Software Requirements Specification

for

Space Navigator

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1. Introduction

1.1 Purpose

This document specifies the software requirements for **Space Navigator**, a therapeutic 2D mobile game designed primarily for individuals with cerebral palsy. The game's objective is to enhance gross motor control, spatial awareness, and core stability through engaging, gamified exercises. By tilting their phone to navigate a spaceship and collect stars in patterns resembling physiotherapy exercises, users improve their hand-eye coordination and upper body motor skills.

While cerebral palsy patients are the primary focus, the product also benefits secondary user groups such as stroke survivors, Parkinson's disease patients, older adults, and therapists. This SRS outlines the features, functional requirements, and constraints of the product to ensure its successful development and deployment.

1.2 Document Conventions

This document follows specific conventions to ensure consistency and clarity:

- **Font Style and Size**:
    - Section headings are written in **bold, 14 pt**.
    - Body text is written in **regular, 12 pt**.
- **Requirement Priorities**:
    - Requirements are classified as **High**, **Medium**, or **Low** priority.
- **Terminology**:
    - **Primary users**: Cerebral palsy patients.
    - **Secondary users**: Stroke survivors, Parkinson's disease patients, older adults, therapists, and general users.
- **Abbreviations**:
    - **CP**: Cerebral Palsy.
    - **UI**: User Interface.
    - **SRS**: Software Requirements Specification

1.3 Intended Audience and Reading Suggestions

This SRS is intended for the following stakeholders:

- **Developers**: To understand the functional and nonfunctional requirements necessary for implementing the Space Navigator game, ensuring it aligns with the needs of cerebral palsy patients as the primary end users.
- **Project Managers**: To oversee development progress and ensure the product meets the specified requirements, especially focusing on the rehabilitation goals for users with motor impairments.
- **Therapists and Researchers**: To explore how the game can support therapy, specifically for cerebral palsy patients, and to assess its potential for use with other motor impairment conditions such as stroke and Parkinson's disease.
- **Testers**: To design and execute test cases ensuring that all requirements are met and the game functions properly for its primary users—cerebral palsy patients—while also supporting the secondary user groups.
- **Documentation Writers**: To create user manuals, guides, and documentation that cater to various user classes, with special emphasis on providing clear instructions for therapists and caregivers.

Reading Suggestions:

- Begin with **Section 1: Introduction** to get an overview of the project's purpose and primary goals for assisting cerebral palsy patients.
- For technical implementation details and system features, refer to **Section 3: System Features** and **Section 4: External Interface Requirements**.
- To understand the broader user base, operational context, and how the game can be tailored to different users (especially the primary user group—cerebral palsy patients), refer to **Section 2: Overall Description**.

1.4 Project Scope

The Space Navigator is a therapeutic 2D web-based game designed to improve hand-eye coordination, upper body motor skills, and stability. The primary objective is to assist cerebral palsy patients in their rehabilitation journey by gamifying physiotherapy exercises. The game features a spaceship that users navigate by tilting their phone, collecting stars arranged in patterns resembling therapeutic movements such as circular or zigzag motions.

While the primary focus is on cerebral palsy patients, the game also serves the following secondary user groups:

- **Stroke survivors**: To improve control and upper body strength.
- **Parkinson's disease patients**: To reduce tremors and enhance stability.
- **Older adults**: To maintain posture, coordination, and balance.

- **Therapists**: To monitor patient progress and adapt therapy plans.
- **General users**: To provide light motor exercises and relaxation.

The game integrates a "hold steady" mechanic that requires users to maintain stability during gameplay, adding an extra layer of therapeutic value. This project aligns with the goal of making rehabilitation exercises more engaging and effective for individuals with motor impairments, particularly **cerebral palsy patients**.

1.5 References

IEEE Std 830-1998, "IEEE Recommended Practice for Software Requirements Specifications

2. Overall Description

2.1 Product Perspective

The Space Navigator game is part of a broader therapeutic ecosystem designed to enhance motor rehabilitation for individuals with cerebral palsy. The game fits into the category of assistive technology by leveraging mobile gaming to support physical therapy exercises.

This product will be used by end users having cerebral palsy and will encourage habituation by providing fun and engaging ways to practice physiotherapeutic movements. It operates as a web-integrated application which uses the device's built-in motion sensors for tilt controls.

Key components of the product include:

- **User Interface (UI)**: A simple and accessible interface tailored for individuals with limited motor abilities, particularly those with cerebral palsy.
- **Game Mechanics**: The game employs tilt-based controls that simulate physiotherapy movements, focusing on improving motor skills such as hand-eye coordination, upper body strength, and stability.

The Space Navigator game is positioned as an accessible, therapeutic solution that can be used both independently by patients and with therapist guidance. It can be used as part of a regular therapy routine, with data tracking and feedback helping users see their progress over time.

2.2 Product Features

The Space Navigator game will offer a variety of features to support its therapeutic goals for cerebral palsy patients and other user groups. The following list outlines the key features:

- **Tilt-Based Control Mechanism**
  Users will control the spaceship by tilting their mobile device, mimicking real-world physiotherapy exercises such as circular, zigzag, or other motions. This feature is aimed at improving hand-eye coordination, upper body motor strength, and stability.

- **Therapeutic Exercise Patterns**
  The game includes pre-designed therapeutic patterns that simulate physiotherapy exercises. These movements are customizable based on the patient's therapeutic goals, with varying levels of difficulty.

- **Progress Tracking and Feedback**
  The game will track user progress, providing feedback after each session. This includes performance metrics such as the accuracy of movement, completion time.

- **Data Streaming via USB/Wi-Fi**
  To enhance the tracking accuracy of user movements, HyperIMU data will be streamed via USB or Wi-Fi. This will allow the game to gather precise information about the user's tilt and movements during the gameplay session.

- **Customizable Game Difficulty**
  The game allows end users to adjust the difficulty of the exercises to accommodate various user needs. Difficulty can be increased or decreased based on the user's progress and physical capabilities.

- **Engaging, Gamified Experience**
  Space Navigator incorporates game mechanics such as collecting stars and navigating through space, making the rehabilitation process fun, habitual and motivating for users. The game is designed to keep users engaged in their therapy while offering therapeutic benefits.

- **3D-Printed Mobile Holder Support**
  The game is compatible with a 3D-printed mobile holder that can stabilize the smartphone during gameplay. This holder will ensure that the user's hands remain free for the tilt-based controls.

2.3 User Classes and Characteristics

The Space Navigator game is designed for a wide range of users, with primary focus on individuals with cerebral palsy. Each user class has distinct characteristics that influence how they will interact with the game. Below are the primary and secondary user classes and their key characteristics:

- **Primary Users:**

Cerebral Palsy Patients

  - **Age Range**: Primarily children and young adults, but can include individuals of any age with cerebral palsy.
  - **Motor Abilities**: Varies widely from mild to severe motor impairments, affecting hand-eye coordination, muscle control, and posture.
  - **Technology Familiarity**: Basic to moderate familiarity with smartphones, but may require assistance with setup or interaction.
  - **Needs**: Require gamified rehabilitation exercises to enhance motor control, stability, and coordination. The game's tilt mechanism helps strengthen upper body and hand-eye coordination.

- **Secondary Users:**

Stroke Survivors

- **Age Range**: Adults of varying ages, typically older adults.
- **Motor Abilities**: Reduced mobility, particularly in one or more limbs. The game aids in regaining control over movement and improving strength and coordination.
- **Technology Familiarity**: Varies, but generally familiar with smartphones.
- **Needs**: Game serves as a rehabilitation tool to improve motor skills, balance, and hand-eye coordination.

Parkinson's Disease Patients

- **Age Range**: Typically, older adults.
- **Motor Abilities**: Characterized by tremors, stiffness, and slower movements, which the game can help address by providing controlled motor exercises.
- **Technology Familiarity**: Varies, with many being moderately familiar with smartphones.
- **Needs**: The game can assist in improving stability and reducing tremors through engaging exercises.

Older Adults

- **Age Range**: Generally, 65 and above.
- **Motor Abilities**: May experience age-related decline in motor control, balance, and coordination.
- **Technology Familiarity**: Varies from beginner to moderate, with some assistance needed for interaction.
- **Needs**: Provides light motor exercises and helps in maintaining coordination, posture, and balance.

Therapists

- **Age Range**: Adults (typically professionals in the healthcare or rehabilitation field).
- **Motor Abilities**: No impairments, but may need to customize the game's features for different patients.
- **Technology Familiarity**: High familiarity with both mobile technology and rehabilitation tools.
- **Needs**: Use the game data and exercises to provide more engaging physiotherapy exercises.

General Users

- **Age Range**: All ages.

- **Motor Abilities**: No significant impairments, but may still use the game for light motor exercises and relaxation.
- **Technology Familiarity**: Generally high familiarity with mobile technology.
- **Needs**: Engage with the game for casual use, relaxation, and light exercise.

2.4 Operating Environment

The Space Navigator game is a web-based mobile game that will be developed using the Godot engine. The operating environment includes the following components:

- **Hardware Requirements:**
  - **PC**: The game will be accessed via a web browser on a PC.
  - **Mobile Device**: A smartphone or tablet that will be placed inside a 3D printed ring control holder to allow for tilt-based game control. The device must have an accelerometer to detect tilt movements.
  - **3D Printed Ring**: A custom-designed holder that securely holds the mobile device in place to facilitate tilt control during gameplay.
  - **USB Cable/WiFi**: A USB cable or WiFi connection will be needed to stream HyperIMU data for real-time motion tracking.
- **Software Requirements:**
  - **Operating Systems**:
    - PC (Windows, macOS, or Linux)
    - Android (version 8.0 and above) or iOS (version 12 and above) for mobile devices
  - **Godot Engine**: The game will be developed using the Godot engine, which supports cross-platform development for both Android and iOS, and is compatible with PC browsers for gameplay.
  - **Web Browser**: The game will be accessible via a web browser on the PC. Supported browsers include:
    - Google Chrome
    - Mozilla Firefox
    - Safari
    - Microsoft Edge
    - Brave
    - Torch

- **Additional Software**:
    - HyperIMU (for motion tracking): The device must support streaming motion data through a USB or WiFi connection.

- **Network Requirements:**
    - A stable internet connection is required for streaming HyperIMU data and any potential cloud-based features (e.g., user data synchronization or progress tracking).
    - If WiFi is used for data streaming, the game should ensure low latency to maintain smooth gameplay.

2.5 Design and Implementation Constraints

The development of Space Navigator will be influenced by several design and implementation constraints that need to be addressed to ensure the game operates smoothly and meets the project objectives. These constraints include:

- **Platform Compatibility:**
    - The game will be developed using the **Godot engine**, which must be compatible with both mobile (Android and iOS) and PC browsers (Google Chrome, Mozilla Firefox, Safari, Microsoft Edge). The game must function consistently across these platforms without performance degradation.
- **Mobile Device Requirements:**
    - The mobile device used for controlling the game must have a **built-in accelerometer** to detect tilt movements. This restricts the game to devices with the required hardware capabilities.
    - The **mobile device must be placed in a custom-designed 3D printed ring holder**. This holder must provide a secure grip while allowing users to tilt the device freely without strain. The design must also accommodate different mobile phone sizes.
- **External Hardware Integration:**
    - The game must support the streaming of **HyperIMU data** (either via **USB cable or WiFi**) for real-time motion tracking. This requires low-latency communication between the mobile device and the PC to ensure smooth gameplay.
    - The game's reliance on **USB cables or WiFi** introduces potential constraints on network speed and stability. If using WiFi, the system must ensure low latency and minimal interference to maintain real-time tracking accuracy.
- **Web Browser Compatibility:**
    - The game must function on PC web browsers, which imposes limits on the use of certain mobile-specific features (such as native tilt controls). This requires creative solutions for translating mobile-based input (tilt motion) to a browser environment.

- **Performance Requirements:**
    - The game must run smoothly on both low-end and high-end devices, ensuring that performance does not degrade due to limitations in hardware capabilities. This includes optimizing asset sizes and game logic to reduce lag and maintain responsiveness during gameplay.
- **Network Connectivity:**
    - A stable internet connection is required for streaming data and synchronizing user progress. This introduces a dependency on the user's network environment, and the game must handle potential issues like high latency, low bandwidth, or interruptions gracefully.
- **Real-time Data Synchronization:**
    - Any real-time data transmission (such as progress tracking or game state updates) must be efficiently managed, ensuring minimal delays while maintaining gameplay fluidity.
- **User Accessibility:**
    - The game must be accessible to users with varying levels of motor ability, with customizability options for controls to accommodate different user needs. These options should be easy to configure for therapists working with cerebral palsy patients.

2.6 User Documentation

The user documentation for the Space Navigator game will provide clear instructions for end-users, therapists, and administrators on how to interact with the game, set up the hardware, and customize settings. The documentation will be divided into sections tailored to different user classes and their needs.

9.1 User Guide for End Users

- **Getting Started:**
    - Instructions for downloading and accessing the game on compatible devices.
    - Setup instructions for using the game on PC browsers while placing the mobile device inside the 3D printed ring holder.
    - How to start the game, including the tutorial mode for first-time users.
- **Game Controls:**
    - Detailed explanation of how to tilt the mobile device to control the spaceship.
    - Instructions for navigating through various levels and completing therapy exercises.
    - Visual guides for recognizing patterns that resemble physiotherapy movements.

- **Gameplay Modes:**
    - Information on different modes of the game, including the therapeutic mode for rehabilitation and the casual mode for general users.
    - How to switch between modes and adjust game difficulty based on the user's progress.
- **Progress Tracking:**
    - Instructions for viewing and interpreting progress reports generated by the game.
    - How therapists can track patient progress in the game and adjust therapy goals accordingly.

9.2 User Guide for Therapists

- **Setting Up for Patients:**
    - Instructions on setting up the game for a specific patient with cerebral palsy or other conditions (stroke, Parkinson's disease, etc.).
    - Customizing game settings to match the patient's therapeutic needs (e.g., difficulty, level design).
- **Monitoring and Adjusting Therapy:**
    - How to monitor patient performance during gameplay.
    - How to adjust the therapy settings and recommend exercises based on real-time data feedback from the game.
    - Tips on interpreting progress reports and making necessary adjustments to the patient's rehabilitation plan.

9.3 Troubleshooting

- **General Troubleshooting:**
    - Instructions for resolving common issues related to mobile device placement, tilt control, or gameplay glitches.
    - How to address connectivity issues when streaming HyperIMU data via USB cable or WiFi.
- **FAQ:**
    - A list of frequently asked questions, such as how to set up the game on multiple devices, how to troubleshoot latency issues, and how to contact technical support if needed.

9.4 Technical Support

- **Contact Information:**
    - Information for users seeking technical support, including email, phone numbers, or online support portals.
    - Hours of availability and response times for support requests.

2.7 Assumptions and Dependencies

2.7.1 Assumptions

The following assumptions have been made in the development of the Space Navigator game:

- **Mobile Device Compatibility:** The game assumes that users have access to a modern mobile device (smartphone) with accelerometer and gyroscope sensors that can be used for tilt control.
- **PC Browser Requirements:** The game will be run on PC browsers, and it is assumed that users have access to a compatible web browser (e.g., Chrome, Firefox, or Edge) with the necessary WebGL support to run the game.
- **Hardware Setup:** It is assumed that the end-user will have a 3D printed ring control holder for placing their mobile device. The ring holder will be designed to hold the device in a stable orientation for tilt-based gameplay.
- **Stable Internet Connection:** The game assumes that a stable internet connection is available for streaming HyperIMU data via USB or WiFi to synchronize the mobile device's motion data with the game.
- **User Experience Level:** It is assumed that end users, particularly those with cerebral palsy or other motor impairments, will need basic guidance and may require assistance to set up and interact with the game for the first time. A tutorial mode will be provided to ease the learning curve.
- **Therapist Involvement:** Therapists will have prior knowledge of rehabilitation techniques and will use the game primarily to monitor and adjust therapy plans for patients.

2.7.2 Dependencies

The following dependencies must be considered for the successful implementation and operation of the Space Navigator game:

- **Godot Engine:** The game is being developed using the Godot Engine, and the project is dependent on its availability, performance, and updates.
- **Web Browsers:** The game relies on the availability of compatible web browsers (Chrome, Firefox, Edge, etc.) that support WebGL for rendering the game and real-time interaction.

- **Mobile Device Sensors:** The game requires modern smartphones with accelerometers and gyroscopes for motion-based control. The game's performance will be dependent on the functionality of these sensors.
- **3D Printing of Ring Holder:** The game's design assumes that a 3D printed ring control holder will be available for users to place their mobile devices. The success of this feature is dependent on the timely availability of 3D printing capabilities and design files.
- **USB Cable/WiFi Streaming:** The game depends on the successful streaming of data from the mobile device to the PC, either through a USB cable or WiFi connection. This dependency requires appropriate drivers and configuration for data transmission.

3. System Features

This template illustrates organizing the functional requirements for the product by system features, the major services provided by the product. You may prefer to organize this section by use case, mode of operation, user class, object class, functional hierarchy, or combinations of these, whatever makes the most logical sense for your product.

3.1 System Feature 1

13. System Features

The Space Navigator game includes the following key features designed to provide an engaging and therapeutic experience for its users:

- **13.1 User Registration and Login**

Description:
The game requires users (primarily therapists and patients) to register and log in to track progress and tailor the game experience to individual needs. Users will authenticate through a secure login system, ensuring that sensitive data is protected.

Functional Requirements:

- **FR1.1:** The system shall allow users to create a new account using an email and password or via third-party authentication (e.g., Google).
- **FR1.2:** The system shall allow users to log in using their registered credentials or through third-party authentication.
- **FR1.3:** The system shall provide a "Forgot Password" feature for password recovery.

Priority: High

- **13.2 Game Setup and Calibration**

Description:
The game requires a one-time setup and calibration process where users place their mobile device into the 3D printed ring holder, which is then used for tilt-based controls during gameplay.

Functional Requirements:

- **FR2.1:** The system shall display instructions for setting up the mobile device within the ring holder.
- **FR2.2:** The system shall calibrate the mobile device's sensors (accelerometer and gyroscope) to align the game's controls with the user's physical orientation.
- **FR2.3:** The system shall provide an option for users to recalibrate the device at any time during gameplay.

Priority: High

- **13.3 Motion-Based Controls**

Description:
The core feature of the game is the motion-based control system. Users navigate a spaceship by tilting their mobile device in various directions, with tilt motions corresponding to in-game movement patterns that mimic physiotherapy exercises.

Functional Requirements:

- **FR3.1:** The system shall allow users to control the spaceship by tilting the mobile device in different directions.
- **FR3.2:** The system shall track the mobile device's orientation in real-time to translate tilt movements into spaceship controls.
- **FR3.3:** The system shall offer calibration options to ensure accurate motion tracking.
- **FR3.4:** The system shall include customizable movement patterns (e.g., circular, zigzag) for therapeutic exercises.

Priority: High

- **13.4 Progress Tracking and Reporting**

Description:
The game provides progress tracking to both users and therapists, enabling them to monitor improvements in motor skills and stability over time.

Functional Requirements:

- **FR4.1:** The system shall track the user's progress by recording the number of stars collected, time spent in the game, and successful completion of therapeutic exercises.

- **FR4.2:** The system shall generate reports that summarize the user's progress over time and can be shared with therapists.
- **FR4.3:** The system shall allow therapists to view detailed progress reports and make adjustments to therapy goals.

Priority: Medium

- **13.5 Therapeutic Mode and Customization**

Description:
The game provides a specialized therapeutic mode where therapists can customize exercises based on patient needs, focusing on specific motor skills and rehabilitation goals.

Functional Requirements:

- **FR5.1:** The system shall provide a "Therapeutic Mode" that customizes the game to focus on specific rehabilitation exercises.
- **FR5.2:** The system shall allow therapists to adjust the difficulty and complexity of exercises, such as altering motion patterns, speed, and duration.
- **FR5.3:** The system shall allow users to switch between therapeutic and casual game modes.

Priority: High

- **13.6 Data Synchronization**

Description:
The game relies on real-time data streaming from the mobile device's sensors to control the spaceship and track movement. Data must be synchronized via USB or WiFi for accurate gameplay.

Functional Requirements:

- **FR6.1:** The system shall allow the mobile device to stream sensor data (accelerometer and gyroscope) to the PC running the game.
- **FR6.2:** The system shall support both USB and WiFi connections for data synchronization.
- **FR6.3:** The system shall provide real-time feedback if data synchronization fails and offer troubleshooting options.

Priority: High

- **13.7 User Interface (UI)**

Description:
The game features an intuitive and accessible user interface (UI), designed to be simple for patients with motor impairments and easy for therapists to navigate.

Functional Requirements:

- **FR7.1:** The system shall display large buttons and readable text to improve accessibility for users with motor impairments.
- **FR7.2:** The system shall allow users to navigate the game interface using simple touch gestures.
- **FR7.3:** The system shall provide audio cues and visual feedback to assist users with low vision or hearing impairments.

Priority: Medium

- **13.8 Help and Support**

Description:
The game includes a help system that provides users with instructions, tutorials, and troubleshooting support.

Functional Requirements:

- **FR8.1:** The system shall provide a tutorial mode to guide new users through basic gameplay and setup steps.
- **FR8.2:** The system shall provide an in-game help section with FAQs and troubleshooting tips.
- **FR8.3:** The system shall include a contact support feature for users to reach out to technical support or therapists.

Priority: Medium

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4. External Interface Requirements

4.1 User Interfaces

- Engaging 2D space-themed game interface with accessible design
- Main game elements:
  - Player-controlled 2D spaceship with smooth movement
  - Colourful star constellations creating fun movement paths
  - Visual feedback for ship stabilization challenges
  - Score system and achievement displays
  - Clean, readable UI with high-contrast elements
- Customization features:
  - Controller sensitivity options
  - Difficulty settings affecting path width
  - Visual and sound effect intensity controls
  - Session length options for different play styles

4.2 Hardware Interfaces

- Ring Controller Accessory:
  - 3D printed ring with phone mount
  - Comfortable grip design for extended play sessions
  - Balanced weight distribution
  - Universal phone mount for different models
- Mobile Device Requirements:
  - Smartphone with motion sensors (accelerometer and gyroscope)
  - HyperIMU app for motion tracking
  - Secure mounting system
  - Screen orientation lock support

4.3 Software Interfaces

- Game Development:
  - Godot Engine implementation
  - Custom physics for responsive ship control
  - Integration with HyperIMU motion data
- HyperIMU Integration:
  - Motion data processing for smooth gameplay
  - Movement tracking for game mechanics
  - Session statistics recording
- Gameplay Systems:
  - Pattern recognition for constellation completion
  - Stability tracking for holding challenges
  - Achievement and progress tracking

4.4 Communications Interfaces

- Game Data Management:
  - Low-latency movement processing
  - Local storage for game progress
  - Optional data export for achievements and scores
- Player Statistics:
  - Session history
  - Achievement tracking
  - Personal best records

5. Other Nonfunctional Requirements

5.1 Performance Requirements

- Game Response:
  - Maximum 30ms input lag for responsive controls
  - 60 FPS minimum for smooth gameplay
  - Consistent performance across supported devices
- Gameplay Accuracy:
  - Precise movement tracking for engaging gameplay
  - Accurate stability detection for challenges
  - Reliable constellation completion detection

5.2 Safety Features

- Player Comfort:
  - Optional break reminders
  - Quick pause function
  - Space requirements warning
- Gameplay Balance:
  - Gradual difficulty progression
  - Adjustable challenge levels
  - Customizable movement sensitivity

5.3 Security Requirements

- Player Data Protection:
  - Secure storage of game progress
  - Privacy controls for sharing achievements
- Access Management:
  - Parent/guardian settings
  - Achievement sharing controls

5.4 Software Quality Attributes

- Accessibility:
  - Multiple difficulty levels
  - Intuitive controls
  - Clear feedback systems
- Reliability:
  - Stable gameplay experience
  - Accurate motion detection
  - Consistent performance
- Adaptability:
  - Progressive difficulty system
  - Customizable controls
  - Varied constellation patterns

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6. Other Requirements

- Game Design:
  - Regular playtesting feedback integration (optional)
  - Engaging reward systems
  - Clear progression paths
- Analytics:
  - Basic gameplay statistics
  - Achievement tracking

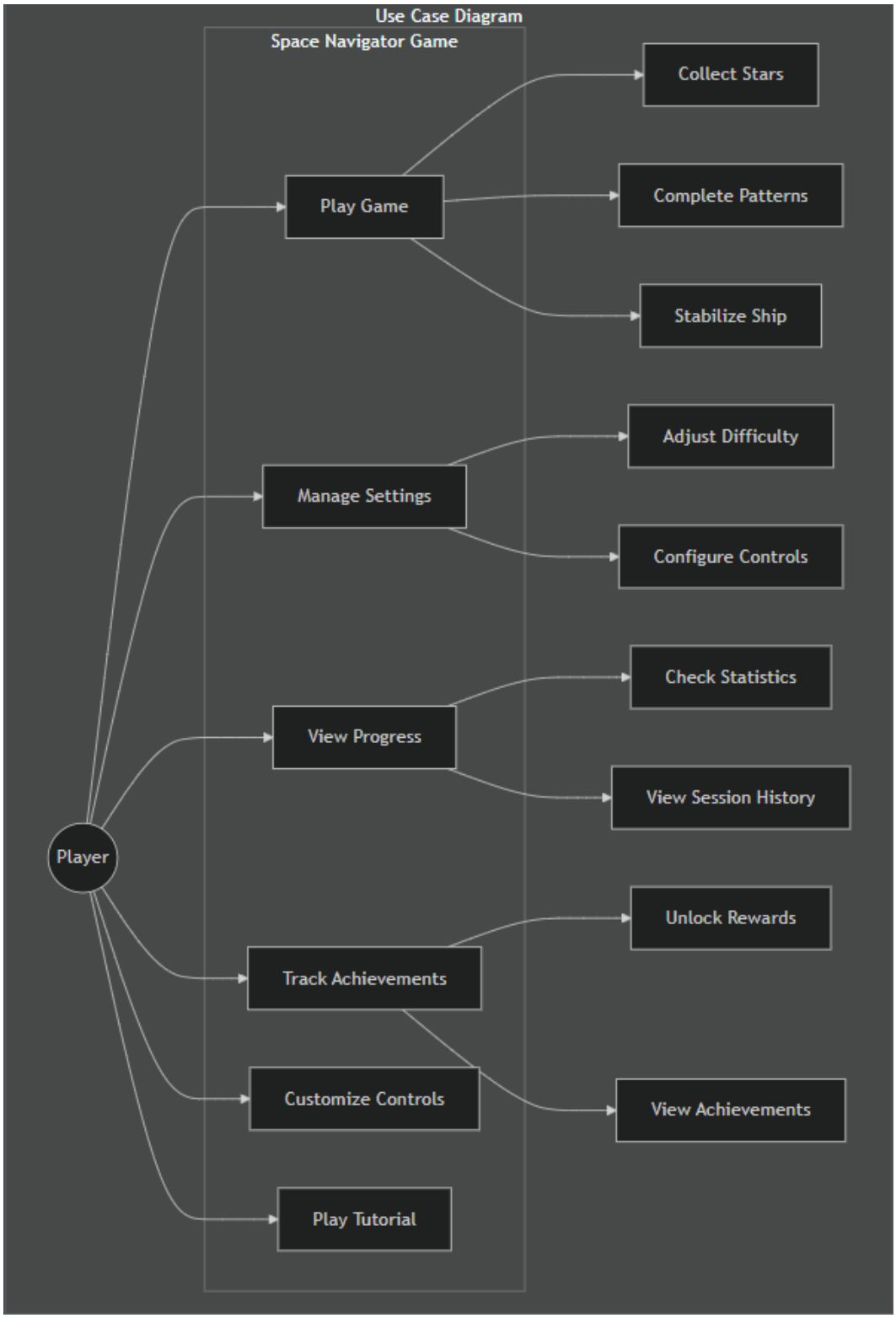
Appendix A: Glossary

- **Constellation Patterns**: Predefined arrangements of stars that create therapeutic movement paths for users to follow with their spaceship, designed to mimic physiotherapy exercises
- **Hold Steady Challenge**: A game feature requiring users to maintain their spaceship in a stable position for a specified duration, helping improve core stability and motor control
- **Movement Paths**: Star-based routes that guide users through therapeutic exercise patterns such as circular motions, figure-eight, or zigzag patterns
- **Ring Controller**: A custom 3D-printed accessory designed to securely hold the mobile device during gameplay while allowing for comfortable tilt control
- **HyperIMU**: An application used to stream motion sensor data from the mobile device to the game for accurate movement tracking
- **Tilt Control**: The primary input method where users control the spaceship by physically tilting their mobile device in different directions

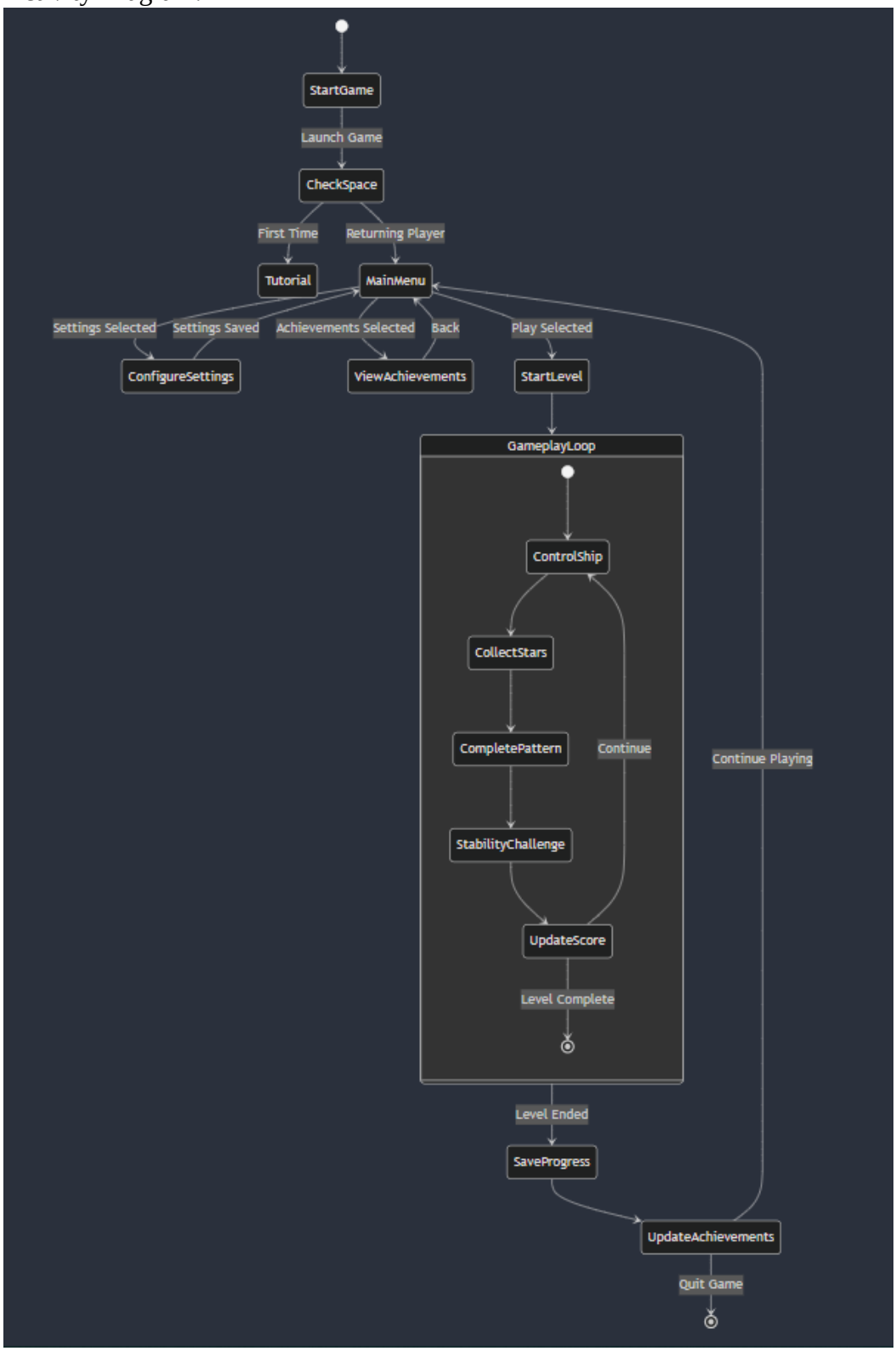
- **Motion Sensors**: Built-in mobile device hardware (accelerometer and gyroscope) used to detect and measure device orientation and movement
- **WebGL**: A web technology standard that enables the game to run in web browsers with 2D and 3D graphics
- **Motor Control**: The ability to regulate or direct the mechanisms essential to movement
- **Spatial Awareness**: The ability to understand and navigate the space around oneself, which the game helps improve through movement exercises
- **Core Stability**: The ability to maintain control of the trunk muscles during movement, which the game helps enhance through steady-state challenges
- **Hand-eye Coordination**: The ability to coordinate hand movements with visual input, which the game develops through spaceship navigation tasks
- **Calibration Mode**: A setup phase where the game adjusts to the user's initial device position and movement capabilities
- **Therapeutic Mode**: A specialized game mode with customizable settings for rehabilitation exercises and progress tracking
- **Progress Dashboard**: An interface showing user performance metrics, achievement progress, and therapy goals
- **Difficulty Scaling**: The automatic or manual adjustment of game challenge levels based on user performance and capabilities
- **Data Synchronization**: The process of transmitting motion data from the mobile device to the PC in real-time via USB or WiFi
- **Progress Tracking System**: The component that monitors and records user performance, movement accuracy, and therapy goal completion
- **User Profile**: A collection of individual user settings, progress data, and customized therapy parameters
- **Session Analytics**: Detailed data about individual gameplay sessions, including movement patterns, stability metrics, and exercise completion rates

Appendix B: Analysis Models

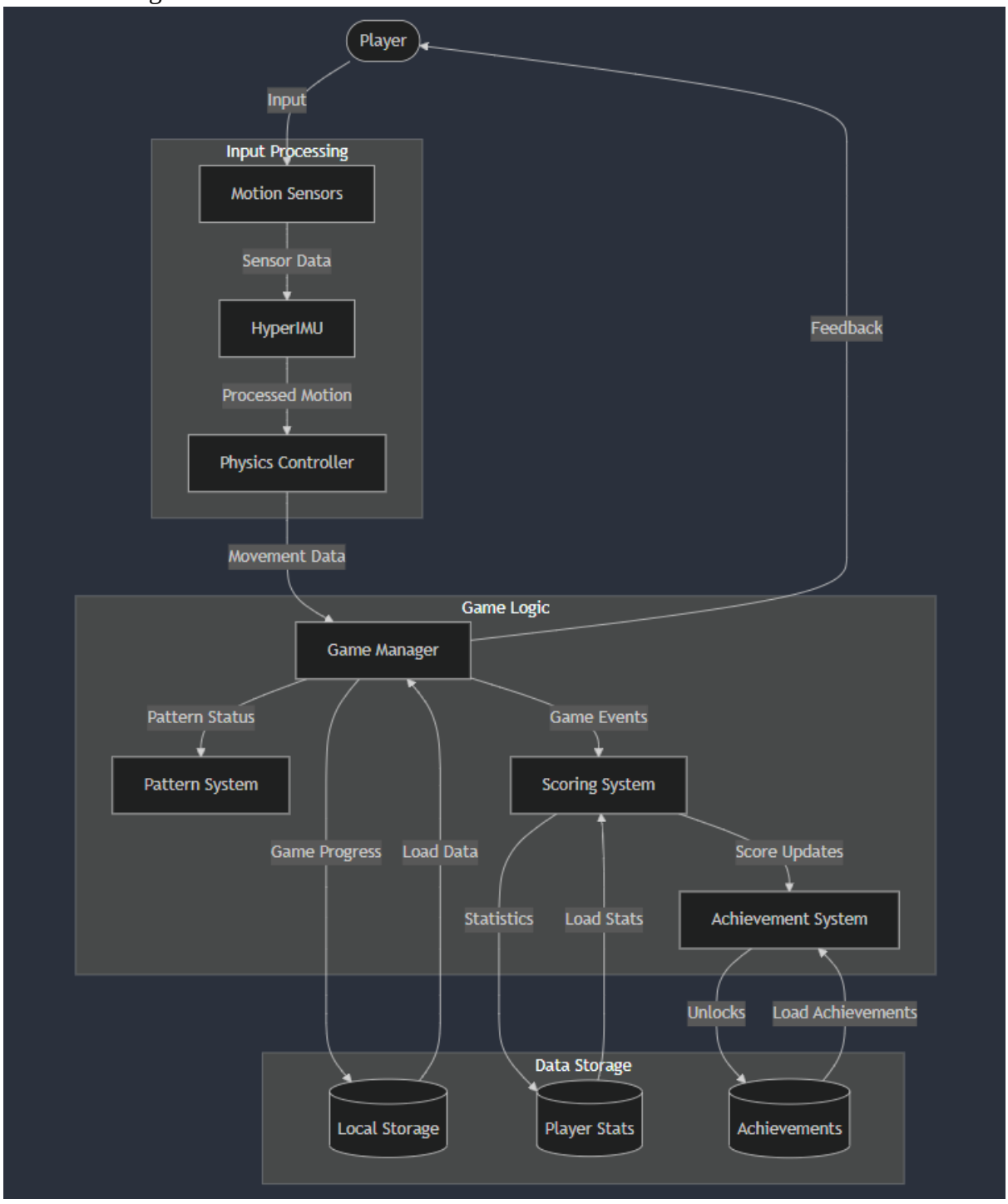
- Use Case Diagram:



- Activity Diagram:



- Data flow diagram:



Appendix C: Issues List

- Playtesting needed for constellation pattern design
- Ring controller comfort testing required
- Optimal sensitivity ranges for different skill levels
- Achievement system implementation
- Progress tracking metrics development
