End to End Hand Gesture Controlled Game

Risk Analysis Report

Team Members

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Introduction

The purpose of this report is to conduct a comprehensive risk analysis for the development of a hand gesture controlled game. The project involves integrating a hand gesture recognition system with a gaming platform, using Pygame and a client-server architecture.

Project Overview

The hand gesture controlled game aims to provide an immersive and interactive gaming experience where players can control game actions using hand gestures detected by a camera. The technology stack includes Pygame for game development and a custom hand gesture recognition system utilizing MediaPipe Library of Google and computer Vision Techniques.

Risk Identification:

- **Technical Risks:**
  - Incompatibility between Pygame and the hand gesture recognition library.
  - Performance issues with real-time hand gesture recognition.
- **Schedule Risks:**
  - Delays in implementing complex hand gesture recognition algorithms.
  - Unforeseen technical challenges during integration.

- **Resource Risks:**
  - Dependence on external libraries with limited support.
- **External Risks:**
  - Changes in Pygame and MediaPipe updates.
  - Legal or regulatory issues related to data privacy and security.

Risk Assessment

We assessed each identified risk based on its likelihood of occurrence, impact on the project, and detectability. Risks were categorized into high, medium, and low priority based on their potential impact on project objectives

- **High Priority**
  - Technical Risk
  - Changes in New version of packages and libraries
- **Medium Risk**
  - Legal Challenges
  - Dependence on external libraries with limited support
  - Latency issues
- **Low Risk**
  - Unexpected issues

Risk Mitigation Strategies

- **Technical Risk:**
  - We faced the compatibility issues between MediaPipe and PyGame and resolved it by using Client Server Architecture. We made a game server which receives commands from a hand gesture recognition client.
  - Then we faced latency issues due to communication protocol and solved using UDP Protocol's low latency feature.
- **Schedule Risks:**
  - As we faced a problem in parallel running of both script by single click hence we used the multiprocessing library of python to run client and server parallel in the machine.
- **External Risk:**
  - We made a installation process of game console in which we specified the library versions to resolve the dependency issues using requirements.txt

Implementation Plan:

Responsibilities for implementing mitigation strategies were assigned to specific team members. Timelines were established for the implementation of mitigation measures, and regular checkpoints were scheduled to monitor progress.

Commits are added on Github using Git to keep track of versioning of software.

Game mechanics and PyGame related issues are solved by
Patel Rishi Chandrakant (B22CS071)

Communication Protocol and Hand Recognition issues are solved by
Akshat Jain (B22CS096)

Risk Monitoring and Control:

Checkpoint: Weekly risk review meetings to assess the effectiveness of mitigation measures and adjust strategies as needed.

Contingency Planning :

1. Technical Risk: Incompatibility between Pygame and the hand gesture recognition library.

Contingency Plan:

- **Description:** In the event that compatibility issues arise between Pygame and the hand gesture recognition library, we have developed a contingency plan to minimize disruption to the project timeline and deliverables.
- **Trigger:** Compatibility issues are detected during integration testing or development phases.
- **Response:**
    - Isolation and Analysis: Immediately isolate the components causing the compatibility issues and conduct a thorough analysis to understand the root cause.
    - Exploration of Alternatives: Explore alternative libraries or solutions for hand gesture recognition that are compatible with Pygame.

    - **Adaptation of Codebase:** If feasible, adapt the existing codebase to resolve compatibility issues, leveraging the expertise of the development team.
    - **Communication:** Maintain transparent communication with stakeholders, informing them of the situation and the steps being taken to address it.
    - **Reassessment of Schedule:** Assess the impact of the compatibility issues on project timelines and adjust the schedule accordingly, reallocating resources if necessary to mitigate delays.

2. **External Risk:** Changes in New Version of Packages and Libraries.

Contingency Plan:

- **Description:** Given the potential impact of changes in new versions of packages and libraries on project stability and functionality, a contingency plan has been developed to manage this risk effectively.
- **Trigger:** Notification of significant updates or changes to essential packages and libraries.
- **Response**:
    - Development of requirements.txt for packages version record
    - Compatibility Testing: Conduct comprehensive compatibility testing to ensure that the updated packages and libraries do not introduce any unexpected issues or conflicts with existing functionality.

- **Rollback Plan:** Develop a rollback plan that outlines steps for reverting to previous versions of packages and libraries if compatibility issues or adverse effects are encountered.
- **Documentation:** Document all changes made as part of the contingency plan, including any modifications to the codebase or dependencies, to maintain a clear record of actions taken.

By implementing these contingency plans, we aim to effectively manage high-impact risks that cannot be fully mitigated, ensuring continuity and resilience in the face of unforeseen challenges during the development of the hand gesture controlled game. Team members have been briefed on these contingency procedures and will execute them as necessary to minimize disruptions and maintain project momentum.

Conclusion

By conducting a thorough risk analysis and implementing appropriate mitigation measures, we aim to minimize the impact of potential risks on the hand gesture controlled game project. Ongoing risk management will be critical to ensuring the successful completion of the project within the defined scope, schedule, and budget.