

# **BioRube Bot Testing**

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## **1 Introduction**

### **1.1 Description of the system to be tested**

BioRube Bot is a 2D mobile game that was developed in Unity using C#. This is an Educational Game for Dr. Sara Cline in Athens State University's Biology department. The game was first developed in 2017 and has been manipulated by a few capstone teams from deployment to adding additional levels and updates. The game offers 2 levels where users can drag and drop the game objects from a menu into the cell to try and activate different parts.

### **1.2 Objectives of the test plan**

The objective of this test plan is to locate all bugs during the play mode of Intro Level 1, Intro Level 2, Level 1 and Level 2 where the behavior of the game objects is either incorrect or undesirable. This will demonstrate that the game meets its requirements.

### **1.3 Methods of testing**

The project is using a unit testing approach, where each object in each level is being tested against several edge cases.

## **2 Overall Plan**

### **2.1 Test materials**

BioRube Bot is a 2D mobile game that was developed in Unity using C#. This is an Educational Game for Dr. Sara Cline in Athens State University's Biology department. The game was first developed in 2017 and has been manipulated by a few capstone teams from deployment to adding additional levels and updates. The game offers 2 levels where users can drag and drop the game objects from a menu into the cell to try and activate different parts.

### 3 Test Cases, Scenarios, and Log

#### 3.1 Entry Level 1

Test Case #	Test Case Description	Test Data	Expected Result	Actual Result	Pass/Fail
1	Check if receptor snaps to cell wall	Receptor	Receptor successfully snaps to cell wall	Receptor does snap to the wall if placed anywhere on the wall outline, but it spawns wherever object is dropped	Pass
2	Check if mitogen goes to spawned receptor	Receptor, Mitogen	Roams to receptor and activates the receptor	Mitogen roams to the nearest Receptor, goes in at the top and activates the receptor.	Pass
3	Check mitogen's behavior when multiple mitogens are dropped	Receptor, 3 Mitogens	One mitogen will roam to Receptor and activate	One mitogen goes to the receptor to activate, the other two go off screen for several seconds. They then come back and start roaming around behind the menu together.	Pass
4	Check if ATP roams to receptor and drops phosphate	2 ATPS	ATPs will collide to bottom of receptor and drop their phosphate. ATPs will then destroy.	ATPs collided with bottom of receptor and dropped their phosphate. ATPs then destroyed.	Pass
5	If a player drags and drops several Receptors onto the screen, Mitogen will still go to one Receptor and activate	3 Receptors, 3Mitogen	Mitogen will go to nearest Receptor and activate	One mitogen goes to the nearest receptor to activate, the other two then go to the next receptor, finally the third one then moves to the final receptor. All mitogens activate all receptors.	Pass
6	If a player drags and drops several Receptors onto the screen, the ATPs will still go to one Receptor and drop their phosphate	3 Receptors, Mitogen, 2 ATPs	The ATPs will go to nearest Receptor activated by Mitogen and drop their phosphate	The ATPs went to the nearest Receptor activated by Mitogen and dropped their phosphate	Pass

### 3.2 Intro Level 2

Test Case #	Test Case Description	Test Data	Expected Result	Actual Result	Pass/Fail
1	User drags and drops a Receptor to snap to cell wall	Receptor	Receptor snaps to cell wall where user spawns it.	Receptor snapped to the cell wall where the user spawned it.	Pass
2	User drags and drops a mitogen inside the cell to activate the receptor that is attached the cell wall.	Receptor, Mitogen	Mitogen roams to top of Receptor, enters it and activates.	Mitogen gets stuck on the cell wall and never activates the receptor.	Fail
3	User drags and drops a mitogen outside the cell to activate the receptor.	Receptor, Mitogen	Mitogen roams to Receptor, enters it and activates.	Mitogen roams to top of receptor and activates.	Pass
4	User drags and drops several receptors and several mitogens	3 Receptors, 4 Mitogens	Mitogens roam to nearest Receptor, enters it and activates.	First mitogen roams to farthest Receptor snapped to cell membrane and activates that receptor. Second Mitogen gets stuck on the side of the activated receptor. Third mitogen roams off screen and never comes back.	Fail
5	User drags and drops two ATPS to connect to the activated receptor.	Receptor, Mitogen, 2 ATPS	ATPs roam to the activated Receptor and drop their phosphates before destroying.	ATPs roamed to the activated receptor and dropped their phosphates before exploding.	Pass
6	User drags and drops a G-Protein to connect with the activated Receptor.	Receptor, Mitogen, 2 ATPS, G-Protein	G-Protein will roam and then connect to the activated Receptor.	G-Protein roams to the activated receptor and bonds.	Pass
7	User drags and drops a GTP to replace the GDP on the G-Protein	Receptor, Mitogen, 2 ATPS, G-Protein, GTP	GTP will roam to the G-Protein and replace the GDP	GTP roams to the G-Protein and bonds, completing the level.	Pass

### 3.3 Level 1

Test Case #	Test Case Description	Test Data	Expected Result	Actual Result	Pass/Fail
1	Spawning the left receptor will cause it to snap to the cell membrane	Left Receptor	Left Receptor snaps to cell membrane	If receptor is placed anywhere on the cell wall, it does snap into position. It can be placed anywhere on the screen though.	Pass
2	Spawning the right receptor will cause it to snap to the cell membrane	Right Receptor	Right Receptor snaps to cell membrane	If receptor is placed anywhere on the cell wall, it does snap into position. It can be placed anywhere on the screen though.	Pass
3	Spawning Mitogen will cause the two receptors to join together and activate	Left Receptor, Right Receptor, Mitogen	Mitogen will roam to the top of the receptors causing them to join and activate	Mitogen roams to the top of the receptors and activates, causing them to move together.	Pass
4	If more than one Left Receptor is spawned, one will still bond to a Right Receptor when a Mitogen attaches	3 Left Receptors, Right Receptor, Mitogen	Mitogen will roam to the nearest Right and Left Receptor to bond and activate them	Mitogen roams off screen for several seconds, then comes back to the left receptor nearest to the one right receptor, activates and merges the receptors.	Pass
5	If more than one Right Receptor is spawned, one will still bond to a Left Receptor when a Mitogen attaches	3 Right Receptors, Left Receptor, Mitogen	Mitogen will roam to the nearest Right and Left Receptor to bond and activate them	Mitogen roams off screen for several seconds, then comes back to the right receptor nearest to the one left receptor, activates and merges the receptors.	Pass
6	If there are multiple Right and Left Receptors and multiple Mitogens, they will still bond and activate	4 Right Receptors, 4 Left Receptors, 3 Mitogen	Mitogens will roam to nearest Right and Left Receptors to bond and activate	If the receptors are spawned in every direction and all over the cell, all three mitogen freeze behind the inventory menu and do not move. If they are spawned in pairs together, the mitogen go off screen for several seconds, and the come back to the nearest left and right receptor and activate. The mitogen then repeat this for the remaining two pairs of receptors on the cell	Pass

				membrane. The last pair does not have a mitogen to activate it.	
<b>7</b>	A user spawns two ATPs to bond to the activated receptors and drop their phosphates.	Left Receptor, Right Receptor, Mitogen, 2 ATPs	ATPs will roam to the activated Receptors to bond, turn dark green, and then swim away to explode after leaving their phosphates.	The ATPs roam to the activated Receptor, drop their phosphates and then roam away to explode.	Pass
<b>8</b>	A user spawns multiple Right and Left Receptors and several ATPs.	3 Left Receptors, 2 Right Receptors, 2 Mitogen, 6 ATPs	Two of the ATPs will roam to the nearest activated Receptors to bond and drop their phosphates before destroying.	The mitogen go off screen for several second before coming back and activating the receptors on the far left and then the receptors on the far right. Two pairs of the ATP's then roam to the activated receptors, drop their phosphates and destroy. The last pair roams endlessly since there is not another activated receptor for it.	Pass
<b>9</b>	A user spawns G-Protein to bond to the Receptors with phosphates.	Left Receptor, Right Receptor, Mitogen, 2 ATPs, G-Protein	G-Protein will roam and bond to the Receptor with phosphates.	G-Protein roams to the receptors and bonds. GDP then destroys itself.	Pass
<b>10</b>	A user spawns multiple G-Proteins after activating the receptors.	2 Left Receptor, 2 Right Receptor, Mitogen, 4 ATPs, 3 G-Proteins	The nearest G-Protein will roam and bond to the activated Receptor.	Two G-Proteins bond to one set of activated receptors, and the other G-Protein bonds with the other activated receptor.	Pass
<b>11</b>	A user spawns a GTP to bond with the G-Protein connected to the activated Receptors	Left Receptor, Right	GTP will roam to the G-Protein connected to the activated Receptors and bond.	GTP attaches to the G-Protein where GDP was. The G-Protein now detaches from the receptors and begins roaming.	Pass

		Receptor, Mitogen, 2 ATPS, G-Protein, GTP			
<b>12</b>	A user spawns multiple GTPs to bond with the G-Protein connected to the activated Receptors	2 Left Receptors, 2 Right Receptors, 2 Mitogen, 4 ATPS, 3 G-Protein, 3 GTPs	One GTP will roam to the G-Protein connected to the activated Receptors and bond. The other GTPs will just continue moving endlessly.	Two of the G-Proteins go to one activated receptor, the other protein goes to the first activated receptor. The GTPs then roam to the G-Proteins and connect where all three of them disconnect from the receptors and begin roaming inside the cell.	Pass
<b>13</b>	A user spawns Kinase	Left Receptors, Right Receptors, Mitogen, 2 ATPS, G-Protein, GTP, Kinase	Kinase will attach to the G-Protein with a GTP attached to it and change to Phase 2 form preparing to bond with the Transcription Regulator	Kinase roams to the G-Protein with GTP bonded to it and connects for a few seconds before Kinase changes to phase 2 form.	Pass
<b>14</b>	A user spawns multiple Kinase	2 Left Receptors, 2 Right Receptors, 2 Mitogen, 4 ATPS, 3 G-Protein, 3 GTPs, 3 Kinase	The kinase will roam to the G-Proteins with GTPs and bond to transform into phase 2 kinase.	All three Kinase roamed to the nearest G-Protein with a GTP attached and transformed by connecting to that one protein.	Pass
<b>15</b>	A user spawns Nuclear Pore Complex to snap to the nucleus.	Nuclear Pore Complex	The Nuclear Pore Complex snaps to the nucleus.	The Nuclear Pore Complex snapped to the nucleus.	Pass



<b>16</b>	A user spawns a Transcription Regulator	Transcription Regulator	The Transcription Regulator will roam to the Kinase in phase 2 form and bond.	The Transcription Regulator roamed to the Kinase in phase 2 form and bonded.	Pass
<b>17</b>	A user spawns ATP	ATP	ATP will roam to Kinase with a Transcription Regulator attached, bond for a few seconds, the Transcription Regulator will detach from Kinase with a phosphate attached to it now while the ATP destroys.	ATP roamed to Kinase with a Transcription Regulator attached, bonded for a few seconds, the Transcription Regulator then detached from Kinase with a phosphate attached to it while the ATP destroyed.	Pass

### 3.4 Level 2

<b>Test Case #</b>	<b>Test Case Description</b>	<b>Test Data</b>	<b>Expected Result</b>	<b>Actual Result</b>	<b>Pass/Fail</b>
<b>1</b>	A user spawns a G-Coupled Receptor to the cell wall.	G-Coupled Receptor	Successfully snaps to cell wall	Successfully snaps to cell wall	Pass
<b>2</b>	A user spawns Mitogen to bond to the G-Coupled Receptor	G-Coupled Receptor, Mitogen	Mitogen roams to the top of the G-Coupled Receptor to bond.	Mitogen roams to the top of the G-Protein Coupled Receptor, bonds and activates	Pass
<b>3</b>	A user spawns one Mitogen and several G-Coupled Receptors.	2 G-Coupled Receptors, Mitogen	Mitogen will roam to the nearest G-Coupled Receptor to bond.	Mitogen goes to the nearest G-Coupled Receptor, bonds, and activates.	Pass
<b>4</b>	A user spawns several Mitogens and several G-Coupled Receptors	2 G-Coupled Receptors, 2 Mitogens	The Mitogens will roam to the nearest G-Coupled Receptors to bond.	One mitogen spawned outside of the cell went off screen for several seconds and then came back to bond to the receptor on the left side. The other mitogen that was spawned inside of the cell became stuck on the membrane.	Fail
<b>5</b>	A user spawns a Trimeric G-Protein to bond to the activated G-Coupled Receptor.	G-Coupled Receptor, Mitogen,	The Trimeric G-Protein spawns near the cell membrane and then moves	The Trimeric G-Protein spawned near the cell membrane and then moved towards the G-Coupled Receptor.	Pass

		Trimeric G-Protein	towards the G-Coupled Receptor.		
<b>6</b>	A user spawns several Trimeric G-Proteins and two G-Coupled Receptors and one Mitogen.	2 G-Coupled Receptors, 2 Mitogen, 3 Trimeric G-Proteins	One Trimeric G-Protein will roam to the nearest activated G-Coupled Receptor. The extra game objects will remain on the screen.	The two mitogens roamed off screen for several seconds before coming back on screen. One mitogen bonded to one receptor on the left and the other Mitogen went behind the menu and froze right in front of the other receptor. One Trimeric G-Protein moved towards the first activated receptor, another destroyed itself, and the third became frozen near the nucleus.	Fail
<b>7</b>	A user spawns an Adenylyl Cyclase to the cell membrane	Adenylyl Cyclase	Adenylyl Cyclase snaps to the cell membrane.	The Adenylyl Cyclase snaps to the cell membrane where spawned.	Pass
<b>8</b>	A user spawns GTP to bond with the Trimeric G-Protein to cause it to move to the Adenylyl Cyclase.	G-Coupled Receptor, Mitogen, Trimeric G-Protein, Adenylyl Cyclase, GTP	GTP will roam to the Trimeric G-Protein and bond. The Trimeric G-Protein will now move to the Adenylyl Cyclase.	GTP roams to the Trimeric G-Protein after the GDP destroys. Part of the Trimeric G-Protein then moves to the Adenylyl Cyclase.	Pass
<b>9</b>	A user spawns multiple GTPs to bond with Trimeric G-Protein.	G-Coupled Receptor, Mitogen, Trimeric G-Protein, Adenylyl Cyclase, 3 GTPs	The nearest GTP will roam to the Trimeric G-Protein and bond. The Trimeric G-Protein will now move to the Adenylyl Cyclase. The remaining GTPs will roam endlessly.	The nearest GTP roamed to the Trimeric G-Protein and bonded. The Trimeric G-Protein moved to the Adenylyl Cyclase. The remaining GTPs are roaming endlessly.	Pass
<b>10</b>	A user spawns two ATPs to bond with the Trimeric G-Protein and Adenylyl Cyclase	G-Coupled Receptor, Mitogen, Trimeric G-	The ATPs will roam to the Trimeric G-Protein and Adenylyl Cyclase to bond and drop their phosphates. They	The ATPs roamed to the Trimeric G-Protein and Adenylyl Cyclase to bond and drop their phosphates. They then wiggled away and exploded.	Pass

		Protein, Adenylyl Cyclase, GTP, 2 ATPs	will then wiggle away and explode.		
<b>11</b>	A user spawns several ATPs to bond with the Trimeric G-Protein and Adenylyl Cyclase.	G-Coupled Receptor, Mitogen, Trimeric G-Protein, Adenylyl Cyclase, GTP, 4 ATPs	The ATPs will roam to the Trimeric G-Protein and Adenylyl Cyclase to bond and drop their phosphates. They will then wiggle away and explode. The remaining ATPs will roam endlessly.	All four ATPs roamed to the Adenylyl Cyclase. Three of the ATPs bonded and destroyed leaving their phosphates. One ATP became stuck on the edge of the cyclase.	Pass
<b>12</b>	A user spawns Inhibited Kinase to pick up the phosphates left by the ATPs.	G-Coupled Receptor, Mitogen, Trimeric G-Protein, Adenylyl Cyclase, GTP, 2 ATPs, Inhibited Kinase	The Inhibited Kinase starts to move to bond with the phosphates left by the ATPs. Once both phosphates have been caught, Inhibited Kinase splits into two objects.	The phosphates dropped from the ATPs move to the kinase. The kinase then breaks apart from the protein signaler with the two phosphates.	Pass
<b>13</b>	A user spawns multiple Inhibited Kinase to pick up the phosphates left by the ATPs.	G-Coupled Receptor, Mitogen, Trimeric G-Protein, Adenylyl Cyclase, GTP, 4	The Inhibited Kinases will start to move to bond with the phosphates left by the ATPs. Once both phosphates have been caught, Inhibited Kinase splits into two objects.	All four ATPs roamed to the Adenylyl Cyclase. Three of the ATPs bonded and destroyed leaving their phosphates. One ATP became stuck on the edge of the cyclase. One Inhibited Kinase caught two phosphates and split into two objects. The other Kinase caught the one phosphate available and stayed as one object.	Fail

		ATPs, 2 Inhibited Kinase			
<b>14</b>	A user spawns a Transcription Regulator.	G-Coupled Receptor, Mitogen, Trimeric G-Protein, Adenylyl Cyclase, GTP, 2 ATPs, Inhibited Kinase, Transcription Regulator	The Transcription Regulator will roam to and bond with the kinase.	The transcription regulator bonded with the kinase.	Pass
<b>15</b>	A user spawns multiple Transcriptions Regulators.	G-Coupled Receptor, Mitogen, Trimeric G-Protein, Adenylyl Cyclase, GTP, 2 ATPs, Inhibited Kinase, 3 Transcription Regulators	The Transcription Regulators will roam to kinase where only one will bond with the kinase.	Two of the three Transcription Regulators moved to Kinase. It appears they are both trying to push into the collider to bond but are preventing either one from connecting. All three objects and just spinning together in a circle. The third transcription regulator is floating nearby but not moving a whole lot.	Fail
<b>16</b>	A user spawns a Nuclear Pore Complex on the Nucleus.	Nuclear Core Complex	The Nuclear Pore Complex will snap to the nucleus wall.	The Nuclear Pore Complex snaps to the nucleus wall.	Pass