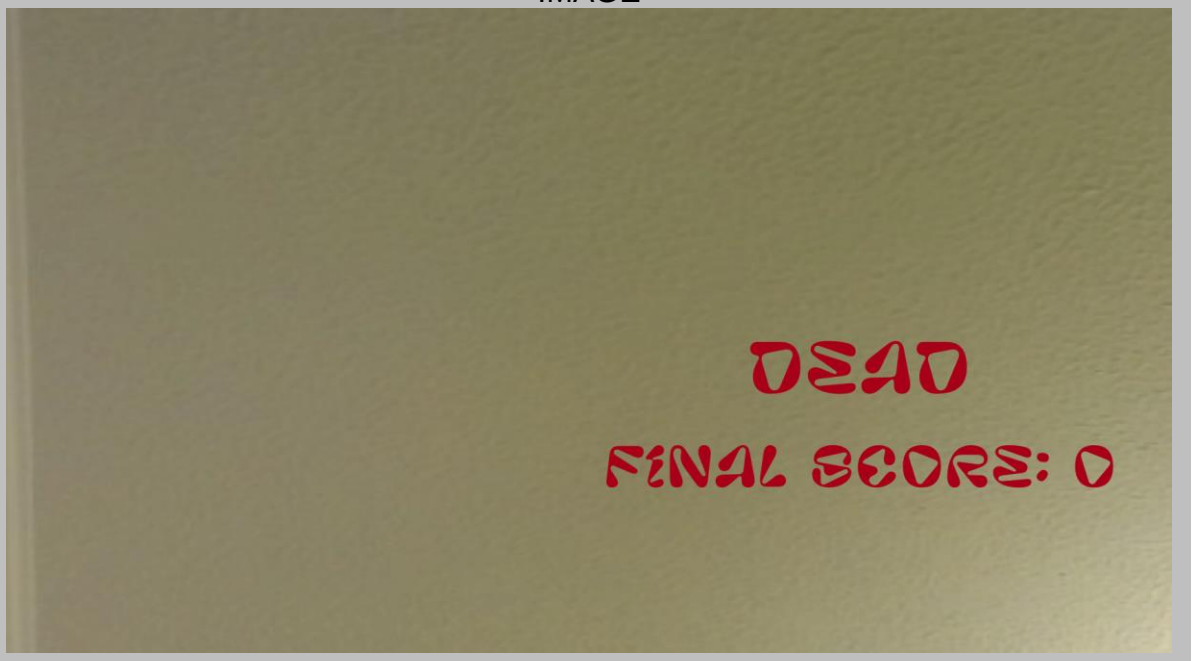
IMAGE



Serpent and Forbidden Fruit

By Yuyan Li

A Snake game that can be controlled interactively with the camera.

https://vimeo.com/849340671?share=copy

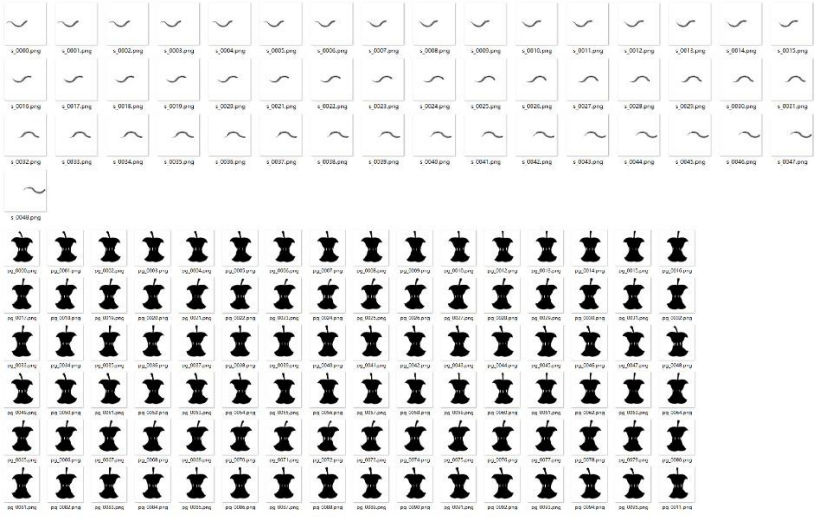
Introduction

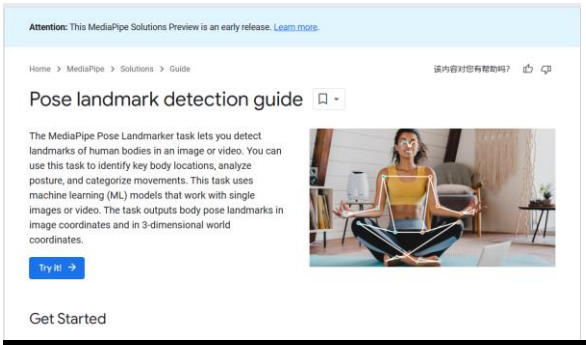
This game offers an innovative version of the classic Snake game, revolutionising traditional Snake character controls by introducing MediaPipe Pose Landmark detection and the p5.js framework to bring an immersive gameplay experience to the audience. Instead of using the usual keyboard and arrow key controls, players play through hand recognition detected by the webcam, making the game more intuitive and interactive, as well as more creative and potentially creating some unexpected surprises.

Concept and Background Research

This project was inspired by the intersection of religious narratives and modern games. By adapting the story of Adam and Eve, I not only offer a fresh take on classic games, but also draw attention to the intriguing dynamics of temptation and desire. We control the serpent, the embodiment of desire, and just as the serpent is attracted to the forbidden fruit, so too is the projection of itself on the player's screen attracted to the apple.The game relies heavily on the MediaPipe Pose Landmark model, a machine learning model developed by Google. It recognises the key to body movements in video frames and subsequently transfers them to the game environment, creating a seamless connection between the physical and digital realms.

Technical Implementation






```
// the position of the left wrist
let leftWristX;
let leftWristY;
// the position of the right wrist
let rightWristX;
let rightWristY;
```

```
99        // right hand preferred
100       if (leftWristX >= 0 && leftWristX <= width
101         && leftWristY >= 0 && leftWristY <= height) {
102         targetX = leftWristX;
103         targetY = leftWristY;
104       }
105
106       if (rightWristX >= 0 && rightWristX <= width
107         && rightWristY >= 0 && rightWristY <= height) {
108         targetX = rightWristX;
109         targetY = rightWristY;
110       }
```

```
function updateFood() {
  foodX = random(foodImg.width / 2, width - foodImg.width / 2);
  foodY = random(foodImg.height / 2, height - foodImg.height / 2);
}
```

```
/* This function moves the snake gradually. */
function moveSnake() {
  let deltaX = targetX - snakeX;
  let deltaY = targetY - snakeY;

  // create springing effect
  deltaX *= springing;
  deltaY *= springing;
  accelX += deltaX;
  accelY += deltaY;

  // move the snake's head
  snakeX += accelX;
  snakeY += accelY;

  // slow down springing
  accelX *= damping;
  accelY *= damping;
}
```

```
138       // show food
139       // image(foodImg, foodX, foodY);
140       animation(appleAni, foodX, foodY);
```

```
// game over
if (snakeX < 0 || snakeX > width || snakeY < 0 || snakeY > height) {
  if (!gameOver) {
    gameOver = true;
  }

  if (gameOver) {
    overTimer--;
    push();
    // stroke(palette[4]);
    // strokeWeight(3);
    fill(palette[3]);
    textSize(100);
    textStyle(BOLD);
    textAlign(CENTER, CENTER);
    text("DEAD", width / 2, height / 2 - 100);

    fill(palette[0]);
    textSize(80);
    textAlign(CENTER, CENTER);
    text("Final Score: " + score, width / 2, height / 2 + 50);
    pop();
```

Implementing this idea required integrating the MediaPipe Pose Landmark model with the p5.js framework. The position of the player's wrist in the video frame becomes the target position of the big snake on the screen.

With both hands visible, the right hand is chosen as the primary control object. The 'apples' are randomly generated in the game space, and the score increases with each reach of the big snake, mimicking the original's seduction of the forbidden fruit.

In order to make the snake's movements smooth and natural, we used linear interpolation. The game ends when the snake exceeds the game boundary. The animation of the big snake and the apple was realised using the p5play library, a powerful tool for creating interactive animations.

Reflection and Future Development

Starting this game is like navigating through an uncharted garden - a metaphorical Eden - and taking on the role of the serpent. It is a journey of curiosity that intertwines narrative elements with technological implementation. We enter this game with the serpent character set and instinctively pick the fruit. In our rendition, the snake becomes a symbol of human ambition, always striving towards a goal. The player's own body language will reflect this metaphor, subtly echoing the story in the game environment. The combination of physical movement and on-screen activity produced an immersive and intuitive gaming experience, but not without its challenges. As developers, we have experienced first-hand the "temptation" of the perfect game experience and the "fall from grace" when encountering real-world limitations such as webcam quality and lighting.

However, just as the story of Adam and Eve marked the beginning of human wisdom and knowledge, our project was a stepping stone towards a more interactive and immersive gaming environment. We learnt valuable lessons about combining machine

learning models with game logic and the importance of user experience design in interactive games.

My future goal is to introduce more complex gestures or body parts, similar to the sinuous path of a snake, to increase player engagement. We also plan to introduce multiplayer features to create a shared Garden of Eden in which players can interact and compete. Additional narrative styles can also be explored to incorporate different stories into our game environment. Either way, the ultimate goal is to create a gaming experience that is engaging, intuitive and filled with rich narrative context.

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