



Machine Learning and Computer Vision in Culture Preservation: Indian Headgear Simulation

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ABSTRACT

Headgears define the rich and diverse culture of India. It is important to proselytize the idea of wearing different types of turbans to spread our heritage and enlighten the world with knowledge of Indian history.

This project aims to develop a web application that provides a variety of headgear filters that can be worn by anyone. The focus is to present a high-quality experience to users including precise image generation, varied filter options, and accurate face recognition.

This headgear simulation is created using the OpenCV module and python programming language which is an apex machine learning tool to create an application like this. Given the real-time webcam data, this Snapchat-like python application uses the OpenCV library to track an object of interest (a face in this case) and puts the turban on the head of the user by recognizing the face and mapping the area to put the turban on.

Keywords: Machine Learning, Computer Vision, Headgear Simulation, Culture Preservation

I. INTRODUCTION

Headgears are an integral part of Indian culture. India has a rich cultural heritage with varied religions and different Headgear is worn by people of almost all religions. But with modernization, the practice of wearing a turban is losing its importance and going out of trend. The headgear (Turbans) that Indians wear is a particular aspect of every culture that defines the rich and diverse culture of India.

It is important to document and make available to the people of India the history, types, and significance of turbans in Indian culture. To develop a web application having features like Snapchat to wear virtual Headgear like turban, topi etc.

The web application will also include history, significance, and photos related to each virtual headgear to help people get information along with trying on which helps in enhancing their knowledge and promote them to wear turbans. It also includes a fun quiz feature that users can play to help them check their knowledge. In addition to this, it also has a functionality where you can see the latest cultural news and it is updated from time to time using the News API.

Scope

- To incorporate different other customary accessories of every culture and try to motivate people towards preserving religion and their traditions.
- To give information about each headgear such as its history and traditional significance and amazing facts related to it so that it can be a source of learning in an innovative way which will boost knowledge.
- Making filters more realistic is very important. This will improve user experience and will be helpful for them to connect with the tradition more effectively.
- Making simulation more effective by using high-end hardware.
- Encourages us to wear different kinds of turbans on different occasions.
- It can be used as an occasional fun activity.

II. REVIEW OF LITERATURE

There are multiple research papers suggesting the use of Machine Learning for culture preservation and even to find the cultural/historical trends and patterns of the earlier human society by incorporating archaeological search and scrutiny techniques into machine learning models.

However, this paper aims to add something new in the former category. Inspired by today's social media exciting features like face filters, this paper dives into the use of machine learning models along with computer vision to simulate exciting Indian cultural headgears on the user's forehead.

And hence, this paper intends to pave a way for machine learning in cultural preservation which can have many useful and exciting approaches. For example, not only 2D images of headgears can be simulated on the user but even 3D models of the headgears can also be created for the same purpose,

Trying to simulate cultural/historical outfits can be the next step as well.

III. METHODOLOGY

A. Design Phase

Given the real-time webcam data, this Snapchat-like python application uses the OpenCV library to track an object of interest (a head in this case) and puts the headgear on the head of the user by recognizing the face and mapping the area to put the turban on along with additional features. The purpose is to make a web-based application to promote the use and importance of headgears in this modern era where this Indian accessory has lost its importance and is not considered a part of daily attire.

This application provides a user-friendly interface. It helps in promoting the use of turbans. It has unique features like quiz and information related to turbans which change when you click the "next" button to change the turban type. This project provides a simple and seamless output of filters.

B. Implementation Phase

This web app is an effortless way of explaining to people the importance of wearing a turban and its significance in our Indian society. The application serves the purpose of making users avail a free platform where they can get turban try-on as well as knowledge related to the turban in a fun manner. OpenCV library helps in perfect mapping of the face which gives precise placement of the turban and gives a realistic experience to the user. Other features allow the user to expand their knowledge and get inspired by looking at the pictures of others to wear turbans in real life. It also has a functionality where you can see the latest cultural news and it is updated from time to time using the News API.

In this a webcam is used to capture and track the face made by the user with the help of computer vision interface.

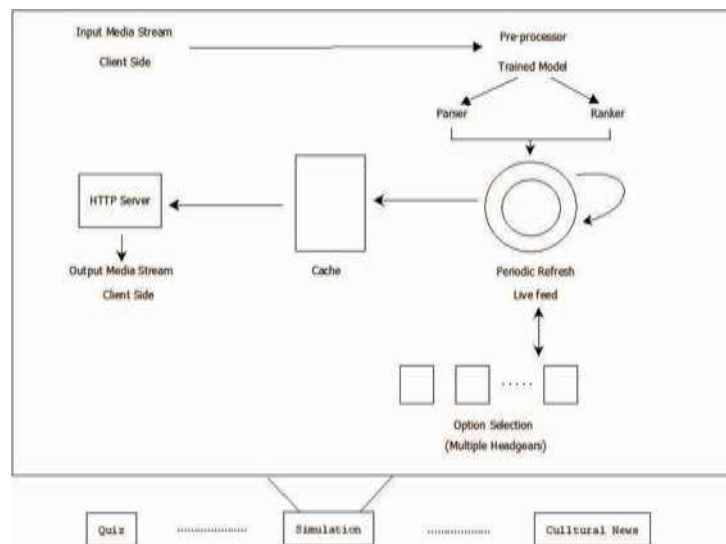


Fig 1. Architecture of the proposed software

It uses OpenCV for face tracking and analysis which is a python library that allows you to perform image processing and computer vision tasks. It provides a wide range of features, including object detection, face recognition, and tracking. The web-based project uses flask for backend project deployment and HTML and CSS for front-end purposes.

The working of buttons and their interaction with user response is handled by javascript. The application functionalities include a virtual try-on of filters of turbans, information about each turban, and a quiz section where we can play and test our knowledge.

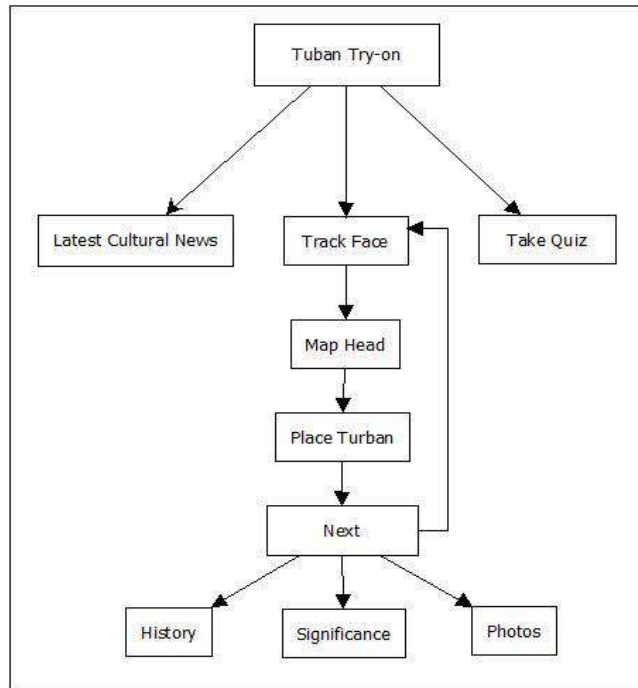


Fig 2. Activity diagram of proposed software

C. System Architecture

The most important task in this project is face recognition. Before anything we must capture a face (phase-1) in order to recognize it, when compared with a new face captured in future (phase-3).

The most common way to detect a face (or any objects) is using a haar cascade classifier. Object detection using haar-feature based cascade classifiers is an effective object detection method proposed in 2001. It is a simple machine learning approach where a cascade function is trained from a lot of positive and negative images. It is then used to detect objects in other images.

Using haar-cascade frontal face detection, we will first find the midpoint of the forehead of the user in the frame. Then using that point as the reference, we will place indian headgears/turbans on the user’s foreheads which will have dynamic dimensions/boundaries depending on the location of the user’s head and its height-width.

D. User Interaction

The figure represents a use case diagram for Indian Headgear Simulation. Users can try on virtual turbans of different types and read about their history, and significance as well as look for related photographs. Users can also give a quiz to check their knowledge about turbans which will promote them towards wearing turbans. In addition to this, it also has a functionality where you can see the latest cultural news and it is updated from time to time using the News API.

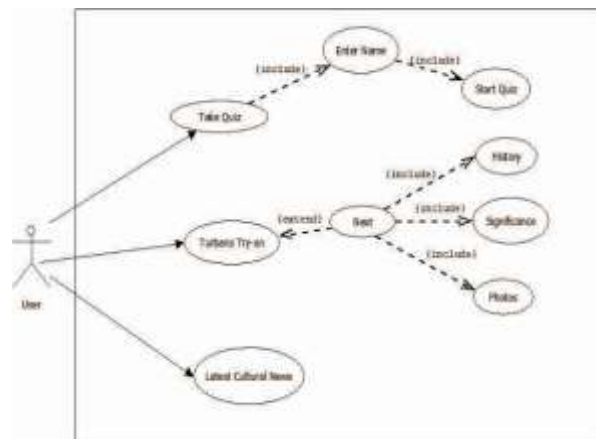


Fig 3. Use case of proposed software

The user interacts with the system application through the interface system application and then starts the camera. Further cameras detect faces through a recognition system. By analyzing the face it selects the particular part of the face where the turban has to be placed and this whole process is done in real-time and we can get output on system application.

IV. Result and Discussion

We have worked on a software where we can use different kinds of headgear filters and change them with a single click and read about their importance and facts related to them. The headgears are expected to be placed at the right position around the head and should move seamlessly along with the head. The user gets the ability to select the turban of their choice. They have the option to test their knowledge with the help of the “take quiz” functionality which is provided in this project. They can look for the latest news related to culture by just clicking on a button to get to know what is going on in the world.

This Project will help in the advancement of our rich cultural heritage. It helps in iterating the importance of turbans and acceptance of turbans in this modern era where they have lost their place and significance. The outcome we expect is to promote the use of turbans. And this website serves the purpose of promoting its use in an innovative way.

Possible Limitations

- The system's overall performance depends on the quality of the camera. The effectiveness of facial-recognition algorithms is influenced by the image quality. When compared to a digital camera, the quality of the scanned video is relatively poor.
- Parallelization among multiple cores is required in case of low RAM availability.
- There is always a scope for improvement in terms of algorithms used, as advancements in machine learning and related research are ever-going. So, better algorithms or better neural networks can directly improve performance by a huge margin.
- Generally, the algorithms in the OpenCV library have heavy RAM requirements for processing information. And also in most machines, processing for a single application happens on a single core, so until advanced coding routines are followed, it would not be possible to parallelize tasks on multiple cores for a single application on those machines.
- The relative angle of the target's face has a significant impact on the recognition score. Usually, several angles are employed when enrolling a face in facial recognition software. The algorithm's capacity to create a face template is impacted by any view other than a frontal view. The rating of any resulting matches increases with the directness and the image's resolution.

Future Scope of the software

- To make interaction and explanation effortless in real-time.
- To incorporate different other customary accessories of every and try to motivate people towards preserving religion and their traditions.
- Making filters more realistic
- Making simulation more effective by using high-end hardware.

V. Conclusion

The main objective is to create an artificial intelligence application that boosts human interaction with computers which is also known as Man-machine interaction (MMI). It refers to the connection between the computer (machine) and human in a way that this system is usable and should have varied functionality. This project aims to develop a web app that provides a variety of turban filters that can be worn by anyone. The focus is to present a high-quality experience to users including precise image generation, varied filter options, and accurate face recognition.

VI. Acknowledgement

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