AstroStreet AR

Software Requirements Specification (SRS)

Assignment 14

CS 3338 – Software Engineering Tools

California State University, Los Angeles

Group 2

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Date: December 8, 2025

Contents

1 Version Description

This section tracks the revision history of the *AstroStreet AR* Software Requirements Specification (SRS) for Group 2 in CS 3338 – Software Engineering Tools.

Version	Description	Date
1.0	Initial version of the Software Requirements Specification for *AstroStreet AR*, prepared for Assignment 14.	December 2, 2025
2.0	Expanded SRS with added assumptions and dependencies, user characteristics, refined hardware and software interface requirements, and additional legal/ethical and glossary entries for *AstroStreet AR*.	December 8, 2025

Future revisions of this document can be recorded by adding new rows to the table with updated version numbers, dates, and brief descriptions of the changes.

2 Introduction

2.1 Purpose

The purpose of this Software Requirements Specification (SRS) is to describe the functional and non-functional requirements of *AstroStreet AR*, a mobile augmented reality shooter game developed by Group 2 for CS 3338 – Software Engineering Tools at California State University, Los Angeles. This document defines what the system shall do from the user's and stakeholders' perspectives, and serves as a contract between the development team and the project stakeholders.

2.2 Scope

AstroStreet AR is a smartphone game in which players go outside, point their phone at the sky or surrounding environment, and see virtual asteroids and alien ships overlaid on the live camera view. The player rotates their body and phone to aim and taps the screen to shoot incoming targets. The system tracks score, player health or shields, and increasing difficulty as enemies appear over time.

The main goals of the system are to:

- Provide an accessible AR game experience that can be played outdoors using a standard smartphone.
- Offer simple, intuitive controls suitable for quick play sessions.
- Track and persist player high scores and basic settings.

This SRS covers the requirements for the initial single-player version of *AstroStreet AR*. Future enhancements, such as online multiplayer modes or cloud-based leaderboards, are considered out of scope for this document and may be addressed in later revisions.

2.3 Intended Audience

This document is intended for the following audiences:

- **Developers**: to understand the required behavior of the system and implement it accordingly.
- **Testers**: to design test cases that verify whether the implemented system satisfies the stated requirements.
- **Course Instructor and Teaching Staff**: to evaluate the completeness and correctness of the requirements as part of Assignment 14.
- **Future Maintainers**: to use as a reference when modifying or extending the system.

2.4 Document Overview

The remainder of this SRS is organized as follows:

- **Version Description** summarizes the revision history of this document.
- **External Interface Requirements** describes how users and external systems interact with *AstroStreet AR*, including user interface behavior and dependencies on hardware and software platforms.
- **Legal and Ethical Considerations** identifies safety, privacy, and ethical concerns related to using an AR game in outdoor environments and explains how the system addresses them.
- **Glossary** defines key terms and acronyms used throughout the SRS.

2.5 Assumptions and Dependencies

The requirements in this SRS are written under the following assumptions and dependencies:

- **A-1:** Players have access to a modern smartphone with a functioning rear-facing camera, motion sensors, and sufficient battery charge for short play sessions.
- **A-2:** The device supports a compatible augmented reality framework (such as ARCore or ARKit) through the chosen game engine.
- **A-3:** Players are familiar with common mobile game interactions, such as tapping buttons and navigating simple menus.
- **A-4:** The game will be distributed through a standard mobile app store (e.g., Google Play or Apple App Store), and thus must comply with the store's basic technical and content guidelines.
- **A-5:** The initial project scope targets single-player, offline gameplay; online features such as cloud leaderboards are considered future enhancements.

These assumptions help bound the problem space and clarify conditions under which the stated requirements are expected to hold.

2.6 User Characteristics

AstroStreet AR is designed for a broad audience of casual players rather than expert gamers.

- **UC-1:** Users may have varying levels of gaming experience, so the game should be understandable without requiring prior knowledge of first-person shooters or AR games.
- **UC-2:** Users may play in short sessions (e.g., a few minutes at a time), so the game should allow quick entry into gameplay and not require a lengthy tutorial.
- **UC-3:** Users may play in outdoor or semi-public spaces, so on-screen text and UI elements should be readable in typical lighting conditions and not rely on very small fonts.
- **UC-4:** Some users may have limited physical mobility or may prefer to rotate in place rather than walk around; the game should remain playable without requiring extensive walking.

3 External Interface Requirements

This section describes how users and external systems interact with *AstroStreet AR*. It specifies requirements for the user interface, hardware, software, and communication interfaces.

3.1 User Interface

3.1.1 Main Menu

- **UI-1:** The system shall display a main menu when the application is launched.
- **UI-2:** The main menu shall display the game title *AstroStreet AR* and the following buttons:
  - **Start Game**
  - **High Scores**
  - **Settings**
  - **Exit** (if supported by the platform)
- **UI-3:** When the user taps **Start Game**, the system shall start a new AR gameplay session.
- **UI-4:** When the user taps **High Scores**, the system shall display the high scores screen.
- **UI-5:** When the user taps **Settings**, the system shall display the settings screen.

3.1.2 AR Gameplay Screen

- **UI-6:** During gameplay, the system shall display the live camera feed as the background of the screen.
- **UI-7:** The system shall display a crosshair or reticle centered on the screen to indicate the aiming direction.
- **UI-8:** The system shall display the player's current score in a corner of the screen (e.g., upper-left).
- **UI-9:** The system shall display the player's current health or shield as a bar or similar indicator (e.g., in the upper-right).
- **UI-10:** If a time limit is used, the system shall display the remaining time during gameplay.
- **UI-11:** The system shall provide a pause button that the user can tap to open the pause menu.
- **UI-12:** When the user taps the screen within the AR gameplay view, the system shall treat this as a "shoot" action and fire a projectile in the current aiming direction.

3.1.3 Pause Menu

- **UI-13:** When the pause button is tapped, the system shall pause gameplay and display a pause menu overlay.
- **UI-14:** The pause menu shall provide options to:
  - **Resume** gameplay.
  - Open **Settings** (limited to in-game options).
  - **Quit to Main Menu**.

3.1.4 Game Over Screen

- **UI-15:** When the game session ends (e.g., the player's health reaches zero or a time limit expires), the system shall display a game over screen.
- **UI-16:** The game over screen shall display the player's final score.
- **UI-17:** If the final score is a new high score, the system shall indicate this to the user (e.g., with a message such as "New High Score!").
- **UI-18:** The game over screen shall provide options to **Play Again** and **Return to Main Menu**.

3.1.5 High Scores Screen

- **UI-19:** The system shall provide a high scores screen that displays a list of previously recorded scores.
- **UI-20:** The high scores screen shall show, at a minimum, the score value and the date each score was achieved.
- **UI-21:** The high scores screen shall provide a way for the user to return to the main menu.

3.1.6 Settings Screen

- **UI-22:** The system shall provide a settings screen accessible from both the main menu and the pause menu.
- **UI-23:** The settings screen shall allow the user to enable or disable sound effects.
- **UI-24:** The settings screen shall allow the user to adjust control sensitivity for aiming.
- **UI-25:** The system shall persist settings changes so that they are applied the next time the application is launched.

3.2 Hardware Interfaces

- **HW-1:** The system shall run on a smartphone device that includes a rear-facing camera.
- **HW-2:** The system shall require device motion sensors (such as a gyroscope and accelerometer) to track the orientation of the phone for AR gameplay.
- **HW-3:** The system shall require a touchscreen to receive tap input for shooting and UI navigation.
- **HW-4:** The system should be playable while the user is holding the device in portrait or landscape orientation (the chosen orientation may be fixed by design).
- **HW-5:** The device should have sufficient processing power and memory to run a basic AR application without severe frame rate drops during simple scenes (for example, at least a mid-range smartphone released within the last several years).
- **HW-6:** The camera should be capable of capturing color images at a resolution suitable for AR tracking under normal lighting conditions.

3.3 Software Interfaces

- **SW-1:** The system shall run on a supported mobile operating system, such as Android or iOS, that can host the chosen game engine (e.g., Unity).
- **SW-2:** The system shall use an augmented reality framework (for example, ARCore on Android or ARKit on iOS) to obtain camera images and device pose information.
- **SW-3:** The system shall use the mobile operating system's storage APIs or the game engine's persistence features to save and load high scores and settings.
- **SW-4:** If a game engine such as Unity is used, the system shall interact with engine components through their documented APIs.
- **SW-5:** The system shall request and obtain operating system permissions required for AR functionality (such as camera access and motion sensor access) before starting an AR gameplay session.
- **SW-6:** If the required AR framework or permissions are not available or are denied by the user, the system shall display an explanatory message and prevent AR gameplay from starting.

3.4 Communication Interfaces

For the initial version of *AstroStreet AR*, no network-based communication is strictly required.

- **COM-1:** The system shall be able to run entirely offline, without requiring a network connection for core gameplay.
- **COM-2:** If future versions introduce an online leaderboard or cloud storage, the system shall communicate with the remote service using secure HTTP-based APIs (e.g., HTTPS REST endpoints). Such features are considered out of scope for the current SRS but may be added in future revisions.

4 Legal and Ethical Considerations

This section identifies legal, safety, and ethical issues related to the use of *AstroStreet AR*, and states requirements to help mitigate these risks.

4.1 Physical Safety in Outdoor Environments

Because *AstroStreet AR* encourages players to move around outdoors while looking at their phone screen, there is a risk that players may become distracted and fail to notice real-world hazards such as vehicles, obstacles, or uneven ground.

- **SAFE-1:** The system shall display a safety warning before the start of gameplay, reminding users to stay aware of their surroundings and to avoid playing while crossing streets, driving, or operating vehicles.
- **SAFE-2:** The system shall allow the user to dismiss the safety warning only by acknowledging it (for example, by tapping an "I Understand" or similar button).
- **SAFE-3:** The system shall pause gameplay when the application loses focus or is minimized, so that the user is not encouraged to continue playing while switching apps or locking the device.

These measures are intended to reduce, but cannot eliminate, the risk of accidents while playing the game.

4.2 Privacy and Use of Device Sensors

AstroStreet AR accesses the device camera and motion sensors to provide an AR experience. In some implementations, it may also store limited gameplay data such as high scores.

- **PRIV-1:** The system shall request permission to use the device camera in accordance with mobile platform guidelines. Gameplay shall not begin until camera access is granted or the user exits the game.
- **PRIV-2:** The system shall use the camera feed only to render the AR gameplay experience and shall not transmit camera images or video frames to external servers in the initial version.
- **PRIV-3:** The system shall not collect personally identifiable information (such as full name, address, or precise location), beyond optional player initials or a nickname for high-score display.
- **PRIV-4:** Any data stored for high scores or settings shall be kept locally on the device in the initial version.

If future versions introduce online features (such as cloud-based leaderboards), additional privacy requirements and notices shall be defined in a later revision of this SRS.

4.3 Data Usage and Retention

The game stores a small amount of persistent data (high scores and settings) to improve the user experience.

- **DATA-1:** The system shall store only the minimum data necessary for its functionality, such as scores, dates, and simple configuration settings.
- **DATA-2:** The system shall not store sensitive data, such as passwords, payment information, or contact lists, as part of normal gameplay.
- **DATA-3:** The system shall allow stored high scores and settings to be deleted by uninstalling the application, which removes local data from the device.

4.4 Age-Appropriate Use

AstroStreet AR is intended as a casual arcade-style game with non-realistic depictions of asteroids, alien ships, and explosions.

- **AGE-1:** The system shall avoid realistic depictions of physical harm to real people or animals.
- **AGE-2:** The system shall be designed to be appropriate for a general audience and shall not include explicit language or graphic content.
- **AGE-3:** If the game is distributed through a mobile app store, the stated age rating shall be consistent with the content (for example, "Everyone" or an equivalent rating), subject to the store's guidelines.

4.5 Ethical Use of Augmented Reality

AR applications can influence how users perceive their surroundings and interact with public spaces.

- **ETH-1:** The system shall not encourage users to enter restricted, private, or dangerous areas in order to play the game.
- **ETH-2:** The system shall not place game objectives or incentives specifically in locations that could increase the risk of harm (such as the middle of streets or near moving vehicles).
- **ETH-3:** The system shall present AR content in a way that respects public spaces and does not promote harassment or nuisance behavior toward other people.

By addressing these legal and ethical considerations, the project aims to provide an enjoyable AR experience while minimizing potential safety, privacy, and ethical concerns for players and bystanders.

4.6 Accessibility and Inclusivity

To make *AstroStreet AR* accessible to a wider range of players, the system shall consider basic accessibility and inclusivity guidelines.

- **ACC-1:** The system shall avoid relying solely on color to convey critical gameplay information and shall ensure that key UI elements (such as health and score) have sufficient contrast against the camera background.
- **ACC-2:** The system shall avoid rapidly flashing visual effects that could pose a risk to users with photosensitive conditions.
- **ACC-3:** The system should provide an option to reduce or disable non-essential visual effects (such as particle bursts) in order to improve clarity on small screens.
- **ACC-4:** Text used in safety warnings and instructions shall be displayed in a readable font size appropriate for mobile devices.

5 Glossary

This section defines key terms and acronyms used throughout the *AstroStreet AR* Software Requirements Specification.

Term	Definition
AR (Augmented Reality)	A technology that overlays virtual objects onto a live view of the real world, typically using the device camera and motion sensors.
UI (User Interface)	The visual elements and controls that the player interacts with, such as buttons, menus, and icons.
HUD (Heads-Up Display)	On-screen information shown during gameplay, including score, health or shield, timer, and other status indicators.
Game Session	A single continuous playthrough that begins when the player starts a game and ends when the player loses, quits, or returns to the main menu.
High Score	A recorded score from a completed game session that is stored and displayed on the High Scores screen.
Persistent Data	Information that is saved to device storage so it remains available after the application is closed, such as high scores and settings.
Camera Feed	The live video stream captured by the device's camera and used as the background for the AR gameplay view.
Sensitivity (Control Sensitivity)	A configurable setting that controls how quickly the aiming reticle responds to device movement.
Safety Warning	A message shown to the user reminding them to stay aware of their surroundings and avoid dangerous behavior while playing the game.
Mobile Platform	The underlying operating system and environment on which the game runs, such as Android or iOS.
Pose	The position and orientation of the device in 3D space, as reported by the AR framework (e.g., where the phone is and which direction it is facing).
Anchor	A fixed reference point in the real world that the AR framework uses to place and maintain virtual objects at stable positions.
Frame Rate	The number of times per second the game updates and redraws the screen, typically measured in frames per second (FPS). Higher frame rates generally result in smoother motion.
Field of View (FOV)	The extent of the observable world that is visible through the camera and displayed on the screen at any given moment.
Accessibility	Design practices that make the game usable by people with a wide range of abilities, including considerations for vision, motion, and other differences.