

Yoga Pose Detection

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ABSTRACT

The art of yoga is an ancient practice that people have used to develop physical force, flexibility and improved clarity of the mind and stability of the emotional system. Yoga is well known for a multitude of therapeutic benefits i.e. managing stress, health improvements and claiming ailments such as anxiety or hypertension. While yoga provided these benefits, it can also lead to injury if not carried out correctly, particularly for everyone practicing alone without the guiding hand of a professional. This project came together as a way to develop a Flask web application using computer vision to detect and classify yoga poses in real-time, and provide live feedback certain people who might not know If they're aligned or in the proper form. Through the utilization of Mediapipe Pose Estimation and OpenCV, we can effectively track body landmarks and estimate important angles for the joints that will be significant for accurate pose recognition. The system identifies different standard yoga poses such as, - downward dog, - warrior, - mountain, and - tree. With a webcam-based interface, the application acts like a virtual yoga assistant, providing an interactive practice experience and optimizing safely accessing it for everyone from the comfort of their own space without the need for further software. The platform also includes modular sections for admin and users.

Admins can view registered users, maintain a dynamic FAQ section, and monitor users' feedback for Quality Assurance purposes.

1. INTRODUCTION

Yoga is an incredible resource for our physical and mental health, but incorrect posture and technique does not promote, or even risk, the same benefits. This is particularly valid for newbies who lack a yoga instructor in the room to observe them as they practice. It is best for individuals whom are not as physically capable to probably never do the yoga poses correctly, especially without the help of a pro. Poor posture and technique diminish the benefits of yoga and can create injuries or discomfort to your body that could develop chronic. Barriers such as time, location, or finances may prevent someone from participating in a traditional yoga class to learn physical postures.

Yoga is a holistic practice that offers physical strength, flexibility, mental clarity and emotional balance. In general, all forms of yoga lead to benefits of reduced stress, enhanced posture, improved concentration, and much more! Yoga is therapeutically proven to help improve many conditions, hypertension. But, if performed incorrectly, yoga can provided decreased benefits

and particularly for those who are starting, without ergonomics or professional guidance.

A solution is needed that delivers reliable, timely analysis of yoga poses to assist and enable users to practice safely and effectively, at home. This project intends to address these problems by creating a web-based application — powered by Flask and using computer vision techniques — to provide users with an interactive experience through webcam-based pose detection, real-time feedback based on pose accuracy, and an intuitive interface; and has a powerful admin module which allows the admin to maintain users, FAQs, and feedback on their web application to provide a seamless and engaging experience for its users. The platform can detect basic yoga postures of practitioners such as downward dog, warrior, mountain pose, tree pose, etc. In addition to real-time feedback, the software acts as a virtual yoga assistant to improve practitioners' form and practice.

2. LITERATURE SURVEY

In traditional yoga practice, participants rely on yoga instructors, video recordings, or mobile applications as their reference. Each of these forms of learning has its right place without any direct feedback. [1].

A feasibility study is a structured, impersonal evaluation of the viability of a project or system that attempts to determine the likelihood of its success. A project will need an assessment of the project in terms of technical, financial, legal, operational, and scheduling dimensions before deciding whether to continue with the project [2].

The proposed system is a web application capable of detecting and classifying yoga postures in real-time via webcam using computer vision techniques with Mediapipe and OpenCV, that uses the body landmarks to map it to the pose name. Users can perform a yoga posture in front of the camera, and the system detects the yoga posture and displays it without any sensor or manual input needed. The application also has a user management admin panel, FAQs, and feedback simply. yet powerful application for yoga. [3].

Visual Studio was meant to offer a robust platform for software authoring using a huge range of technologies and programming languages. Visual Studio has long number of features, tools introduced to support the whole software development process. [4].

Microsoft developed Visual Studio, a full-fledged Integrated Development Environment (IDE), which was first launched in 1997. Since its initial release with few code editing and debugging capabilities, graphical view, compilers integrated within it, and version control. Developers now creating a range of applications from desktop and web applications to mobile and cloud-based apps prefer Visual Studio for its versatility and robust development capabilities. [5].

The common markup language used to create web pages is called HTML (Hypertext Markup Language). It enables browsers to render multimedia web pages by defining the content and structure of web content. The basic blocks of a web page are HTML elements, which are represented by tags. These components include embedded object-like

form and image as well as text semantics such as headings, paragraphs and links. HTML . It enables browsers to render multimedia and web pages by defining the content and structure of the web content. [6].

The web page presentation became simple with the development of CSS (cascading style sheet) language you apply styles on HTML documents, it offers instructions on fonts, design of a webpage. [7].

It is said in different ways, CSS specifies how to display elements in print, audio, video and other media. Because it distinguishes style formatting from HTML text, this useful tool saves developers a ton work and simplifies uniforms for a variety of web pages. friendly programming language. Due to the punctuation mark in grammar and its use of the English language, even the novice readers will be capable of understand it [8].

Because Python is an explained language - which means that the code can be run by line - it is perfect for quick testing and debugging. The interactive mode of the python improves development experience by allowing the programmer to write and test directly to the interpreter. [9].

By encountering the functionality within the python objects, the modularity and code facilitates reusing by simplifying object- oriented programming. For both inexperienced and experienced users, its adaptation ability, such as web development and data analysis, makes a great option [10].

3.METHODOLOGY

3.1 Problem Description:

Project provides a technical solution through real - time currency detection and classification to support users in maintaining proper postures when practicing yoga. Users will receive a real- time response about their yoga, which allows yoga practice to be interactive, accessible and pleasant through a webcam- based system. This application serves as either a self-improvement tool for yoga practitioners or as a tool for yoga instructors to incorporate in a safe and valuable learning experience. Yoga is an ancient practice, which can benefit both physical and mental well-being. Proper posture is important for injury prevention and to take full advantage of the physical and mental benefits of each pose. The project's aims to develop a web application for Flask that computer vision methods to identify and classify yoga poses in real-time.

3.2 Information Gathering:

The system's requirements are identified and documented. The objective of the requirements step is to build a real-time yoga pose detection system using computer vision, so that users can track the precision and accuracy in their yoga posture. The system must incorporate two roles admin and user. Admins estimation, and SQLite or MySQL for data storage.

3.3 Data Preprocessing:

The system must incorporate two roles namely: admin and user. Admins manage users, FAQs, and feedback while users utilize the system by performing yoga in front of a webcam so real time

analysis can be completed. The main technologies and tools are determined in this phase however, these include: Flask for the backend, OpenCV and Mediapipe for pose , user flow, and system scope.

3.4. Model Selection and Training:

The system is comprised of two main modules: the admin module, and the user module. The admin module provides administrators with secure log in access to be able to view and delete registered users, to administer frequently asked questions, and to moderate user feedback.

3.5 Model Evaluation:

Users can register with the user module, log in to access play space, turn on a camera for pose detection while performing yoga, review the FAQ section, and submit feedback. Each module has role-based access control ensuring task separation and secure access. This stage assures module.

3.6 Implementation:

This part of the project involves the implementation of the yoga pose detection component, composed of a fairly straight- forward job. The technical implementation pulls in Mediapipe Pose Estimation which will take in the webcam feed and extract the key body landmarks. OpenCV will allow the webcam feed to be processed in real- time video.

3.7 User Interface (UI) & User Experience (UX):

The User Module provides the users with many interactive and informative features. Users may register with the appropriate and valid personal data and login with their credentials. One exciting feature allows users to find appropriate yoga poses after

performing yoga in front of the camera.

3.8 Conservation and Monitoring:

Unit testing is completed on individual items such as: pose classification, sign in/authentication of the sign-in protocol, and data storage. Integration testing will confirm that data flows correctly from the front end to the back end, and from back end to database. User acceptance testing is also conducted to verify the intended flow of the program with actual users.

4.RESULTS

The architecture diagram shows the architecture of a yoga pose detection web application, made with Flask. The architecture diagram explains how the components will communicate with one another in the system. The system has two main roles to represent the basic roles of an admin, and a user. The admin module will include functionality to manage the application. For instance, the admin is able to view and delete registered users, view, add, and delete questions in the FAQ section, and to manage user feedback. The User module allows individuals to register, camera for real-time pose detection and feedback, look at the FAQ section for assistance, and submit feedback in order to see and review.

5.CONCLUSION

The main component of the system is the Pose Detection module that employs computer vision libraries such as Mediapipe and OpenCV to analyze video input through the camera and detect body landmarks in real-time. The Pose Detection module runs a user's pose in real-time, categorizes

it with a frame of reference to specific yoga poses, and then has feedback users can get on how they can improve their posture. The Flask Web Application is the core system, with the front end (the actual user interface), the pose detection module, and the back end (the database) all communicating through it. Essentially, the Flask Web Application is accepting user requests, executing application logic, and routing information. Finally, the Database is where user credentials, pose data, FAQs, and feedback are stored and protected. This architecture provides the clear structure while enabling a smooth exchange between users and the system with a division of roles and responsibilities to provide a responsive, interactive, and efficient yoga training experience.

6. REFERENCES

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