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GESTURE BASED RPS GAME

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ABSTRACT:

The Gesture- Grounded gemstone- Paper- Scissors (RPS) Game is an interactive computer vision operation that enables druggies to play the classic RPS game using real- time hand gestures. erected using MediaPipe for hand shadowing and OpenCV for videotape processing and UI picture, the system captures the stoner's hand through a webcam, detects corner points, and classifies the hand disguise as gemstone, paper, or scissors. The stoner competes against a computer opponent with aimlessly generated moves. The game offers a visually engaging interface with live gesture discovery, automatic score shadowing, and match progression. crucial features include a scoreboard and game history logs, both stored in CSV format for patient data shadowing. The system supports round- grounded gameplay and transitions easily between game countries similar as launch screen, active play, game over, scoreboard view, and history view. This design demonstrates the operation of real- time gesture recognition in interactive games and highlights the eventuality of AI driven mortal- computer commerce. It's an excellent illustration of integrating machine literacy, computer vision, and stoner interface design into a single, stoner-friendly Python operation.

Keywords: Gesture Recognition, Hand Tracking, MediaPipe, OpenCV, Real-Time Computer Vision, Human-Computer Interaction, Rock-Paper-Scissors Game, Python Game Development.

Introduction:

Human- computer commerce (HCI) has evolved significantly with the advancement of computer vision and artificial intelligence. Traditional input styles similar as keyboards, mice, and touchscreens are now being supplemented or replaced by gesture grounded interfaces, enabling further intuitive and natural relations. This design, named" Gesture- Grounded gemstone- Paper- Scissors (RPS) Game," explores this paradigm by developing a real- time game that detects and interprets hand gestures to control gameplay. gemstone- Paper- Scissors is a simple yet widely given hand game that makes it an ideal use case for experimenting with gesture recognition. The ideal of this design is to allow druggies to play the RPS game against a computer opponent using only their hand gestures captured through a webcam. By integrating MediaPipe for hand shadowing and OpenCV for image processing and UI picture, the system can descry and classify hand signs into gemstone, paper, or scissors in real- time. Beyond gesture discovery, the game includes fresh features similar as a graphical interface, score shadowing, round operation, and the capability to view a scoreboard and game history, which are persistently stored using CSV lines. These features enhance the stoner experience and give a complete and interactive gameplay terrain.

Review of Literature

Most existing Rock-Paper-Scissors (RPS) games use keyboard or mouse input, limiting natural interaction. Vision-based versions built with basic OpenCV methods face issues like low accuracy and lighting sensitivity. There is a need for a real-time, reliable, and engaging gesture-based RPS game using advanced hand-tracking frameworks like MediaPipe to improve human-computer interaction.

S.No	Research Paper Title	Author(s)	What They Did	Output / Result
1	MediaPipe: A Framework for Building Perception Pipelines	Lugaresi et al. (2019)	Developed MediaPipe – a real-time framework for hand tracking using palm detection and 2D hand landmarks.	Provided accurate, cross-platform, real-time hand tracking with low latency and high efficiency.
2	Gesture Recognition: A Survey	Mitra & Acharya	Surveyed various gesture recognition approaches, including vision-based and glove-	Highlighted gesture recognition as an intuitive and powerful mode of interaction for gaming,

S.No	Research Paper Title	Author(s)	What They Did	Output / Result
		(2007)	based techniques, and their role in HCI.	accessibility, and control systems.
3	Rock-Paper-Scissors Using OpenCV (Open Source Projects)	Various Developers	Created gesture-controlled RPS games using OpenCV and contour detection or template matching.	Enabled basic gameplay but faced limitations with accuracy, lighting sensitivity, and lacked extensibility.
4	Vision-based Gesture Recognition for HCI	Wachs et al. (2011)	Investigated real-time gesture interfaces for smart environments, healthcare, and public spaces.	Demonstrated that vision-based gesture interfaces can reduce reliance on physical devices and improve user experience.

Methodology:

Existing System

Existing gesture-based RPS systems rely on classical image processing methods like contour detection, skin color filtering, or template matching for hand detection. Gesture recognition is based on static features such as contour area or convex hull, making them sensitive to lighting and hand placement. Most approaches lack structured gameplay, data logging, and user-friendly interfaces, with limited extensibility for adding new gestures or modes.

Proposed system

1. The **Gesture based RPS game** The proposed system uses Media Pipe's real-time hand landmark detection, providing 21 precise key points for accurate gesture recognition. Rock, paper, and scissors are identified dynamically based on relative landmark positions, making the system robust under different lighting and angles. It includes a complete gameplay loop with rounds, scoring, and smooth state transitions, while also storing scoreboards and game history in CSV files. A user-friendly OpenCV-based GUI with buttons and labels enhances interaction, and the design is modular and scalable, allowing easy extension to new gestures, modes, or multiplayer features.

A. System Architecture

1. **Input Module –** Captures real-time video frames using webcam.
2. **Hand Detection & Landmark Extraction** – Uses MediaPipe to detect hand and extract 21 key landmarks.
3. **Gesture Recognition Module –** Classifies gestures (rock, paper, scissors) based on landmark positions.
4. **Game Logic Module** – Compares user move with computer's random move, handles rounds, scoring, and game states.
5. **User Interface Module –** OpenCV-based GUI for displaying live feed, overlays, scores, and results.
6. **Data Logging Module –** Stores scoreboard and game history in CSV files.
7. **Extensibility Layer –** Supports adding new gestures, multiplayer mode, or voice-based input.

B. Algorithms Used

- **Hand Detection & Landmark Extraction:** MediaPipe's deep learning (CNN + regression).
- **Gesture Recognition:** Rule-based geometric analysis of landmarks.
- **Game Logic:** Simple conditional comparison (if–else rules) for RPS outcomes.

c. Workflow

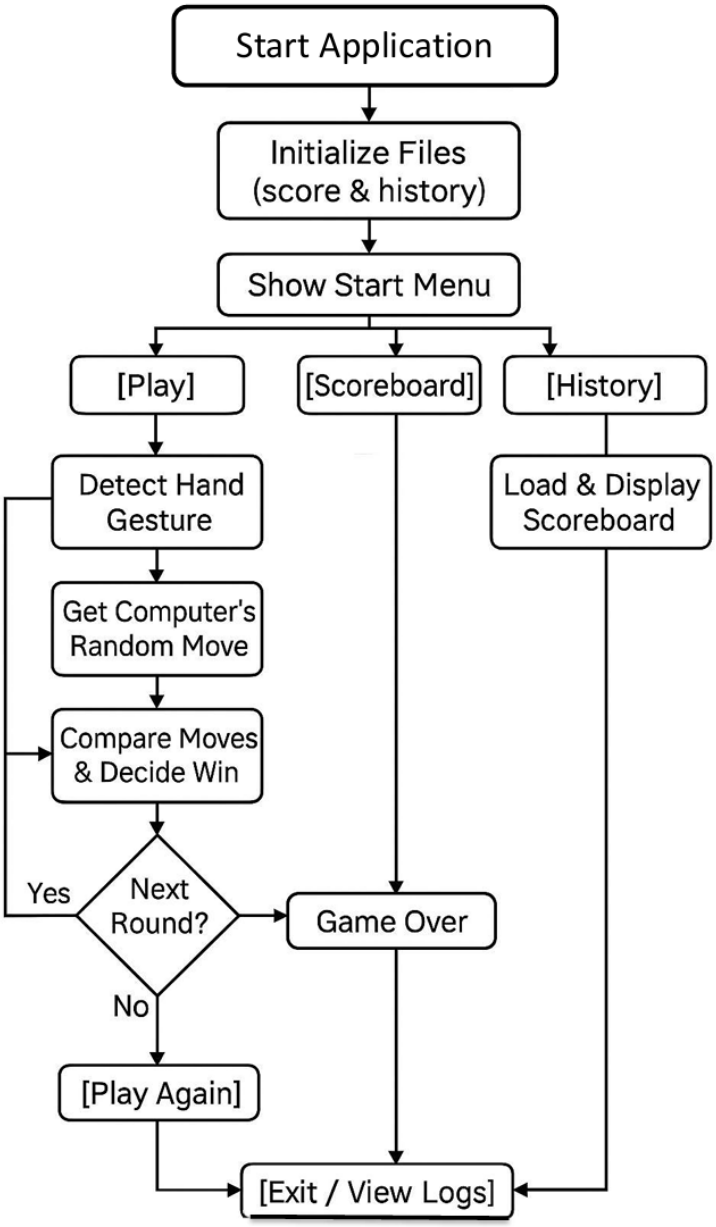

Fig1

D. Evaluation Metrics

1. Accuracy – % of correctly classified gestures.
2. Precision, Recall, F1-score – per gesture class (rock, paper, scissors).
3. Confusion Matrix – shows misclassifications.
4. Latency & FPS – speed of detection (real-time).
5. Detection Rate / False Positives – reliability of hand detection.
6. Robustness – test under different lighting, angles, distances.
7. Round Success Rate & Time-to-Play – smooth gameplay measure.
8. User Satisfaction (SUS score) – usability feedback.

Results

The system successfully detects and classifies hand gestures (rock, paper, scissors) in real- time using MediaPipe with high delicacy. The OpenCV-predicated interface enables smooth gameplay with automatic score shadowing, round progression, and live gesture visualization. Game history and

scoreboard are stored in CSV lines for analysis. The results demonstrate robust gesture recognition under normal lighting conditions and deliver an engaging, user-friendly interactive gaming experience.

Fig 2

This image represents a **gesture-controlled Rock-Paper-Scissors game** built using MediaPipe and OpenCV. The system detects hand gestures in real time and compares them with the computer's move to decide the winner. The main menu provides options to start the game, exit, view the scoreboard, and check game history. During gameplay, the player's gesture is recognized and displayed along with the computer's choice, result of the round, and running scores. The scoreboard records overall game outcomes, while the game history logs each round's details, including player move, computer move, and result. This makes the game interactive, visually appealing, and easy to track progress.

Conclusions:

The Rock-Paper-Scissors game using MediaPipe and OpenCV successfully demonstrates how real-time hand gesture recognition can be applied to interactive gaming. By detecting 21 hand landmarks, the system accurately identifies gestures and ensures smooth gameplay. The inclusion of a scoreboard and game history enhances user experience, while the modular design allows easy scalability for adding new gestures or features. This project

proves that gesture-based interfaces can make gaming more engaging, efficient, and user-friendly.

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REFERENCES:

1. **Lugaresi, C., Tang, J., Nash, H., McClanahan, C., Uboweja, E., Hays, M., … Grundmann, M. (2019).** ***MediaPipe: A Framework for Building Perception Pipelines*****. arXiv preprint arXiv:1906.08172.**
2. **Mitra, S., & Acharya, T. (2007).** ***Gesture Recognition: A Survey*****. IEEE Transactions on Systems, Man, and Cybernetics, Part C (Applications and Reviews), 37(3), 311–324.**
3. **Wachs, J. P., Kölsch, M., Stern, H., & Edan, Y. (2011).** ***Vision-based hand-gesture applications*****. Communications of the ACM, 54(2), 60–71.**
4. **OpenCV. (2025).** ***OpenCV Documentation*****. Retrieved from: https://opencv.org/**
5. **MediaPipe. (2025).** ***Google MediaPipe Framework Documentation*****. Retrieved from: https://developers.google.com/mediapipe**
6. **Various Developers. (n.d.).** ***Rock-Paper-Scissors using OpenCV (Open Source Projects)*****. GitHub.**
7. **Zhang, Z. (2012).** ***Microsoft Kinect Sensor and Its Effect*****. IEEE Multimedia, 19(2), 4–10.**
8. **Ren, Z., Meng, J., & Yuan, J. (2013).** ***Depth camera based hand gesture recognition and its applications in Human-Computer-Interaction*****. Proceedings of IEEE International Conference on Information, Communications and Signal Processing (ICICS), 1–5.**
9. **Molchanov, P., Gupta, S., Kim, K., & Kautz, J. (2015).** ***Hand gesture recognition with 3D convolutional neural networks*****. Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR) Workshops, 1–7.**
10. **Wu, Y., & Huang, T. S. (2001).** ***Vision-based gesture recognition: A review*****. Lecture Notes in Computer Science, 1739, 103–115.**
11. **Rautaray, S. S., & Agrawal, A. (2015).** ***Vision based hand gesture recognition for human computer interaction: a survey*****. Artificial Intelligence Review, 43(1), 1–54.**
12. **Oppenheim, A. V., & Schafer, R. W. (2009).** ***Discrete-Time Signal Processing*****. Pearson Education. (For signal/image processing concepts used in OpenCV.)**
13. **Bishop, C. M. (2006).** ***Pattern Recognition and Machine Learning*****. Springer. (For ML fundamentals behind gesture recognition.)**