SFWRENG 4GP6: Software Design IV
Capstone Computer Game Design Project
Verification and Validation

Roygbiv

Gameboys

Kareem Abdelmesih - 1407633
Victoria Graff - 1401451
Puru Jetly - 1417837
Viraj Patel - 1429286
Rehan Theiveehathasan - 1416031

9 March 2018

Contents

1   Definitions

- **Collect:** collide with, making the collected object disappear
- **Correct sphere:** sphere that is expected to be tagged next
- **Incorrect sphere:** sphere that is not expected to be tagged next
- **Player:** black player sphere
- **Tag:** collide with, making the tagged object bounce off in the opposite direction
- **Winning sphere:** Violet sphere when it is expected to be tagged next

2   Remarks

- Note that the colored non-player spheres are referenced according to their colors' name. For instance, the red sphere is named *Red*.
- In the context of unit tests, wherever missing implementation of code exists, the stated value of the actual output is denoted as N/A.
- All failed tests related to menu options/actions fail because Unity doesn't support the tools to test code that uses the unity engine anymore. This means that most user input is difficult to test with unit/system tests. Currently working on a fix. Current solution is to test all menu related items manually.
- System tests S23, S25, S28, S29 will fail when attempting to run all tests in Unity. If these tests are run individually they will pass.

3   Bonus

Please check the project Wiki

4 Unit Testing

ID: U-1	Change Y-Angle of Camera
Rqmts Tested	F-1
Initial State	Level 1, everything in default state
Input	Move mouse along y-axis (up or down)
Expected Output	Rotate camera view up or down in respect to mouse movement
Actual Output	N/A
Status	Pass

ID: U-2	Change X-Angle of Camera
Rqmts Tested	F-1
Initial State	Level 1, everything in default state
Input	Move mouse along x-axis (left or right)
Expected Output	Rotate camera view left or right in respect to mouse movement
Actual Output	N/A
Status	Pass

ID: U-3	Camera Angle Remains a Fixed Distance from Character
Rqmts Tested	F-1
Initial State	Level 1, everything in default state
Input	Function call to camera update
Expected Output	Camera remains a fixed distance from the character regardless of movement
Actual Output	Camera is at a fixed distance that never updates
Status	Pass

ID: U-4	Change position of character in X-direction
Rqmts Tested	F-2
Initial State	Level 1, everything in default state
Input	Input of "Horizontal Input" aka "A" and "D" key OR "Left Arrow" and "Right Arrow"
Expected Output	Position of character moves along X-axis 4 units
Actual Output	Position of character moved by 4 units
Status	Pass

ID: U-5	Change position of character in Z-direction
Rqmts Tested	F-2
Initial State	Level 1, everything in default state
Input	Input of "Vertical Input" aka "W" and "S" key OR "Up Arrow" and "Down Arrow"
Expected Output	Position of character moves along Z-axis 4 units
Actual Output	Position of character moved by 4 units
Status	Pass

ID: U-6	Detect Object Collision
Rqmts Tested	F-3
Initial State	Level 1, everything in default state
Input	Collision flag as input
Expected Output	Flag raised that detects Unit Collision
Actual Output	N/A
Status	Fails due to Unity Engine updating a few frames after test is ran.

ID: U-7	Update Map
Rqmts Tested	F-5
Initial State	Level 1, everything in default state
Input	Position change of object
Expected Output	Co-ordinates of object on the map change in response to change of position of objects.
Actual Output	There are no co-ordinates on the map to change, as the map is a top view camera of the character model.
Status	Pass

ID: U-8	Create new game
Rqmts Tested	F-7, F-8
Initial State	Everything Default
Input	Function call to start new game
Expected Output	Game State variables are that of Level 1
Actual Output	N/A
Status	Fail - refer to remarks pt 3

ID: U-9	Save Game
Rqmts Tested	F-9, F-10
Initial State	Level 1, everything in default state
Input	Function call to save game
Expected Output	Program saves state of the game to a file
Actual Output	N/A
Status	Fail - refer to remarks pt 3

ID: U-10	Load Game
Rqmts Tested	F-11, F-12
Initial State	Main Menu
Input	Previous save file of a game.
Expected Output	Game loads all variables of game that was saved
Actual Output	N/A
Status	Fail - refer to remarks pt 3

ID: U-11	System Pause
Rqmts Tested	F-13, F-14
Initial State	Level 1, everything in default state
Input	Function call for pause
Expected Output	Game stops play
Actual Output	Game is paused
Status	Pass

ID: U-12	System Un-Pause
Rqmts Tested	F-16, F-17
Initial State	Level 1, everything in default state
Input	Function call for pause
Expected Output	Game resumes play
Actual Output	Game is resumed
Status	Pass

ID: U-13	Change Game Settings
Rqmts Tested	F-18, F-20
Initial State	Game Settings Menu
Input	Change of variables related to game settings
Expected Output	Game behaves differently than before
Actual Output	N/A
Status	Fail - refer to remarks pt 3

ID: U-14	Save Game Setting
Rqmts Tested	F-21
Initial State	Game Settings Menu
Input	Function call for pause
Expected Output	Game stops play
Actual Output	N/A
Status	Fail - refer to remarks pt 3

ID: U-15	Player Can Jump (Y-Axis Movement)
Rqmts Tested	F-2
Initial State	Level 1, everything in default state
Input	Input of the "Jump" key
Expected Output	Character position moves in the Y-axis
Actual Output	Character moves in Y-axis
Status	Pass

ID: U-16	Change Camera View
Rqmts Tested	F-1
Initial State	Any level, prior to entering zones with different camera view
Input	Directional input that moves character into a zone with a different camera view
Expected Output	Camera view changes between third-person, and Side-view
Actual Output	N/A
Status	Fail, zones with different camera views were decided to be put on hold and are not implemented yet.

ID: U-17	System Returns Correct Interaction on Object Collision Interaction
Rqmts Tested	F-4, F-27
Initial State	Level 1, everything in default state
Input	Collision flag as input
Expected Output	ID tag of the object
Actual Output	ID tag of the object is compared
Status	Pass

ID: U-18	Display Map
Rqmts Tested	NF-1, F-6
Initial State	Level 1, everything in default state
Input	Input of "Map" key aka "M"
Expected Output	Draws map of current level with an indicator for the current position of the character
Actual Output	Status of Map in the scene is 'active'
Status	Pass

ID: U-19	Display Main Menu
Rqmts Tested	NF-1
Initial State	On game start, everything in menu state
Input	Function call for main menu
Expected Output	Main menu is drawn with all available options shown
Actual Output	N/A
Status	Fail - refer to remarks pt 3

ID: U-20	Display Pause Menu
Rqmts Tested	NF-1, F-15
Initial State	Game is in play
Input	Function call for pause menu
Expected Output	Game pauses, and draws the pause menu with all available options shown
Actual Output	Game menu active on the scene
Status	Pass

ID: U-21	NF-1, Display Respawn Menu
Rqmts Tested	F-24
Initial State	Game is in play
Input	On character death, function call for respawn menu
Expected Output	Respawn menu is drawn with all available options shown
Actual Output	Game ended
Status	Fail - refer to remarks pt 3

ID: U-22	NF-1, Display Options Menu
Rqmts Tested	F-19
Initial State	Main menu
Input	Select "Options" on main menu
Expected Output	Options menu is drawn with all available options shown
Actual Output	N/A
Status	Fail - refer to remarks pt 3

ID: U-23	NF-1, Display Level End Menu
Rqmts Tested	F-32
Initial State	Game is in play
Input	Function call for level end menu
Expected Output	Level End Menu is drawn with all available options shown
Actual Output	Game ended, and no menu is drawn
Status	Fail - refer to remarks pt 3

ID: U-24	Quit to Main Menu
Rqmts Tested	F-30
Initial State	Level 1, everything in default state, in pause menu
Input	Function call for main menu
Expected Output	Exit level, and then draw main menu with all available options
Actual Output	N/A
Status	Fail - refer to remarks pt 3

ID: U-25	Erase Level Progress
Rqmts Tested	F-30
Initial State	Level 1, everything in default state, in pause menu
Input	On "Quit to Main Menu" selection, function call to checkpoint reset
Expected Output	Current progress of the level is lost
Actual Output	N/A
Status	Fail - refer to remarks pt 3

ID: U-26	Character Respawn on Death
Rqmts Tested	F-22
Initial State	Level 1, character death
Input	Function call to respawn
Expected Output	On death, character spawns at level start co-ordinates
Actual Output	Character given option to respawn.
Status	Pass

ID: U-27	Respawn Loads from Checkpoint
Rqmts Tested	F-23
Initial State	Level 1, character death
Input	Function call to respawn
Expected Output	On death, character spawns at checkpoint co-ordinates
Actual Output	Program exits game
Status	Fail - refer to remarks pt 3

ID: U-28	Checkpoint Updates on Reaching Next Checkpoint
Rqmts Tested	F-23
Initial State	Level 1, everything in default state
Input	Function call for checkpoint update
Expected Output	Checkpoint co-ordinates update to latest checkpoint co-ordinate
Actual Output	N/A
Status	Fail - refer to remarks pt 3

ID: U-29	Restart Level
Rqmts Tested	F-25
Initial State	Pause menu
Input	Function call for reset level
Expected Output	Level resets back to default state
Actual Output	N/A
Status	Fail - refer to remarks pt 3

ID: U-30	Exit Game
Rqmts Tested	F-31
Initial State	Main menu
Input	Function call for exit code
Expected Output	Program exits game
Actual Output	N/A
Status	Fail - refer to remarks pt 3

ID: U-31	Display Level Select Manager
Rqmts Tested	NF-1, F-29
Initial State	Main menu
Input	Function call for level select manager
Expected Output	Level select manager is drawn, with all available options shown
Actual Output	N/A
Status	Fail - refer to remarks pt 3

ID: U-32	Display Only Completed Levels for Selection
Rqmts Tested	F-28
Initial State	Level select manager
Input	Function call for display unlocked levels
Expected Output	Only available levels are drawn and shown
Actual Output	N/A
Status	Fail - refer to remarks pt 3

ID: U-33	Level Select Loads Correct Level ID
Rqmts Tested	F-28
Initial State	Level select manager
Input	Function call for load level
Expected Output	Selected level is loaded into the game
Actual Output	N/A
Status	Fail - refer to remarks pt 3

ID: U-34	Auto-save on Level Completion
Rqmts Tested	F-32
Initial State	Level 1, on level completion
Input	Function call to save game
Expected Output	Current progress is saved
Actual Output	Program exited game
Status	Fail - refer to remarks pt 3

ID: U-35	Next Level
Rqmts Tested	NF-1, F-32
Initial State	Level end menu
Input	Function call for load next level
Expected Output	Next level is loaded
Actual Output	N/A
Status	Fail - refer to remarks pt 3

ID: U-36	Retry
Rqmts Tested	NF-1, F-32, F-24
Initial State	Respawn menu
Input	Function call for reset level
Expected Output	Level is reset
Actual Output	N/A
Status	Fail - refer to remarks pt 3

ID: U-37	Highlight Menu Option
Rqmts Tested	NF-1
Initial State	Main menu
Input	Function call for option highlights
Expected Output	Currently selected option is highlighted on screen
Actual Output	N/A
Status	Fail - refer to remarks pt 3

5 System Testing

ID: S-1	Move north (stationary)
Rqmts Tested	F-2, F-43, NF-9
Initial State	The player is stationary in game mode
Input	Simulated press and hold on the up arrow key until the player shifts one unit
Expected Output	The player moves north immediately
Actual Output	The player moved north immediately
Status	Pass

ID: S-2	Move north (in motion)
Rqmts Tested	F-2, F-43, NF-9
Initial State	The player is moving south in game mode
Input	Simulated press and hold on the up arrow key until the player shifts one unit
Expected Output	The player moves north immediately
Actual Output	The player moved north immediately
Status	Pass

ID: S-3	Move east (stationary)
Rqmts Tested	F-2, F-43, NF-9
Initial State	The player is stationary in game mode
Input	Simulated press and hold on the right arrow key until the player shifts one unit
Expected Output	The player moves east immediately
Actual Output	The player moved east immediately
Status	Pass

ID: S-4	Move east (in motion)
Rqmts Tested	F-2, F-43, NF-9
Initial State	The player is moving west in game mode
Input	Simulated press and hold on the right arrow key until the player shifts one unit
Expected Output	The player moves east immediately
Actual Output	The player moved east immediately
Status	Pass

ID: S-5	Move south (stationary)
Rqmts Tested	F-2, F-43, NF-9
Initial State	The player is stationary in game mode
Input	Simulated press and hold on the down arrow key until the player shifts one unit
Expected Output	The player moves south immediately
Actual Output	The player moved south immediately
Status	Pass

ID: S-6	Move south (in motion)
Rqmts Tested	F-2, F-43, NF-9
Initial State	The player is moving north in game mode
Input	Simulated press and hold on the down arrow key until the player shifts one unit
Expected Output	The player moves south immediately
Actual Output	The player moved south immediately
Status	Pass

ID: S-7	Move west (stationary)
Rqmts Tested	F-2, F-43, NF-9
Initial State	The player is stationary in game mode
Input	Simulated press and hold on the left arrow key until the player shifts one unit
Expected Output	The player moves west immediately
Actual Output	The player moved west immediately
Status	Pass

ID: S-8	Move west (in motion)
Rqmts Tested	F-2, F-43, NF-9
Initial State	The player is moving east in game mode
Input	Simulated press and hold on the left arrow key until the player shifts one unit
Expected Output	The player moves west immediately
Actual Output	The player moved west immediately
Status	Pass

ID: S-9	Pause game
Rqmts Tested	F-13, F-14, F-15, F-18
Initial State	Game is not paused in game mode
Input	Simulated press on the P key
Expected Output	Game pauses and the pause menu appears
Actual Output	Game paused and the pause menu appeared
Status	Pass

ID: S-10	Resume game
Rqmts Tested	F-16, F-17
Initial State	Game is paused in game mode
Input	Simulated press on the P key
Expected Output	Game resumes and the pause menu disappears
Actual Output	Game resumed and the pause menu disappeared
Status	Pass

ID: S-11	Tag a correct sphere (Red)
Rqmts Tested	F-3, F-4, F-45, NF-5, NF-7, NF-8
Initial State	The player is expected to tag Red in game mode
Input	Simulated press and hold on the up arrow key until collision with Red
Expected Output	The player tags Red
Actual Output	The player tagged Red
Status	Pass

ID: S-12	Tag an incorrect sphere (Orange) and lose the game
Rqmts Tested	F-3, F-4, F-22, F-23, NF-5, NF-7, NF-8
Initial State	The player is not expected to tag Orange in game mode
Input	Simulated press and hold on the up arrow key until collision with Orange
Expected Output	The player tags Orange, the player is presented with the losing menu
Actual Output	The player tagged Orange, the player was presented with the losing menu
Status	Pass

ID: S-13	Tag the winning sphere (Violet) and win the game
Rqmts Tested	F-3, F-4, F-32, F-35, F-45, NF-5, NF-7, NF-8
Initial State	The player is expected to tag Violet in game mode
Input	Simulated press and hold on the up arrow key until collision with Violet
Expected Output	The player tags Violet and the level completion menu appears
Actual Output	The player tagged Violet and the level completion menu appeared
Status	Pass

ID: S-15	Collect shield power-up
Rqmts Tested	F-3, F-4, F-27, F-42, NF-7, NF-8
Initial State	The player is in game mode
Input	Simulated press and hold on the up arrow key until collision with the shield power-up
Expected Output	The player collects the shield power-up and the shield is activated by increasing health to 2
Actual Output	The player collected the shield power-up and the shield was activated by increasing health to 2
Status	Pass

ID: S-16	Collide with level boundaries (attempt to escape boundaries)
Rqmts Tested	F-3, F-4, F-44
Initial State	The player is in game mode
Input	Simulated press and hold on the up arrow key until collision with level boundaries
Expected Output	The player collides with the level boundaries and stays inside
Actual Output	The player collided with the level boundaries and stayed inside
Status	Pass

ID: S-17	Jump (on ground)
Rqmts Tested	F-43, NF-1
Initial State	The player is on the ground in game mode
Input	Simulated press on the space bar
Expected Output	The player jumps
Actual Output	The player jumped
Status	Pass

ID: S-18	Jump (in air)
Rqmts Tested	F-43, NF-1
Initial State	The player is in the air in game mode
Input	Simulated press on the space bar
Expected Output	The player does not jump (again)
Actual Output	The player did not jump (again)
Status	Pass

ID: S-19	Start level 1
Rqmts Tested	F-7, F-8, NF-11
Initial State	No level is loaded
Input	Simulated press to start new game
Expected Output	Level 1 loads and is ready to play
Actual Output	Level 1 loaded and was ready to play
Status	Pass

ID: S-20	Floor supports stationary player
Rqmts Tested	F-2
Initial State	Player is on ground in game mode
Input	No input
Expected Output	Player does not fall through ground
Actual Output	Player did not fall through ground
Status	Pass

ID: S-21	Floor supports player in free fall
Rqmts Tested	F-2, NF-9
Initial State	Player is in the air in game mode
Input	No input
Expected Output	Player does not fall through ground
Actual Output	Player did not fall through ground
Status	Pass

ID: S-22	Camera orbit left (stationary)
Rqmts Tested	F-1, NF-10
Initial State	The player is stationary in game mode
Input	Simulated move on the mouse until the camera rotates by positive 60 degrees in y-axis
Expected Output	The camera orbits the player by positive 60 degrees in y-axis
Actual Output	The camera orbits player by positive 60 degrees in y-axis
Status	Pass

ID: S-23	Player turns left due to camera
Rqmts Tested	F-1, F-2, NF-9, NF-10
Initial State	The player is stationary
Input	Simulated move on the mouse until the camera rotates by negative 60 degrees in y-axis, Simulated press and hold on up arrow until player shifts up by one unit
Expected Output	The camera orbits the player to negative 60 degrees in y-axis. The player turns 60 degrees to their left and goes forward by one unit.
Actual Output	The player moved 1 unit left due to direction of the camera.
Status	Pass

ID: S-24	Camera orbit right (stationary)
Rqmts Tested	F-1, NF-10
Initial State	The player is stationary in game mode
Input	Simulated move on the mouse until the camera rotates by negative 60 degrees in y-axis
Expected Output	The camera orbits the player to negative 60 degrees in y-axis
Actual Output	The camera orbits player by negative 60 degrees in y-axis
Status	Pass

ID: S-25	Player turns right due to camera
Rqmts Tested	F-1, F-2, NF-9, NF-10
Initial State	The player is stationary
Input	Simulated move on the mouse until the camera rotates by positive 60 degrees in y-axis, Simulated press and hold on up arrow until player shifts up by one unit
Expected Output	The camera orbits the player to positive 60 degrees in y-axis. The player turns 60 degrees to their right and goes forward by one unit.
Actual Output	The player moved 1 unit right due to direction of the camera.
Status	Pass

ID: S-26	Camera orbit up (stationary)
Rqmts Tested	F-1, NF-10
Input	Simulated move on the mouse until the camera rotates by positive 80 degrees in x-axis
Expected Output	The camera orbits the player by positive 80 degrees in x-axis
Actual Output	The camera orbits player by positive 80 degrees in x-axis
Status	Pass

ID: S-27	Camera orbit up (in motion)
Rqmts Tested	F-1, F-2, NF-9, NF-10
Initial State	The player is stationary
Input	Simulated move on the mouse until the camera rotates by positive 80 degrees in x-axis, Simulated press and hold on up arrow until player shifts up by one unit
Expected Output	The camera orbits the player to positive 80 degrees in x-axis. The player goes forward by one unit.
Actual Output	The player moved 1 unit forward and camera orbited above player.
Status	Pass

ID: S-28	Camera orbit down (stationary)
Rqmts Tested	F-1, NF-10
Initial State	The player is stationary in game mode
Input	Simulated move on the mouse until the camera rotates by negative 40 degrees in x-axis
Expected Output	The camera orbits the player by negative 40 degrees in x-axis
Actual Output	The camera orbits player by negative 40 degrees in x-axis
Status	Pass

ID: S-29	Camera orbit down (in motion)
Rqmts Tested	F-1, F-2, NF-9, NF-10
Initial State	The player is stationary
Input	Simulated move on the mouse until the camera rotates by negative 40 degrees in x-axis, Simulated press and hold on up arrow until player shifts up by one unit
Expected Output	The camera orbits the player to negative 40 degrees in x-axis. The player goes forward by one unit.
Actual Output	The player moved 1 unit forward and camera orbited below player.
Status	Pass

ID: S-30	Camera does not go through floor(stationary)
Rqmts Tested	F-1, NF-10
Initial State	The player is stationary in game mode
Input	Simulated move on the mouse until the camera rotates by negative 60 degrees in x-axis
Expected Output	The camera orbits the player by negative 40 degrees in x-axis as camera rotation is clamped to not go past negative 40 degrees
Actual Output	The camera orbits player by negative 40 degrees in x-axis
Status	Pass

ID: S-31	Camera does not go through floor (in motion)
Rqmts Tested	F-1, F-2, NF-9, NF-10
Initial State	The player is stationary
Input	Simulated move on the mouse until the camera rotates by negative 60 degrees in x-axis, Simulated press and hold on up arrow until player shifts up by one unit
Expected Output	The camera orbits the player to negative 40 degrees in x-axis as there is a clamp placed on camera to not go past -40 degrees in x-axis. The player goes forward by one unit.
Actual Output	The player moved 1 unit forward and camera orbited below player.
Status	Pass

ID: S-32	User alters game settings
Rqmts Tested	F-19 F-20 F-37 F-38 F-39 F-40 F-41 NF-6
Initial State	The user is in the game settings menu
Input	Simulated clicks on setting options
Expected Output	The system updates the users requests
Actual Output	N/A
Status	Fail - Settings implementation not yet complete.

ID: S-33	Player can return to main menu
Rqmts Tested	F-30 F-31 F-34
Initial State	The user is in the pause menu
Input	Simulated click on 'Main Menu' button
Expected Output	The user is returned to the main menu
Actual Output	The user is returned to the main menu
Status	Fail - refer to remarks pt 3
ID: S-34	Player can start level over
Rqmts Tested	
Initial State	The user is in the pause menu
Input	Simulated click on 'Replay' button
Expected Output	The level is restarted
Actual Output	The level is restarted
Status	Fail - refer to remarks pt 3