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| **Project Name: Project 1: Voting System Team#08** | |
| **Test Stage: Unit \_\_X System \_\_** | **Test Date: 3/24/2023** |
| **Test Case ID#: TieBreaker\_01** | **Name(s) of Testers: Ugtakhbayar Battulga** |
| **Test Description:**Using google test in IRElectionTests.cpp to test the TieBreaker function of Election.cpp/.h class files. The algorithm is run 10000 times to test its fairness between two candidates. This will confirm if the algorithm is biased or not | When running this test all files are in the same working directory which can be found in Project1/src. |
| **Automated: yes\_\_X\_ no \_\_\_using Google Test** |  |
| **Results: Pass \_\_\_\_X\_ Fail\_\_\_\_\_\_\_\_** |  |
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| **Preconditions for Test:**  N/A | |

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| **Step**  **#** | **Test Step**  **Description** | **Test**  **Data** | **Expected**  **Result** | **Actual**  **Result** | **Notes** |
| 1 | Declaration and initialization of a vote counter integer A to count the amount of votes candidate A got | N/A | N/A | N/A | N/A |
| 2 | Declaration and initialization of a vote counter integer B to count the amount of votes candidate B got | N/A | N/A | N/A | N/A |
| 3 | **srand(time(NULL));** line of code seeds the random number generator used by the **rand()** function. The **srand()** function sets the starting point, or the seed value, for the sequence of random numbers generated by **rand()**.  In this specific line of code, the **time(NULL)** function is used to generate a seed value based on the current time. | Current time | different and unpredictable values each time the program is executed. | different and unpredictable values each time the program is executed. | N/A |
| 4 | Declaration and initialization of bool variable to verify if the algorithm is fair or not | False | N/A | N/A | N/A |
| 5 | Runs the TieBreaker() algorithm implemented in Election.cpp/.h class files 10000 times to count how many times each candidate won the tie | vector<int> options that contains the two candidates in a tie  integer variable A and B | Neither A nor B is less than 4000 or greater than 6000 | Neither A nor B is less than 4000 or greater than 6000 | N/A |

**Post condition(s) for Test:**



Specific results showed candidate A selected 5018 times and candidate B selected 4982 times. Using a t-test to determine if this proportion is significantly different from 50%, we see find that the difference is not significantly different (p-value of 0.7263). The 95% confidence interval is (0.492, 0.512), suggesting that the actual value is likely quite close to 0.5.

Test Passed