Requirements Specification

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| # | Type | Description | Demonstration Scenario | Success Measure |
| 001 | Must Have | One level of Super Mario Bros. will be beaten by the implementation of the NEAT algorithm | A video will record most of the attempts of trying to beat levels in Super Mario Bros. This video will also demonstrate the final, successful attempt. Even though this video will be shown, a live demonstration of what it looks like real-time will be shown as well. | Once one level of Super Mario Bros. is beaten. |
| 002 | Must Have | The level of Super Mario Bros. must be beaten in the amount of time given in the level and with no deaths. Meaning that the final attempt cannot contain any “Time’s Up” or deaths. | See requirement 001. | Once one level of Super Mario Bros. is beaten with no deaths or “Time’s Up”. |
| 003 | Would Like to Have | Beating all levels of Super Mario Bros. | A video will record the game from start to finish showing the NEAT algorithm beating the entire game. | Once the entire game is beaten in one sitting. This means that there are no “Game Overs.” It does not matter if the algorithm beats the game in a fast amount of time or not. |
| 004 | Would Like to Have | Presentation in Research & Creative Works Conference. | Presenting at the Research & Creative Works Conference. | Once I have presented my final product at the Research & Creative Works Conference, then I will have succeeded. |
| 005 | Would Like to Have | Apply this project to Super Mario World | A video demonstration a completion of a level being beaten in Super Mario World. | Once a level in Super Mario World is completed. |
| 006 | Must Have | The neural network will move Mario. | See requirement 001. | Once the neural network has successfully moved Mario (death or no death). |
| 007 | Must Have | The neural network will learn from mistakes. | The idea here is that the neural network will begin to learn from its mistakes. So in the video described in requirement 001, I will have a part showing how Mario died from either a pitfall or an enemy or both and how the neural network learned from that mistake. | Once the neural network has learned from dying. |
| 008 | Must Have | Information regarding the neural network and genetic algorithm will be visible during runs of the game. | A GUI will be developed that will be seen on screen during any run of the game. This will be demonstrated through the video described in requirement 001. | Once the GUI displays the fitness, the neural network, generation number, species number, and genome number. Any other information is optional. |
| 009 | Must Have | The genetic algorithm will mutate at random. | A file will be generated to show the random mutation of the generations. | Once successful random mutation has occurred at every generation. |
| 010 | Must Have | The genetic algorithm will produce “offspring” by method of crossover. | A file will be generated to show the networks of offspring and the networks of the parents from random generations. | Once crossover has successfully occurred at each generation. |
| 011 | Must Have | The game will reload a save state whenever fitness is not increasing for a certain amount of time. This time will be based on frames and will be in the range of 20 – 60 frames. Testing will determine this number. | The video described in requirement 001 and a live demonstration will show how the game reloads after a certain amount of time. | Once the game successful reloads a save state after waiting too long. |
| 012 | Would Like to Have | Write a paper about this project, the findings, and implications. | Provide paper for public reading. | Once the paper is written. |
| 013 | Must Have | The game will shut down after the level is successfully completed. | The video described in requirement 001 will demonstrate the game shutting down once the level is successfully complete. | Once the game shuts down after the level is successfully complete. |