Smart Mirror

AI-Based Eyewear Recommendation System

Project Code

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1. Abstract

This project aim is to design and develop the “Smart Mirror” to enhance the eyewear shopping experience in optical shops. In traditional frame selection customer is mostly dependent on shop owner decision which causes dissatisfaction and lead to customer indecision. This system utilizes a two way mirror which appear as a regular mirror. It has a camera and dedicated processing unit. As customer walk in front of mirror camera will capture the picture and by using processing unit will analyze the facial features and face shape. By using the AI it will match the best frame according face shape and it will display the picture on smart mirror.

2. Background and Justification

Over a decade there is no major shift for customer to select the frames as it manual, challenging and mostly dependent on owner of shop. The final decision usually relies on opinion from sale staff and friends which is unreliable. Diagnosing one’s own face shape accurately is difficult for average consumer.In world of fashion face shape plays a crucial role in determining the which eyeglass frame suit or is best for individual. In the market there are multiple products which are working on same principle like there is interactive fitting mirror which is transforming fitting rooms with AR and AI [6]. Magic mirror are available for home these are used for exercising [7], checking weather condition [7], personal notification system and alarm or clock [7], but there is no specific product which fulfill the eyewear issues.

In the recent years the advancement in computer vision and artificial intelligence has made it affordable and possible to get real-time recommendations.So this innovation will boost the customer experience and provide a new direction in world of customer experience, fashion and need.Some smart mirror systems exist in beauty and retail domains [1][2], none focus specifically on personalized eyewear recommendation. This project fills this gap by designing a specialized Smart Mirror to assist users in selecting frames, enhancing both customer satisfaction and retail efficiency.

3. Project Methodology

This project will follow a systematic approach which is divided into several parts.The methodology encompasses the hardware setup, software development and system integration. For hardware it requires the Two-way mirror which reflect light from one side and allow passing from other side, a LED display for output, a processing unit (Computer/Raspberry Pi) and a camera for taking picture. Now in second phase we will develop software which will take image as input and apply face detection algorithm, face shape classification and then recommendation base on face shape.These output recommendation will be displayed on led. Third and last step is to integrate the hardware and software to a working product.

4. Project Scope

The scope of project is to develop and design prototype smart mirror which take picture as input and after processing it will assist customer the best eyeglass frame according to face shape and features.Our focus is to build a functional prototype that demonstrate the core feature of concept.

5. High level Project Plan

The project plan below outlines a clear and structured breakdown of tasks, each with defined descriptions and duration. The schedule spans a total of 36 weeks, ensuring a smooth workflow and timely completion of the Smart Mirror prototype.

No	Task	Description	Duration
1	Requirement Specification	Finalize functional and non-functional requirements, create component list and success criteria.	2 weeks
2	Hardware Procurement	Finding and ordering two-way mirror, camera, display, Raspberry Pi and necessary peripherals.	3 weeks

3	Assembly & Environment Setup	Assemble hardware, install OS and dependencies (Python, OpenCV, TensorFlow), and verify hardware connectivity.	4 weeks
4	Dataset Collection	Capture face images in diverse lighting and poses; label with face shape categories for training.	4 weeks
5	Data Pre-processing & Augmentation	Clean, normalize, augment images, and split dataset into train/validation/test sets.	3 weeks
6	Model Design & Training	Design CNN(convolutional neural network for classification that uses activation function) or classifier for face shape, train model, evaluate and tune hyper-parameters.	8 weeks
7	Model Evaluation & Tuning	Measure accuracy, confusion matrix analysis, perform cross-validation and optimize model.	4 weeks
8	Software Development (Detection + UI)	Implement face detection, classification pipeline, matching algorithm, and simple UI for the mirror display.	4 weeks
9	Integration & Raspberry Pi Deployment	Integrate model with UI, deploy/optimize on Raspberry Pi, and ensure real-time inference.	3 weeks
10	User Testing & Evaluation	Conduct user trials in an optical shop or lab, collect feedback, and measure usability and recommendation accuracy.	2 weeks
11	Documentation & Final Report	Write final project report, prepare presentation slides, and compile code/documentation for submission.	2 weeks

6. References

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