Group 49 Asteroids

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Requirement Engineering

1.Functional Requirements

Must have

- The player shall be able to start a game by clicking the start button in the "start game" screen.
- The payer shall be able to start a new game from the "Home screen" page
- During the game, the player shall see on the top right corner of the screen the number of lives they have remaining. In the beginning, it's three.
- During the game, the player shall be able to see their score on the top left corner of the screen.

- After a game starts, the player shall see a spaceship sprite located at the centre of their screen.
- During the game, the player shall be able to move the spaceship to different directions
    1. The player shall be able to make the spaceship go to the direction it's pointing with the up arrow key
    2. The player shall be able to make the spaceship rotate clockwise with the right arrow key.
    3. The player shall be able to make the spaceship move counter-clockwise with the left arrow key.

- In the game, players shall see asteroid sprites moving across the screen.
- In the game, if the player drives the spaceship sprite outside the boundary of the screen, they should see the spaceship appearing from the other side of the screen (e.g. if the player drives the spaceship through the top right corner of the screen, the spaceship should appear from the bottom left corner).
- In the game, they shall observe that if they get hit an asteroid, they lose a life. After the player loses all three lives, the game should end, and the player should be directed to the "game over" screen.

- In the game, the player shall be able to shoot bullets. This shall be possible by pressing the space bar.

- After the player shoots bullets, if a bullet touches an asteroid, it breaks into smaller asteroids. Altogether, there are three sizes of asteroids and depending on the asteroid size, the player earns a specific amount of points.
- The player shall observe that regardless of the size of the asteroid, they always move with the same speed.
- The game shall calculate the score of the player
    1. If the player shoots the big asteroids, they shall earn 69 points
    2. If the player shoots the medium-sized asteroids, they shall earn 420 points
    3. If the player shoots small asteroids, they shall earn 9001 points.
- The player shall be able to see that after they shoot down an asteroid of the smallest size, the asteroid does not split further, rather it disappears.
- The game shall have an authentication system where the users can either register an account or login in. This option shall be visible in the welcome screen of the game.
- If a new user wishes to play the game, they shall be able to create a new account which will require them to input their name, preferred username (this shall be unique) and password. This option shall be available in the register page.
- If a user possesses an account, they shall be able to log in using their username and password.
- After each game, the score of the user shall be recorded in the database under their account.
- The game over screen shall show the top five scores after the end of each game.

Should have

- The user shall be able to head background music when the game is launched.
- The user shall be able to head gunfire sounds when shooting bullets.
- The user shall be able to hear collision sounds when the asteroids hit the spaceship
- The user shall be able to hear rumbling noise when bullets split the asteroids.
- The player shall be able to observe that regardless of which screen they are in the dimensions of the screen is 1280 pixels wide and 720 pixels high.

Could have

- The user should be able to pause the game
- The game shall have the option for the player to choose the type of spaceship sprite they want.
- The game shall have the option for the player to choose the background they want.
- The player shall have the option to change the resolution of the game screen
- The player shall be able to choose the appearance (skin) of the asteroids.
- The game shall have the option to advance to other levels.

Won't have

- The game shall have the option to create an account using their Google and Facebook accounts.
- The game shall have the option to share their score through Facebook, WhatsApp and Snapchat.
- The game shall have the option for the player to choose the number of lives they have at the beginning of the game.
- The player shall observe that whenever they are hit by their bullet, they lose a life.
- The player shall have the option to choose between different levels of difficulty of the game.

2.Non-Functional Requirements

- The whole project (the game logic, the database connection, authentication) shall be implemented in the Java programming language.
- The application shall be runnable in Linux, Windows (10 or higher) or Mac OS (10.14 or higher)
- The first, fully functioning prototype of the game shall be handed by the 6th of December, 2019.
- The final version of the game shall be handed on the 24th of January 2020.
- The game shall be tested extensively with a minimum of 70% or higher branch coverage.
- The game shall not have any cheat-codes.
- A SQL database shall be used to store data. Additionally, a JDBC driver will be used for the communication between the database and the software.
- For the database connection, the prepared statement shall be used to prevent SQL injection attacks.
- The password stored in the database shall be encrypted.

- The game shall display no data of one user to another except for their high-score (this is true if and only if a user's high score is among the top 5 high scores in the database. In that case, it will be presented to all the user at the end of every game).
- The authentication (after the user enters username and password) time and the loading time of the game (the time between the user pressing start and the game starting) shall be under 3 seconds to enhance user experience.

Modelling Use Cases

Use case 1
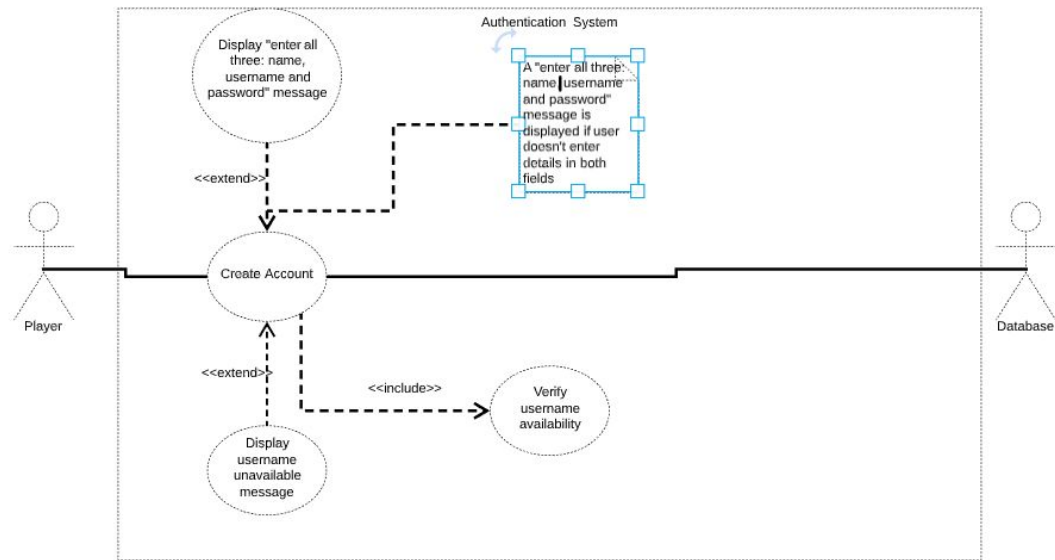
Use Case: player creating a new account

Author: Moshiur Rahman

Date: 27/11/2019

Purpose: An account is needed for the player to be able to store their score in the database

Overview: the user presses the create account button and puts in a valid username, password and name. This data is sent to the database and a new account is created.

(username unavailable) in the case of the user entering an unavailable username, they will be requested to enter a unique one.

(empty field) in the case of the user not entering all three: username, password and name, the user will be given an error message.

Cross-reference: user case 2.

Actors: Player and Database

Pre-conditions: the authentication system must be connected to the game and database

Post-conditions: no other user should be able to make an account with the same username.

The flow of events: the user enters an available username, and password and then an account gets created for them.

The alternative flow of events:

- the player might enter a username that is already used, then receive an error message and then might input an available username.
- the player might enter only the username or the password, then receive an error message and then enter both.

The exceptional flow of events: the authentication system and database might malfunction and allow multiple users to make accounts with the same username.

User case 2
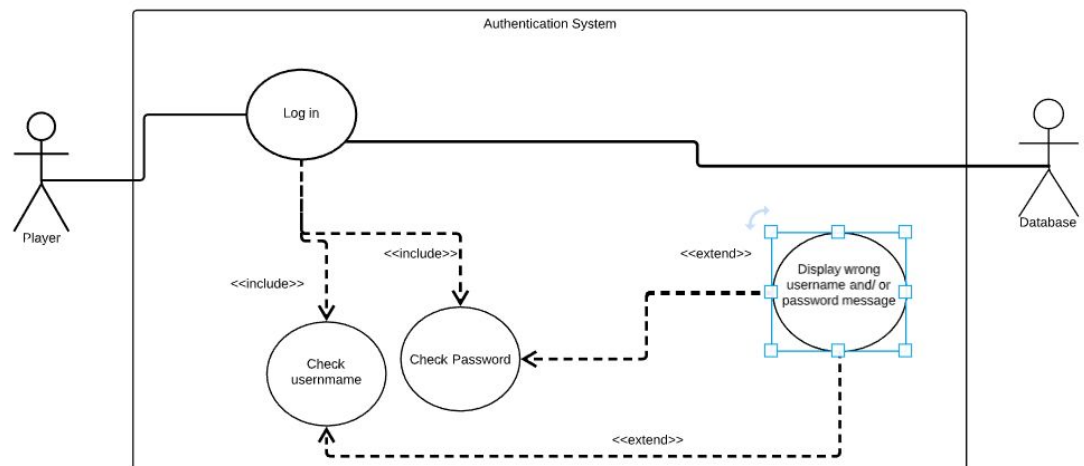
Use Case: User logging into their account

Author: Zohar Cochavi

Date: 27/11/2019

Purpose: logging in is necessary for the user to play the game and store the game score under their name

Overview: the user presses the login button and then enters a valid username and password. This data goes to the database and it is checked for validity. After that, the user is notified for logging in successfully.

(invalid username and/ or password) in the case of a user inputting a wrong username and/ or password, they are notified with an error message saying "wrong username and/ or password".

(user with no account) in the case where the user tries to enter credentials that are not registered in the database, the user will also be notified with a "wrong username and/ or password" message.

Cross-reference: user case 1

Actors: player and database

Pre-conditions:
- the user should have a registered account.
- the authentication system must be connected to the game and database

Post-conditions: since the user will play a new game, a new score will be stored under their account in the database.

The flow of Events: the user puts in a valid username and passwords and they are logged in.

The alternative flow of events: the user puts in an invalid username or password and the authentication system displays an error message.

The exceptional flow of events: despite putting the wrong password for a username, the user is authenticated successfully.

User case 3
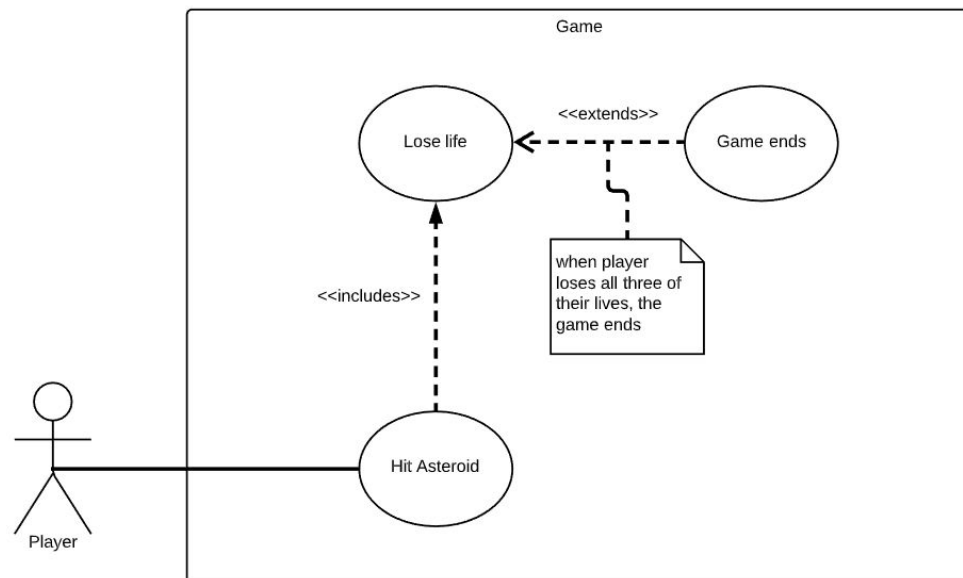
Use Case: user colliding with asteroids

Author: Moshiur Rahman

Date: 28/11/2019

Purpose: user colliding with to an asteroid.

Overview: during the game, if the user (the spaceship controlled by the player) gets hit with an asteroid, they lose a life.

(gets hit for the fourth time) if the user gets hit for the fourth time with an asteroid, the ends.

Cross-reference: user case 5 and 6

Actors: player

Pre-conditions:

- the user already has an account
- The user already logged in
- The user already started the game

Post-conditions: the user loses a life and if they have been hit more then three times the game is over.

The flow of Events: the user gets hit with an asteroid and loses a life.

The alternative flow of events: the user gets hit for the third time and the game ends.

The exceptional flow of events:

- the user is able to play even after losing all three lives
- The user gets hit with an asteroid but does not a life

User case 4
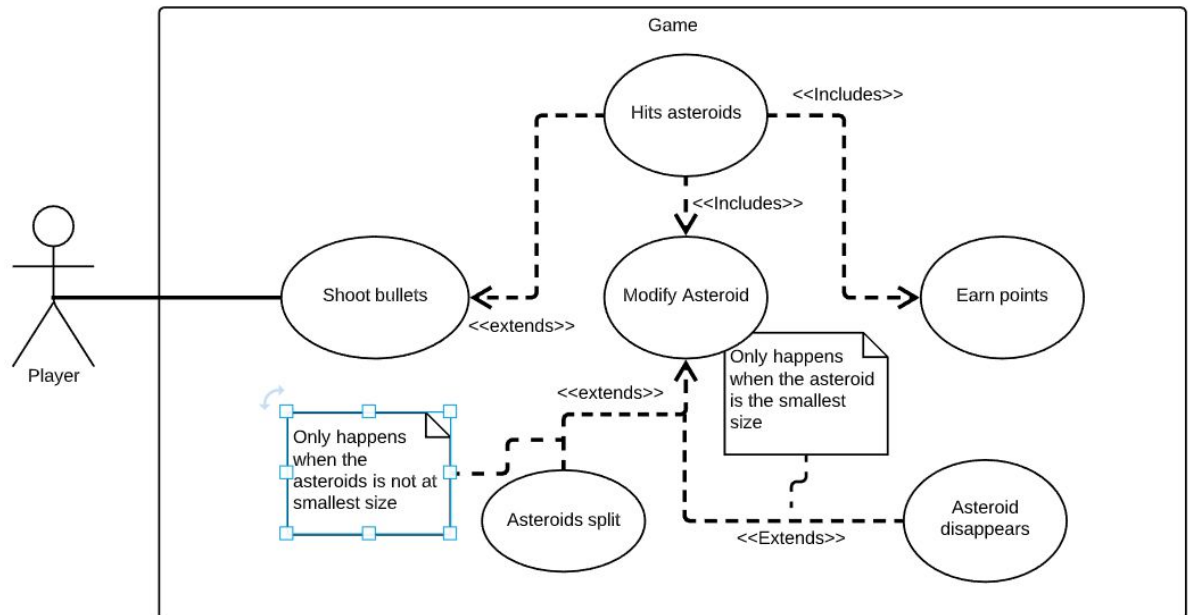
Use Case: shooting bullets

Author: Zohar Cochavi

Date: 29/11/2019

Purpose: the player can shoot asteroids to earn points

Overview: the player shoots the asteroids and then either hits or misses. If they hit, they earn points depending on the size of the asteroids. After the player hits the asteroids, it split in two and the children asteroids are of a smaller size (altogether there are three sizes, big, medium and small). After the player hits the smallest sized asteroids, the asteroids disappear.

Cross-reference: use case 5.

Actors: player

Pre-conditions:

- The user has an account
- The user has logged in
- The user has started the game

Post-conditions:

- The player has more points
- The asteroids disappear

- The asteroids have a smaller size

The flow of events: after the player shoots the bullets, and the bullets hit the asteroids, it either splits or disappears depending on its size. The player earns points depending on the size of the asteroids they hit.

The alternative flow of events: there is no alternative flow of events.

The exceptional flow of events:

- The player shoots the asteroids, but its size remains unchanged
- The player shoots the asteroids but does not earn points

User case 5
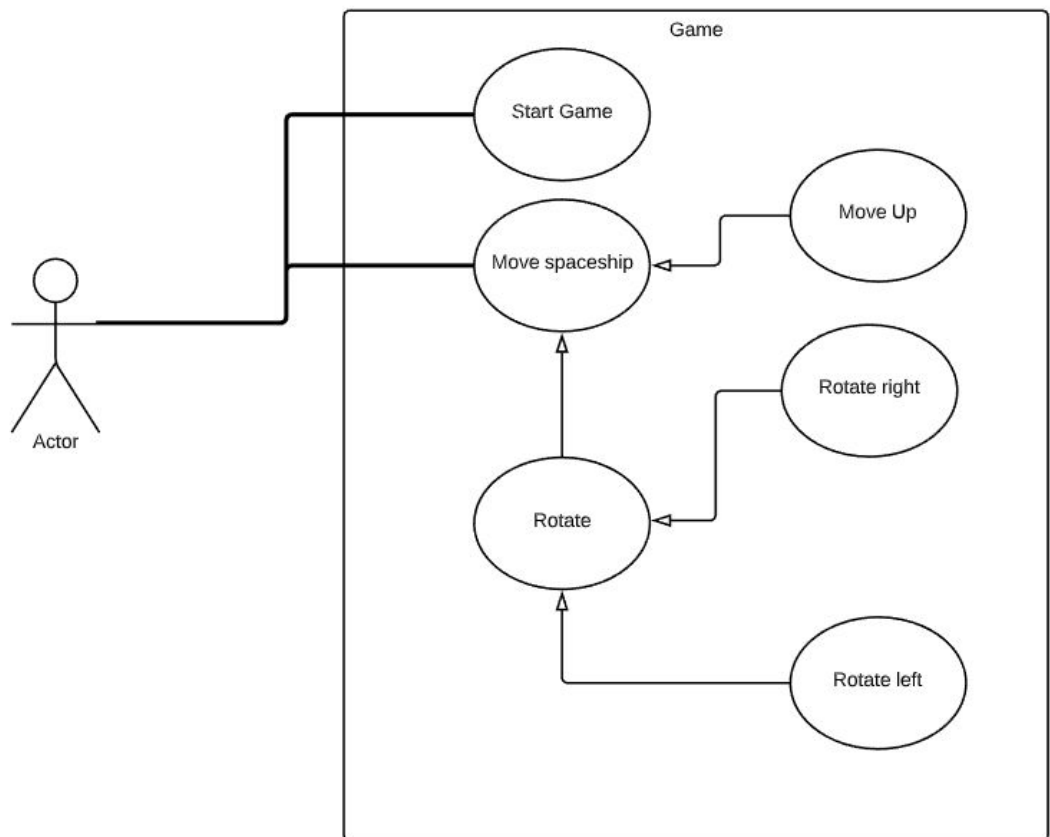
Use Case: starting a game and controlling sprite

Author: Moshiur Rahman

Date: 28/11/2019

Purpose:

Overview: After the player starts the game the player shall be able to see their spaceship sprite in the middle of the screen. The player can control the movement of the spaceship with the keyboard. The player can move to the direction at which the spaceship is pointing with the up key. They can move clockwise by pressing the right key and lastly, they can move counter-clockwise with the help of the left key.

Cross-reference: no cross-reference

Actors: player

Pre-conditions:

- The user has an account
- The user has logged in

Post-conditions:

- The spaceship sprite is not in the position that it was in at the beginning of the screen.

The flow of events: after the start of the game, the player shall be able to see their spaceship sprite in the middle of the screen. The player can control the movement of the spaceship with the keyboard.

The alternative flow of events: there is no alternative flow of the events.

The exceptional flow of events: the movement of the spaceship sprite does not correspond to the specific keys. For example, the spaceship turns clockwise after the user presses the up key.

User case 6
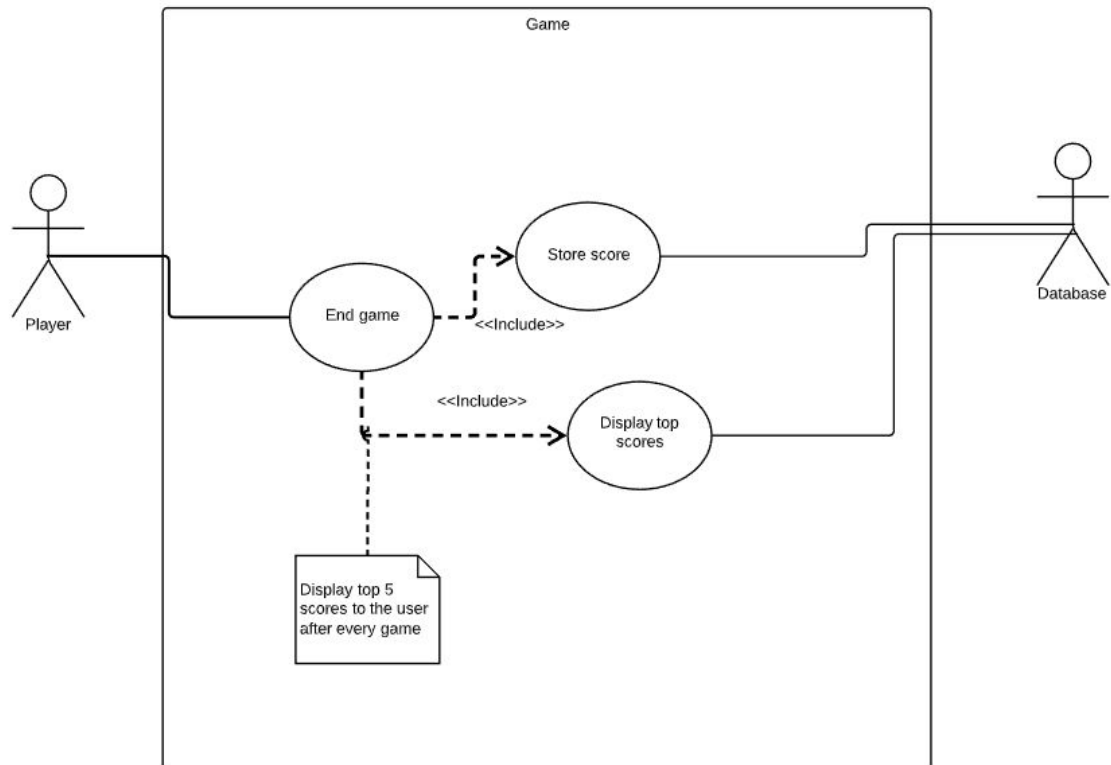
Use Case: ending game

Author: Moshiur Rahman

Date: 29/11/2019

Purpose: The game over screen

Overview: After the player loses all their lives, they are directed to the game over screen where they are shown their own score of the game and the top five scores of all time.

Cross-reference: use cases 1, 2, 3 and 5.

Actors: player and database

Pre-conditions:

- The user has an account
- The user logged in
- The user plays a game
- The game is connected to the database.
- The game has ended

Post-conditions: after the game, there is a new score registered under the user's name.

The flow of event: after the player has lost all their lives and the game has ended, their game score is registered in the database. Moreover, the top five scores of all the players are shown on the screen.

The alternative flow of events: there is no alternative flow of the event.

The exceptional flow of events:

- The wrong score of the player is displayed on the screen.
- Scores that are not the five highest is shown on the screen