

Use Cases Document

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Revision History

Name	Date	Reason For Changes	Version
Andrew, Brian, Cuong	February 16, 2023	Initial revision	1.00

Name	Load ballot file
ID	UC_001
Description	At the end of the election, the officials access the ballot file to collect the results in order to finalize and declare the winner.
Actors	1. Election officials
Organizational Benefits	Determine the result of the election. Provide insight into the outcome of the election, including the relative performance of candidates and ballot totals
Frequency of Use	Multiple times a year; once per election.
Triggers	The user specifies a file and path in the system to load.
Preconditions	File exists and its type matches as required.
Postconditions	<ol style="list-style-type: none"> 1. The file is loaded successfully. 2. File's content is displayed correctly.
Main Course	<ol style="list-style-type: none"> 1. System prompts the user to enter a file path [directory and filename] (AC2). 2. System verifies that the file is available at the given path (AC1) (EX1). 3. System verifies that the file is readable (UC_002). 4. System displays the content of the file.
Alternate Courses	<p>AC1: File cannot be found</p> <ol style="list-style-type: none"> 1. System is unable to find the file at the given path 2. System informs the user that the file is unavailable 3. Return to (MC1) <p>AC2: User terminates the process</p> <ol style="list-style-type: none"> 1. Program exits
Exceptions	<p>EX1: User enters an invalid path's format</p> <ol style="list-style-type: none"> 1. System notifies the user that the file path is invalid. 2. Return to (MC1). <p>EX2: User does not add a file extension</p> <ol style="list-style-type: none"> 1. System adds the extension .csv 2. Return to (MC2)

Name	Read ballot file header
ID	UC_002
Description	An election file is opened, and the header contents are read. The system extracts the necessary information from the header and displays it back to the user for confirmation. When a file is being opened, the system needs to determine whether the file is readable and is ready to be displayed.
Actors	<ol style="list-style-type: none"> 1. Election officials 2. The system
Organizational Benefits	Prevents unnecessary user input of redundant information. Maintain the fairness and integrity of the election if the feature is being used for confidential files.
Frequency of Use	Once per system instance
Triggers	UC_001 is complete
Preconditions	The file exists and has no internal issues, and is being opened.
Postconditions	The data is read and collected without issues, and header information is displayed to user
Main Course	<ol style="list-style-type: none"> 1. System reads the file (EX1). 2. System reads the header of the file. 3. System determines the election type. 4. System displays header information to the user. 5. User confirms validity of file, or cancels (AC1).
Alternate Courses	AC1: Opened wrong file <ol style="list-style-type: none"> 1. Return to (UC_001)
Exceptions	EX1: User does not have READ permission <ol style="list-style-type: none"> 1. System reports error to user 2. Returns to (UC_001)

Name	Process election
ID	UC_003
Description	The system performs the necessary steps to complete all requirements involved in completing the election determination process. This includes tabulating results (IR or CPL), generating a results file, and generating an audit file. It involves calling other use cases.
Actors	<ol style="list-style-type: none"> 1. Election officials 2. The system 3. Programmers and testers
Organizational Benefits	Election officials are able to finalize the results faster and more accurately.
Frequency of Use	Once per system instance
Triggers	UC_002 is complete
Preconditions	The system is running, UC_002 is complete
Postconditions	The results are tallied and displayed to the user, the audit file is generated.
Main Course	<ol style="list-style-type: none"> 1. System enters the appropriate use case to tabulate ballots for election type (UC_006 or UC_007) 2. System calls UC_005 to display results 3. System calls UC_009 to name audit file 4. System calls UC_006 to create audit file (EX1)
Alternate Courses	N/A
Exceptions	EX1: User terminates the system <ol style="list-style-type: none"> 1. Safely exit any file write procedures

Name	Break a tie
ID	UC_004
Description	In a tie situation, a set of tied candidates (≤ 2) is given, and the index of one candidate in the set is returned. The selection of the returned index will be random and unbiased, as in a coin toss.
Actors	<ol style="list-style-type: none"> 1. The system 2. Programmers and testers
Organizational Benefits	Automatically resolve a contentious election (any close results like a tie will likely be contentious) following official procedure and leaving no room for election officials intentionally or unintentionally meddling in results.
Frequency of Use	Any time there is a tie in an election tabulation.
Triggers	<p>One of the following cases is met:</p> <ul style="list-style-type: none"> • When no one has a majority in IR, UC_010 is called, and vote counts are tied • In IR, when removing lowest candidates, tied lowest count • In CPL, when assigning remainder seats and a tie occurs • In CPL, if one party does not have enough candidates
Preconditions	Within UC_003, and one of the trigger cases is met.
Postconditions	The coin toss is fair, and the winner is determined.
Main Course	<ol style="list-style-type: none"> 1. The index of one candidate among a list of inputs is randomly selected.
Alternate Courses	N/A
Exceptions	N/A

Name	Display result page
ID	UC_005
Description	Take relevant information from the election results and display it for the user.
Actors	<ol style="list-style-type: none"> 1. Election officials 2. Programmers 3. Testers
Organizational Benefits	Formats and compresses results of election onto readily interpretable page(s); this makes the results clearer and could even be shared directly with media, reducing chance for user error in interpretation of more raw result data. This ultimately improves the consistency of and confidence in the elections.
Frequency of Use	Once per system instance
Triggers	Election data tallying is complete
Preconditions	Within UC_003, when either UC_007 or UC_008 is complete
Postconditions	Election is complete and the results have been displayed
Main Course	<ol style="list-style-type: none"> 1. Calculate statistics for display that are not explicit results of tabulation. 2. Data is displayed on a formatted page, including victor, election type, number of seats, total votes, and vote counts and percentages for each candidate.
Alternate Courses	N/A
Exceptions	N/A

Name	Create audit file
ID	UC_006
Description	Generate an audit file that includes requisite information to verify proper execution of the program and the election
Actors	<ol style="list-style-type: none"> 1. Election officials 2. The system 3. Programmers and testers
Organizational Benefits	Provide an easily processed file which can be used to confirm election results
Frequency of Use	Once per system instance
Triggers	An election of any type has been tabulated
Preconditions	Within UC_003, after the election tabulation is complete and a file name is created in UC_009.
Postconditions	Audit file is saved at the local directory
Main Course	<ol style="list-style-type: none"> 1. Open a new text (.txt) file at local directory 2. Write an audit summary, including: (EX1) <ol style="list-style-type: none"> a. Type of voting b. Number of candidates c. Candidates' information d. Number of ballot e. Calculations f. Vote totals g. Winner(s) h. Which candidate received which ballot 3. Save the file with the given name 4. Close the file
Alternate Courses	N/A
Exceptions	EX1: File write error <ol style="list-style-type: none"> 1. System failed to write the audit file 2. Software displays error to user

Name	Tabulate IR
ID	UC_007
Description	Tabulate and store the results of the instant runoff voting process on a given set of ballots
Actors	<ol style="list-style-type: none"> 1. The system 2. Programmers and testers
Organizational Benefits	The process of vote tabulation is automated to greatly reduce the effort required to count ballots.
Frequency of Use	Once per system instance (depending on election type)
Triggers	Automatically called within UC_003
Preconditions	Within UC_003, election type is IR
Postconditions	The IR votes are counted and the results, including the winner, the candidates eliminated, and the vote tallies at each round, are recorded.
Main Course	<ol style="list-style-type: none"> 1. Count primary votes for each valid candidate 2. Evaluate vote totals against victory criteria (AC1) (AC3) 3. Remove candidate with lowest vote total, assign votes to next candidate on ballot (AC2) 4. Store round results 5. Return to (MC2)
Alternate Courses	<p>AC1: A candidate meets victory criteria</p> <ol style="list-style-type: none"> 1. Store results 2. Return to (UC_003) <p>AC2: Candidates are tied</p> <ol style="list-style-type: none"> 1. Refer to UC_004 to determine outcome <p>AC3: No candidate receives a majority vote</p> <ol style="list-style-type: none"> 1. Refer to UC_010 to determine outcome
Exceptions	N/A

Name	Tabulate CPL
ID	UC_008
Description	Tabulate and store the results of the party list voting process on a given set of ballots
Actors	<ol style="list-style-type: none"> 1. The system 2. Programmers and testers
Organizational Benefits	Automates the process of vote tabulation, greatly reducing the effort required to count ballots.
Frequency of Use	Once per system instance (depending on election type)
Triggers	Automatically called within UC_003
Preconditions	Within UC_003, and the election type is CPL
Postconditions	PCL votes are tabulated, results are recorded, including vote totals, seats assigned, and candidates are elected
Main Course	<ol style="list-style-type: none"> 1. Tabulate vote totals by party 2. Assign whole seats (AC1) 3. Tabulate remainders 4. Assign seats to largest remainders (AC2) 5. Store results
Alternate Courses	<p>AC1: Not enough candidates in party</p> <ol style="list-style-type: none"> 1. Seats are assigned as a lottery using UC_004 <p>AC2: Candidates are tied</p> <ol style="list-style-type: none"> 1. Refer to UC_004 to determine outcome
Exceptions	N/A

Name	Name audit file
ID	UC_009
Description	The audit file is given a descriptive and easily recognizable name, including election type and date.
Actors	<ol style="list-style-type: none"> 1. The system 2. Programmers and testers
Organizational Benefits	An audit file being descriptively named makes it easier, faster and more efficient for the user to locate and identify in the future.
Frequency of Use	Once per election
Triggers	An audit file is being created
Preconditions	Election ended and an audit file is being created
Postconditions	An audit file with election type and election date in its name
Main Course	<ol style="list-style-type: none"> 1. The system generates the name with given information (AC1) 2. The system notifies the user the name is usable and the file's name has been set
Alternate Courses	AC1: File's name is already in use <ol style="list-style-type: none"> 1. The system notifies the user that the name with given information has already been used 2. Return to (MC1)
Exceptions	N/A

Name	Resolve inconclusive IR as popularity vote
ID	UC_0010
Description	In the case that no candidate receives a majority of the vote during IR election, the election is to be resolved as a popularity vote
Actors	<ol style="list-style-type: none"> 1. The system 2. Programmers and testers
Organizational Benefits	System is robust to potential non-standard outcomes of an IR vote, and meets user requirements.
Frequency of Use	Situational, at most, once per system instance
Triggers	Called by system if precondition is met
Preconditions	<ol style="list-style-type: none"> 1. The election type is IR. 2. Two candidates remain, neither of whom has more than 50% of the votes. 3. Within UC_007
Postconditions	Winning candidate is selected based on popular vote
Main Course	<ol style="list-style-type: none"> 1. Sort final candidates by number of votes received (highest to lowest) 2. Assign first (most voted) candidate as winner (AC1) 3. Store results
Alternate Courses	AC1: Candidates are tied <ol style="list-style-type: none"> 1. Refer to UC_004 to determine the outcome
Exceptions	N/A

Name	Extract additional information from the user
ID	UC_0011
Description	The user needs to provide additional information aside from that in the ballot file when configuring the system.
Actors	<ol style="list-style-type: none"> 1. Election officials 2. The system 3. Programmers and testers
Organizational Benefits	Avoid missing small information to minimize the risk of mistakes and improves the overall integrity of the system
Frequency of Use	Once per election
Triggers	Automatically asked by the system
Preconditions	The system must be initiated
Postconditions	System configuration is set up correctly according to both the pre-written and the additional information
Main Course	<ol style="list-style-type: none"> 1. System prints out a list of additional information that is not yet provided in the ballot file 2. System asks the user to enter the information 3. The user enters the information in order 4. The system validates the format of the inputs (AC1) 5. The system notifies the user the information has been entered correctly
Alternate Courses	AC1: Invalid format of input <ol style="list-style-type: none"> 1. System notifies the user that their input(s) is not correct 2. System prints the correct format(s) 3. Return to (MC2)
Exceptions	N/A

Name	Read ballot file
ID	UC_0012
Description	Process a ballot file to input each ballot into a data structure within the software system. This UC does not process header information.
Actors	<ol style="list-style-type: none"> 1. System 2. Programmers and testers
Organizational Benefits	Vote data is stored within the system in a format that can be later processed for tabulation.
Frequency of Use	Once per ballot file.
Triggers	UC_002 is complete
Preconditions	Ballot file name has been entered, header information has been extracted, user has confirmed correctness of header information, and system has loaded file correctly
Postconditions	All ballots are stored within the software in a data structure. Ballot information is correct and complete
Main Course	<ol style="list-style-type: none"> 1. System sequentially reads lines in the ballot file, and inputs information to internal data structure.
Alternate Courses	N/A
Exceptions	N/A