Veggie Chop Challenge

A Gesture-Controlled Interactive Web Game Using Hand Tracking

1. Introduction

Veggie Chop Challenge is a browser-based interactive game that uses real-time hand gesture recognition to simulate vegetable chopping actions. The system allows users to interact without physical controllers, demonstrating modern human–computer interaction using computer vision.

2. Objectives

The objectives of this project include implementing real-time hand tracking, mapping gestures to game actions, designing a touchless interface, and visualizing gameplay using HTML5 Canvas.

3. Technologies Used

The project is developed using HTML5, CSS3, JavaScript (ES6), MediaPipe Tasks Vision for hand landmark detection, WebRTC for camera access, and the Canvas API for rendering graphics.

4. Gesture Recognition

Hand gestures are classified using landmark positions provided by MediaPipe. Specific gestures such as pinch, open palm, fist, and peace sign are mapped to pick, place, chop, and finish actions respectively.

5. Game Workflow

The user starts the camera, picks a vegetable using a pinch gesture, places it on the board with an open palm, chops using a fist gesture, and finishes the round using a peace sign. A minimum of three chops is required.

6. Graphics and Animation

Vegetables, cutting board, knife, and slices are rendered using procedural canvas drawing. Animations and easing functions provide realistic motion and visual feedback.

7. User Interface

The interface includes step indicators, live hand skeleton overlay, confidence bars, gesture hints, and animated feedback messages. The layout is responsive and user-friendly.

8. Applications

The system can be applied to gesture-based gaming, touchless interfaces, educational tools, accessibility systems, and public interactive kiosks.

9. Limitations

The application requires good lighting conditions, supports only single-hand detection, and depends on webcam quality.

10. Conclusion

Veggie Chop Challenge demonstrates the effective use of computer vision for natural user interfaces. The project highlights the potential of gesture-controlled systems in interactive web applications.