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Please fill in the following table, filling in each cell as carefully as you can for each test (i.e. there should not be *any* blank cells in a row). Please capture *all* tests that you plan to execute, however small or insignificant they may seem. Tests in each row should be unique and independent of each other, however.

Add or delete rows in the following table, as required, but do not delete or modify the columns. Take a look at the questions at the end of this document, to see what information should be included in each table cell. As we have learned, there are multiple types of objectives for prototyping and you need to be clear about exactly what each of your tests is trying to accomplish.

In general, more independent and more modular tests are better than just a single, giant test that attempts to test overall functionality. You probably want to test overall functionality towards the end of the term too, but you want to do this *well before* Design Day. This will give you time to fix any problems that you do find with your comprehensive prototype! The likelihood of such problems will be *much* smaller, if you have been thoughtful with your previous prototype testing though!

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| --- | --- | --- | --- | --- |
| ***Test ID*** | ***Test Objective***  ***(Why)*** | ***Description of Prototype used and of Basic Test Method***  ***(What)*** | ***Description of Results to be Recorded and how these results will be used (How)*** | ***Estimated Test duration and planned start date***  ***(When)*** |
| **1** | To determine the optimal size and color of the vision markers so that the robot can efficiently read them from a distance in a range of 0.5m-2m.  This will help us make vision markers of the optimal size and color such that the players do not have to struggle to give input.  The results will also help us determine if there are code issues in taking inputs.  This test will be a success when we find the optimal size and color of vision markers such that it can be read by the robot at distances in a range of 0.5m-2m.  This is the best way to test this objective as this tests the actual physical’s robot’s ability to read input which makes the results of the test more meaningful than the results of the test of the input reading ability of a simulated robot. This reflects accurately real gameplay. | This is a physical, high fidelity and focused test.  This is high fidelity as this tests the actual physical’s robot’s ability to read input which makes the results of the test more meaningful than the results of the test of the input reading ability of a simulated robot. This will reflect the real gameplay more accurately.  This is a focused test as we are specifically focusing on one of the ability of the robot, particularly one specific feature of our game.  The way we will test this is that we will try different sizes and colors of vision markers. We will start from 20x20cm and we will work our way to bigger vision markers by increasing the size of the side by 10cm every time until the robot is able to read the vision marker in the ranges of 0.5m to 2.0m. We will try different vision marker colors with good contrast.  In terms of material all we need would be paper and a printer.  We all have the skills to do this. | The results will be dimensions of the sizes that the robot has failed to read in a range of 0.5-2.0m of distance between the camera and the players.  They will be recorded on an excel spreadsheet as a pass or fail depending on if the dimensions were adequate for the robot to read the input or not.  This data is important for our project as a crucial feature of the game is for the robot to take input and show how you can lose control over autonomous weapons systems and how they might not behave the way you want every time. This shows the ethical concerns around lethal autonomous weapons systems which is the primary need of our client.  As the tests have not been performed yet we cannot determine whether or not the results are consistent with the defined objectives. Our hypothesis is that we will require signs that are at least 40x40 cm wide and long. | This test would not take more than 30 minutes. We expect to try 4-5 different sizes and colors of vision markers  The results are required by next Sunday the 16th November when we will be submitting our final design.  The only dependency for this test is a well written code. So that we don’t mistake code errors for vision marker size or color issue.  The test doesn’t take that long hence it will provide us the results we need in time. We expect to the do all the tests on Monday and Tuesday November 10th and 11th respectively which would leave us almost one whole week to make any adjustments or changes we require to do which is ample amount of time to make changes and retest if required. |
| **2** | To verify if the robot accurately navigates the maze while staying within the boundaries of the paths.  This test will also help us understand if there are any coding issues.  The results will help us correct the translation distances and rotation angles set if required so that the robot stays within the boundaries of the maze.  This test will be a success when the robot will successfully navigate the maze without making any errors.  This is the best way to test this as this tests the actual physical robot on the real maze map which makes the results more helpful compared to the results of testing the navigation skills of a simulated robot. This reflects accurately real gameplay. | This is a physical, High fidelity and focused test.  This is a high fidelity test as this test is being done on the actual maze map and not a simulator. This will reflect the actual gameplay more accurately.  This is a focused test as this focused on a specific feature of the game which is the navigation skills of the robot.  This will require coding skills which every member in our team has.  In terms of material this will require the robot and a tarp on which we will be designing the maze with duct tape based on the numerical model of the maze (See deliverable G).  The way we will test this feature is that we will play the game multiple times providing different inputs every time as different inputs results in different paths. Input reading is a feature we can rely on as it will have been tested in test 1. We will see if the robot is able to get to the end of the maze without making any errors. Here we won’t be testing the actions and visual cues of the robot this will be in test 3. So here the robot will only navigate the maze. | The results will show whether the robot is able to successfully navigate the maze from the start to end in different scenarios or not.  The results will be recorded on an excel spreadsheet as pass or fails for every path in the maze depending if the robot was able to navigate the different paths or not.  This data is important to our project as navigating the maze is the core of our game. In addition to that the whole game is based on navigating the maze and facing different moral dilemmas that make players face the ethical challenges around lethal autonomous weapons systems. This will make them understand the ethical concerns around lethal autonomous weapons systems which is the primary need of our client.  As the tests have not been performed yet we cannot determine whether or not the results are consistent with the defined objectives. Our hypothesis is that the code may require little adjustments in the translation distances and the rotation angles as we expect the distances we defined numerically to differ slightly from the distances the robot will have to travel on the real tarp. | This test should not take more than 1 hour as navigating the maze would only take 2-3 minutes mainly due to the fact that here there will be no actions taken by the robot. We will solely focus on the navigation. So in an hour we will be able to easily test all the different paths and make the adjustments we need for translation distance and rotation angles.  The results are required by next Sunday the 16th November when we will be submitting our final design.  The dependencies for this test are a well written code so that the robot doesn’t just stop due to code errors and a well working input taking feature (test 1) as different inputs result in different paths. We need to have the maze map ready.  If we can’t give input we wouldn’t be able to test different paths and to use multiple code snippets to test different paths which wouldn’t be very reflective of real gameplay.  The test doesn’t take that long hence it will provide us the results we need in time. We expect to the do all the tests on Monday and Tuesday November 10th and 11th respectively which would leave us almost one whole week to make any adjustments or changes we require to do which is ample amount of time to make changes and retest if required. |
| **3** | To verify that the robot takes the actions it is supposed to take at the right locations and at the right time.  The results will help us understand if there are any coding issues.  This test will be a success when the robot will accurately navigate the whole maze taking the right actions at the right place without making any errors.  This is the best way to test as this test the actual physical robot which makes the results more helpful compared to the results of tests on a simulated robot. This reflects accurately real gameplay. | This is a physical, high fidelity and focused test.  This is high fidelity because we are testing this with the real physical robot and we are testing it while playing the game physically. This test reflects the real gameplay which makes it high fidelity.  This is a focused test as this is focused on one specific feature of our game which is the robots actions.  We will test this by playing the game multiple times providing different inputs to the robot every time as different inputs result in different scenarios in which the robot has to take different actions. As the navigation skills and the input reading test will be already done we can rely on those features to do the test.  In terms of material this will require the robot and a tarp on which we will be designing the maze with duct tape based on the numerical model of the maze (see deliverable G document).  This will require coding skills which every member in our team has. | The results will show whether the robot is successfully able to take the actions it is supposed to take at the right locations and at the right time.  The results will be recorded as a pass or fail for every action it is supposed to take depending on whether it took it or not.  This data is important to our project as the robot’s action is at the core of our game as it is the mean we used to convey the ethical concerns around lethal autonomous weapons systems which is the goal of the product and the primary need of the client.  As the test hasn’t been performed yet we cannot determine if the results are consistent with the objectives of the test. Our hypothesis is that there will be no errors in the robot’s action. It will take the actions it is supposed to at the right locations and at the right time. | This test should not take more than one hour as we do not have very long actions sequences.  The results are required by next Sunday the 16th November when we will be submitting our final design.  The dependencies for this test are that we need a well written code so that the robot doesn’t just stop due to code errors. We need the robot to be able to take input as different inputs result in different paths which result in different actions sequence (test 1). We need the robot to successfully navigate the maze until the end without going off track and (test 2). We need to have the maze map ready.  If these dependencies are not met then we would have to test different code snippets for different action sequence separately which would not be very reflective of real gameplay.  The robot  The test doesn’t take that long hence it will provide us the results we need in time. We expect to the do all the tests on Monday and Tuesday November 10th and 11th respectively which would leave us almost one whole week to make any adjustments or changes we require to do which is ample amount of time to make changes and retest if required. |
| **4** | To determine the robots ability to navigate on the tarp.  This will help us determine at what translation and rotational speed we should set the robot at so that it doesn’t slip.  The result will help us understand if the set up requires additional features such as taping the tarp to the ground so that it doesn’t get stuck in the wheels of the robot or does not cause errors in its navigation accuracy.  The test will be a success if the robot does not have any issues moving on the tarp. This is the best way to test as it replicates real condition of use on real material. | This is a physical, high fidelity and focused test.  This is a high fidelity test as this test is being done on the actual maze map with the real robot and not in a simulator. This will reflect the actual gameplay more accurately.  This is a focused test as this specifically test one element of the prototype which is the tarp’s friction.  The way we will test this is that we will be making the robot navigate the maze at different translation and rotational speeds. We will then find the right speeds at which the robot does not slip or get stuck and go off track.  In terms of material this will require the robot and a tarp on which we will be designing the maze with duct tape based on the numerical model of the maze (see deliverable G document).  This will require coding skills which every member in our team has. | The results will show if the robot is able to properly navigate on the tarp without going of track due to slipping or getting stuck.  Results will be recorded in an excel spreadsheet. There will be rows for different speeds and we will give them a pass or fail depending on the navigation performance of the robot on the tarp at those speeds. In addition to that we will note down if there were issues due to the interaction of the tarp and the wheels such as the wheels getting stuck in frizzles.  This data is important for us to determine the right translation and rotation speed to set the robot at. If the robot slips then it can start going in the wrong trajectory which will make the game fail.  As the test hasn’t been performed yet we cannot determine if the results are consistent with the objectives of the test. Our hypothesis is that 1 m/s for translation speed and 30 degrees per second for rotational speed would be ideal for the robot to navigate without slipping and getting stuck. | This test should not take more than one hour.  The results are required by next Sunday the 16th November when we will be submitting our final design.  The dependencies of this test are that we need to have the maze map ready. We need the robot to be able to take input as different inputs result in different paths (test 1). We need the robot to successfully navigate the maze until the end without going off track and (test 2).  The test doesn’t take that long hence it will provide us the results we need in time. We expect to the do all the tests on Monday and Tuesday November 10th and 11th respectively which would leave us almost one whole week to make any adjustments or changes we require to do which is ample amount of time to make changes and retest if required. |
| **5** | To determine if maze map is durable or not.  The results will help us determine the durability of the tarp and the tape.  It will help us understand if we require changes in the material used.  This test will be a success if the tarp is able to handle the robot’s movement, normal foot traffic and rough movements without tearing and without the tape ripping off.  This is the best way to do the test as since we are using the actual physical game map and the physical robot instead of the simulator it makes the results more accurate. In addition, it replicates conditions of real use of the tarp. | This is a physical, high fidelity and focused test.  This is a high fidelity test as this tests the maze map material with real conditions of use.  This is a focused test as this tests a specific element of our game which is the maze map.  In terms of material we will require a tarp and duct tape. We will design the maze on the tarp based on our numerical model (see deliverable G document) using duct tape.  We will be testing this with 3 people walking on the maze normally as if they were playing the game and then we will make rough foot movements to simulate the extremes, the rough use.  We do not require any skills to do this. | The results will show if the maze map meaning the tarp is durable or not.  The results will be recorded on an excel spreadsheet as a pass or fail depending for different kinds of usage, such as normal foot movements and then rough foot movements. We record a pass or fail for the tape used in the above conditions.  The data of this test is important because if the tarp tears than the robot will not be able to navigate the maze and the game will fail.  As the test hasn’t been performed yet we cannot determine if the results are consistent with the objectives of the test. Our hypothesis is that the tarp and the tape will be durable. The tarp won’t tear nor will the tape rip off. | This test should not take more than 30 minutes.  The results are required by next Sunday the 16th November when we will be submitting our final design.  The only dependency for this test is to have the maze map ready.  The test doesn’t take that long hence it will provide us the results we need in time. We expect to the do all the tests on Monday and Tuesday November 10th and 11th respectively which would leave us almost one whole week to make any adjustments or changes we require to do which is ample amount of time to make changes and retest if required. |
| **6** | To determine if the game is immersive, impactful and epiphanic.  This test will help us see if the game meets its goal of conveying the ethical concerns and evoking a moment of realization in an impactful way.  It will also help us verify if the game works as intended.  This test will be a success if at least 80% of the players find the game immersive, impactful and epiphanic.  This is the best way to do the test as since we are using the actual physical game and the physical robot instead of the simulator it more accurately reflects real gameplay. In addition players will be interacting with the game physically with the game instead of virtually which makes it more involving than a simulator. This makes the results more meaningful than testing the results of testing immersiveness with the use of imagery and simulation provided to players. | This is a physical, high fidelity and comprehensive test.  This is a high fidelity test as this test will be done using the real physical game. This test will reflect real gameplay conditions.  This is a comprehensive test as this tests all the features of the game all together when the players will be playing it. In addition to that it test the user experience of the game as well.  Then we will test this by making volunteers play our game and by asking them for their feedback.  In terms of material we will require a tarp and duct tape. We will design the maze on the tarp based on our numerical model (see deliverable G document) using duct tape  This test does not require from us any particular skills. | The results of this test will show how many players found the game immersive, impactful and epiphanic.  We will record the results on a spreadsheet. We will record a pass or fail or neutral which will be asked to the volunteer players. In addition to that we will note their feedback.  The data of this test is very important as this helps us ensure that the game doesn’t just convey the ethical concerns around lethal autonomous weapons systems but it effectively highlights their importance and makes the players realize about the potential their LAWS pose to us. This is the primary need of our client.  As the test hasn’t been performed yet we cannot determine if the results are consistent with the objectives of the test. Our hypothesis is that more than 80% of the players will find the game immersive, impactful and epiphanic. | This test should last one hour at most.  The results are required by next Sunday the 16th November when we will be submitting our final design.  The dependencies are all the tests above because the whole game won’t work if the other individual elements of the game such as robot navigation, robot actions, robot’s ability to move on the tarp, tarp durability, robot input taking do not work.  The test doesn’t take that long hence it will provide us the results we need in time. We expect to the do all the tests on Monday and Tuesday November 10th and 11th respectively which would leave us almost one whole week to make any adjustments or changes we require to do which is ample amount of time to make changes and retest if required. |

# **Gantt chart**

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# **Filling in the “Prototyping Test Plan” table**

# **Why** are we doing these tests?

This explains the **objectives** of the prototype testing activity. Capture the reasons or motivation for the tests, giving enough background information to justify doing **any** prototyping at all. Specify whether the tests are for: learning, communication, de-risking, etc.

How will these results be used to make decisions or select concepts? Is there a better way of doing any of the tests? If so, why wasn’t the specific test done this way? For example, there may be time or cost constraints or perhaps other reasons that would justify your selected approach for achieving the test objectives. This is a chance for you to think about the **need for your test** and to analyze whether there are better ways to achieve the same results.

What are the **criteria for each test’s success or failure**? Make sure that the test will actually answer the questions that need answering.

# **What** is the prototype and what is the test?

Describe the prototype **type** (e.g. focused or comprehensive, physical or analytical) and justify the selection of this type of prototype.

**Describe the prototype** and **testing process** in enough detail to allow someone else to build and test the prototype, instead of you. What materials are required and what is the approximate estimated cost of the prototype and test setup? What work (e.g. test software or construction or modeling work or research) needs to be done? This is a chance for you to analyze the practicality of your planned testing activity. Can you actually build this prototype (i.e. do you have the skills, materials, time, etc.)?

# **How** is the prototype used? Does it match the objectives (i.e. the **Why)**?

What information will be **measured** and how will the **results be recorded**? Assuming that you have completed the test, what data will you have gathered? Is this important data for the project (i.e. do you need to know these results)? If not, what data needs to be gathered, instead? Is this all consistent with your defined objectives for the test?

# **When** is the testing happening and how long will it take?

How long is the test or the set of iterative tests estimated to take and what are the **dependencies** (i.e. what needs to happen before the testing can occur)? When are the results required and what depends on the results of this test in the project plan? The project Gantt chart should show how the testing fits in with the rest of the project work and might be a better way of displaying this information (i.e. just write the estimated test durations below). Are these **times ‘reasonable’** or are you better off doing things differently? Do you even need to do this test at all, given that it will take this long? Will the results be available in time to make any difference to the project?