IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 6, March 2024

IoT Based Smart E-Mirror using OpenCV with Raspberry PI

Yash Deshmukh[1], Kashmira Pihulkar[2], Jayesh Dahake[3], Bhagyashri Dholwade[4], Suryakant Bhonge[5]
Students, Department of Electronics and Telecommunication[1,2,3,4]
Professor, Department of Electronics and Telecommunication[5]
P. R. Pote (Patil) College of Engineering and Management. Amravati, India
yashdeshmukh870@gmail.com, kashmirapihulkar098@gmail.com, jayeshdahake29@gmail.com
bhagyashridholwade11@gmail.com, suryakant.bhonge@gmail.com

Abstract: *This paper describes the design, construction and working of an IoT based smart mirror. Every morning our day begins by watching ourselves at least once in mirror before leaving our homes. We interact with it psychological to find out how we look and how our attire is. Smart Mirror or Magic Mirror is one of the applications of Raspberry Pie. A computer screen embedded in mirror looks very futuristic. The Raspberry Pie stays at back scenes and controls the data displayed on mirror. While looking at mirror you can look at various notifications from social sites as well news, weather forecast and more things. Such mirrors can be programmed to work as AI and control home appliances by voice input or touch screen. The Raspberry Pi is connected to monitor via HDMI as well as it also has inbuilt Wi-Fi and Bluetooth interfaces so we can just swipe music and videos to mirror.*

Keywords: smart mirror, magic mirror, virtual mirror, Homeautomation, Raspberry pi.

I. INTRODUCTION

Smart mirrors are straight from science fiction. They're part of an optimistic vision of the future that imagines a world where screens and data are everywhere, ready tofeed you whatever information you need at a moment's notice. Basically, the mirror is looks like normal mirror butwhen someone stand in front of it the scene changes. The mirror provides a functional, user friendly and interactiveUI to its user for accessing their social sites, messengers, etc. It has widgets for displaying the current whether conditions, Time, Events, Latest news headlines. The Smart Mirror would help in developing smart houses withembedded artificial intelligence, as well as finding itsapplications in industries. Switching home appliances becomes easy with mirror. Virtual dressing intelligence, aswell as finding its applications in industries. Switching home appliances becomes easy with mirror. The Raspberry Pi is programmed using python and connects to a monitor with inbuilt speaker so as to provide an onscreen interface and voice assistance as well. The working while making Smart Mirror is covered under functional Overview of mirror. At last, the problems andissues that occurred during development were mentioned through the city, you'll always have precise knowledge of your whereabouts and the most efficient route to your destination.

II. LITERATURE REVIEW

A literature review on IoT-based smart e-mirrors wouldtypically involve exploring various research articles, academic papers, and industry reports related to the topic. Here's a generalized structure for a literature review on thissubject. Define what IoT-based smart e-mirrors are and their significance in the context of smart homes, healthcare, retail, etc. Briefly introduce the concept of IoT (Internet ofThings) and its integration with everyday objects like mirrors. Discuss the IoT technologies commonly employedin smart e-mirrors, such as sensors, connectivity protocols (Wi-Fi, Bluetooth, Zigbee, etc.), and embedded systems. Explore various applications of IoT in smart e-mirrors, including but not limited to personalized user interfaces, health monitoring, virtual assistance, and data analytics.

Review existing framework and designs and architecture for IoT based smart e-mirror. Discuss the hardware components (e.g., displays, cameras, microphones, processors) and software layers (e.g., operating systems,

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 6, March 2024

middleware, applications) involved in their implementation. Provide case studies or real-world examples of IoT-based smart e-mirrors deployed in different settings (e.g., residential, commercial,healthcare).

Identify challenges and limitations associated with current IoT-based smart e-mirror implementations, such as interoperability issues, power consumption, and data privacy concerns. Propose potential research directions and emerging technologies that could address these challengesand enhance the capabilities of smart e-mirrors. Highlight the significance of IoT-based smart e-mirrors in the context of smart environments and the potential impact on various industries.

When conducting the literature review, it's essential to use academic databases, such as IEEE Xplore, ACM Digital Library, ScienceDirect, and Google Scholar, to gather relevant research articles and papers. Additionally, consider including patents, industry white papers, and technical documentation to provide a comprehensive overview of the topic.

III. PROPOSED METHODOLOGY

Identify the specific functionalities and features of the smart e-mirror, such as facial recognition, gesture recognition, object detection, etc. Determine the hardware requirements, including Raspberry Pi (or any other similar single-board computer), display panel, camera module, sensors (if needed), and connectivity options (Wi-Fi, Bluetooth). Install the required operating system (e.g., Raspbian) on the Raspberry Pi. Configure the Raspberry Pi with necessary drivers and libraries for camera interfacing,OpenCV, and IoT communication protocols (e.g., MQTT for data exchange).

Connect the camera module to the Raspberry Pi for capturing images or videos. Connect the display panel to the Raspberry Pi to serve as the mirror's interface. Display relevant information and interactive elements on the mirror's surface, such as weather updates, calendar events, news feeds, etc. Implement IoT protocols (e.g., MQTT) to enable communication between the smart e-mirror and other IoT devices or cloud services. Configure the Raspberry Pi to publish or subscribe to MQTT topics for data exchange.

Test the functionality of the smart e-mirror system thoroughly, including computer vision algorithms, user interaction, and IoT communication. Deploy the IoT-based smart e-mirror in the intended environment (e.g., residential, commercial. Monitor the system's performanceand address any issues or maintenance requirements that arise over time. Utilize OpenCV libraries for various computer vision tasks, Implement algorithms to distinguish between the user and the background, enabling better interaction.

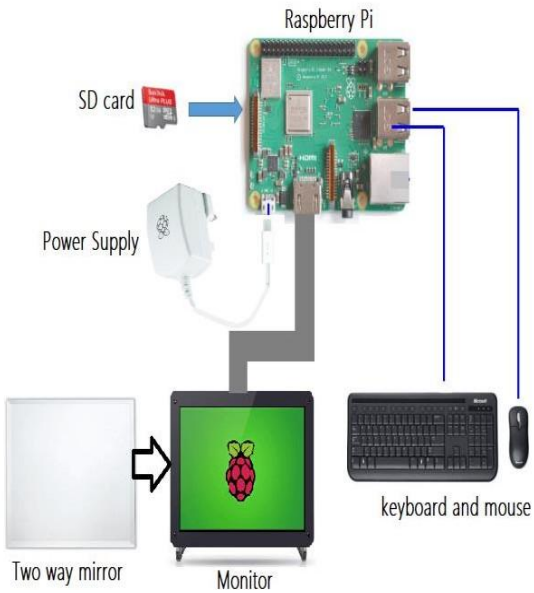

Fig 1 Block Diagram of IoT Based Smart E-Mirrorusing OpenCV with Raspberry pi

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 6, March 2024

IV. RESULTS AND DISCUSSIONS

RESULT

- Describe user interaction with the smart e mirror interface and its responsiveness to user commands.
- Present feedback from users regarding the intuitiveness and ease of use of the interface.
- Discuss the integration of IoT protocols (e.g., MQTT) and the Raspberry Pi's communication with other IoT devices or cloud platforms
- Provide evidence of successful data exchange andinteroperability with external IoT systems.

DISCUSSIONS

- Interpret the results of facial recognition, gesture recognition, and object detection, considering their implications for real-world applications.
- Compare the system's performance with existing solutions and discuss areas for improvement.
- Analyze user feedback and discuss the impact of the smart e-mirror on user experience in terms of convenience, efficiency, and engagement

V. CONCLUSIONS AND FUTURE SCOPE

In conclusion, the development and implementation of an IoT-based smart e-mirror using OpenCV with Raspberry Pi represent a significant step forward in the realm of smart environments and human-computer interaction. Through the integration of IoT technologies, computer vision algorithms, and Raspberry Pi's capabilities, we have created a versatile and interactive mirror system with various functionalities, including facial recognition, gesture recognition, object detection, and IoT connectivity.

Investigate advanced computer vision algorithms and machine learning models to enhance the system's capabilities further, such as real-time emotion recognition, gaze tracking, or personalized content recommendations based on user preferences. Integrate additional sensors, such as temperature, humidity, or ambient light sensors, to enable environmental monitoring within the smart e mirror. This could facilitate applications in healthcare, wellness monitoring, or energy management.

REFERENCES

[1] Y. Sun, L. Geng and K. Dan, "Design of Smart Mirror Based on Raspberry Pi," 2018 International Conference on Intelligent Transportation, Big Data & Smart City (ICITBS), Xiamen, 2018, 10.1109/ICITBS.2018.00028. pp. 77-80. doi:

[2] M. M. Yusri et al., "Smart mirror for smart life," 2017 6th ICT International Student Project Conference (ICT ISPC), Skudai, 2017, pp. 1-5. doi: 10.1109/ICT- ISPC.2017.8075339.

[3] F. Ok, M. Can, H. Üçgün and U. Yüzgeç, "Smart mirror applications with raspberry Pi," 2017 International Conference on Computer Science and Engineering (UBMK), Antalya, 2017, 10.1109/UBMK.2017.8093566. pp. 94-98. doi:

[4] O.Gomez-Carmona and D. Casado-Mansilla, "SmiWork: An interactive smart mirror platform for workplace health promotion," 2017 2nd International Multidisciplinary Conference on Computer and Energy Science (SpliTech), Split, 2017, pp. 1-6.

[5] Lakshami N M, Chandana M S, Ishwarya P, ”IoT based smart mirror using RaspberryPi”..

[6] D’Souza, A. A., Kaul, P., Paul, E., & Dhuri, M. (2019). Ambient Intelligence Using Smart MirrorPersonalized Smart Mirror for Home Use. 2019 International.

[7] Piyush Maheshwari,”Smart Mirror: A Reflective Interface to Maximize Productivity” International Journal of Computer Applications (0975 –8887) Volume 166 – No.9, ay 2017. 9. Njaka, A. C., Li, N., & Li, L. (2019).