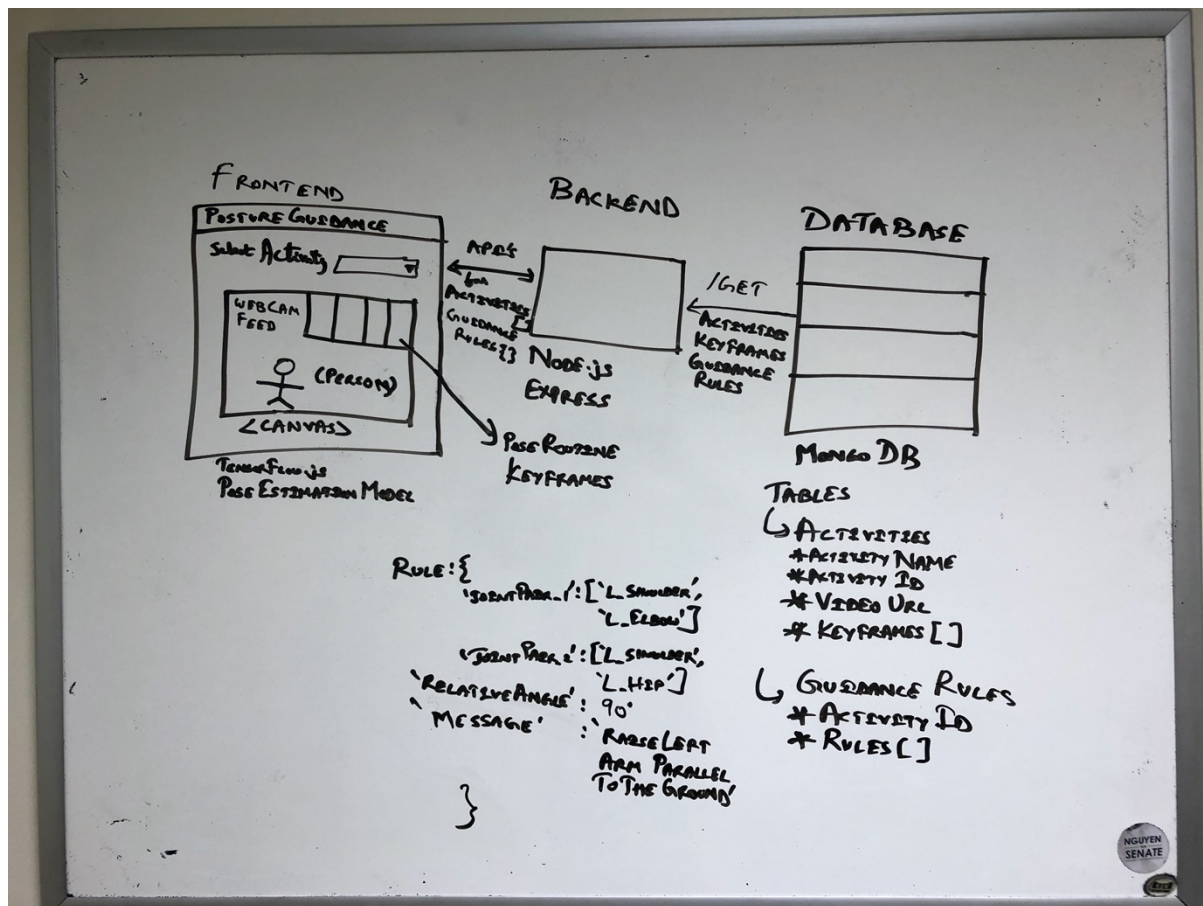
As it relates to identifying posture, we would be working with Human Pose Estimation models which estimate the key joint positions/ skeleton of a human given an image. We would be extending it to process multiple image frames (~5-10) per second, enabling it to work on live video camera feed which is nothing but ~24 frames of images per second. Identify correct posture from expert videos and use that as a step by step guide for beginners.

UML Diagrams:

Sequence Diagram



Overall Architecture and Design



Technologies Used:

Frontend – React.js/HTML/CSS/JavaScript

Backend – Node.js, Express

Database – MongoDB

Deep learning – 2D Human Pose Estimation model, TensorFlow.js, TensorFlow/PyTorch

Camera Feed Processing – OpenCV or in browser via JavaScript

User Stories:

1) Spike/Setup

Setup development environment, load pre-existing 2D Human Pose Estimation model, run build to get it working on webcam

2) User Interface Design

Design the interface that would allow the user to select an activity which he/she desires to learn

3) Pick Activity Options

Gather expert videos for sample activities which we would later process to extract key frames and calculate guidance

4) Process Activity Video

Process the activity video to gather keyframes, calculate guidance rules and store in a json format

5) Test TensorFlow.js Human Pose Estimation Model

Check pose inference accuracy for the lightweight TF.js model and see if it works across all poses, else port larger/accurate python model to the JavaScript framework

6) Check <canvas> Rendering of Guidance Instructions

Render the webcam feed within browser window, overlay activity keyframes and guidance instructions on the <canvas> element

7) Store/Retrieve Activities, Guidance Rules from a Database

Eventually retrieve only selected activity specific guidance rules from a MongoDB database exposed via an API using Express.js