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CS1555 HW5 User’s Manual

**Guide to using the system:**

Uponstarting the program, the user is presented with a menu that asks them to choose between 9 options: add forest (1), add worker (2), add sensor (3), switch workers duties (4), update sensor status (5), update forest covered area (6), find top-k busy workers (7), display sensor ranking (8), or exit (9).

1. Add forest

Upon selecting the add forest option, the user is asked to provide a name for the forest they wish to add, an area for the forest, the acidity level of the forest (between 0 and 0.99999), the coordinates of the forest (X min/max and Y min/max). If the insert is successful, the user will be given a message that says “Forest number x was successfully added to the database”, where x is the forest number that the system assigned to the new forest. Several inputs can cause exceptions in the system such as: giving a forest name that already exists in the system, giving a negative area, giving negative coordinates, giving a minimum coordinate (xmin or ymin) that is greater than the corresponding max coordinate (xmax or ymax), and giving an acid level outside of the specified range. This operation results in adding a new record to the forest table. After the operation finishes, the user will be directed back to the selection menu.

2. Add worker

Upon selecting the add worker option, the user is asked to provide the SSN (9 digits, no dashes/spaces), name, rank, and 2-letter abbreviation for the worker’s employing state. If the insert is successful, the user will be notified that the worker was successfully added. Several issues can cause exceptions in this operation such as: giving the name/SSN of a worker who is already in the system, giving a negative rank, or giving a state abbreviation of a state that is not in the system. This operation results in adding a new record to the worker table. After the operation concludes, the user will be directed back to the selection menu.

3. Add Sensor

Upon selecting the add sensor option, the user will be prompted to give the x and y coordinates of the sensor, the year/month/day/hour/minute of the last time the sensor was charged, the SSN of the worker assigned to maintain the sensor, the year/month/day/hour/minute of the sensor’s last report, and the energy level of the sensor. If the system successfully adds the sensor into the system, the system will notify that the operation was successful by giving the user the auto generated sensor ID and coordinates of the new sensor. Several issues can cause exceptions in this operation such as: supplying negative numbers or letters as input for the coordinates, supplying an SSN that is not in the system, supplying a negative energy level, or supplying the SSN of a worker who is not in the same state as the sensor. This operation results in adding a new record to the sensor table. Upon completing the operation, the system will direct the user back to the selection menu.

4. Switch Workers Duties

Upon selecting the Switch Workers Duties option, the user will be prompted to input the names of two workers to swap their duties (Worker A will be responsible for all of Worker B’s sensors, and vice versa). Several inputs can cause exceptions in the system such as: putting the same name for worker 1 and 2, giving a name that is not in the database, or trying to swap the duties of workers that are employed in different states. If the operation is successful, the system will notify the user that it successfully swapped the two workers’ duties. This operation may result in updating the sensor table. Upon completion of the operation, the system will direct the user back to the selection menu.

5. Update Sensor Status

Upon selecting the Update Sensor Status option, the user will be prompted to provide the x and y coordinates of the sensor they wish to update, a new energy level for the sensor, the year/month/day/hour/minute the sensor was last charged, and the temperature that the sensor reported. Several issues can cause exceptions in the system such as: entering invalid/negative coordinates, inputting coordinates of a sensor that is not in the system, or inputting an energy level outside of the given range (0-100). Upon inputting valid information, the system will tell the user that the sensor was successfully updated and will tell the user if there was reported emergency or not. If the sensor reported a temperature that was equal to or over 100 degrees, a record will be inserted into the emergency table and the user will be notified. If the recorded temperature was under 100, the user will be notified that no emergency was reported. This function results in an updated record in the sensor table and potentially a new record in the emergency table. Upon completion of the operation, the user will be directed back to the selection menu.

6. Update Forest Covered Area

Upon selecting the Update Forest Covered Area option, the user will be prompted to give the name of the forest, the two-letter abbreviation of state that the forest resides in, and the new area. This operation updates the area portion of the coverage table; given a forest and a state, it updates the amount of area of the forest that is in the given state. The percent total of the forest that is in the state will be automatically updated as well. Several inputs can cause exceptions with this operation such as: giving a forest/state that is not in the system, giving an area that is larger than the total area of the forest/state, or supplying a forest and state that do not overlap. This operation results in an update to the coverage table. Upon completion of the operation, the user will be directed back to the selection menu.

7. Find Top-K Busy Workers

Upon selecting this option, the user will be asked how many of the top busiest workers they want to see. Busiest is defined as having the greatest number of sensor to recharge; a worker needs to recharge a sensor if its energy level is less than or equal to 2. It is important to note that the system will treat workers that have the same number of sensors to recharge as one. For example, if the user wanted to see the busiest worker, but three workers are tied for busiest, the system will show them all to the user. The system will show the user the rank of the worker in terms of busyness, the name of the worker, and the number of sensors that the worker needs to recharge. For example, if the user inputs that they want to see the top 2 busiest workers and there are two workers tied for first (Mike and John) with 3 sensors each to recharge and the next busiest worker (James) has 2 sensors to replace, the system will output:

1: Mike sensors to recharge: 3

1: John sensors to recharge: 3

2: James sensors to recharge: 2

If the user inputs an invalid number for k (negative, greater than the number of workers in the system, or invalid), an exception will occur. This operation does not result to changes in any of the tables in the database. Upon completing the operation, the user will be directed back to the selection menu.

8. Display Sensors Ranking

Upon selecting the Display Sensors Ranking option, the system will generate a ranking of each of the sensors in the system based on the number of reports the sensor has issued in the form of (rank). Id: (sensor ID) number of reports: (number of reports issued by the sensor). Note that sensors that have reported the same number of reports will have the same rank. For example, if there are four sensors in the system, sensor 1 has given 5 reports, sensor 2 has given 7 reports, sensor 3 has given 5 reports, and sensor 4 has given 2 reports, the system would output:

1: id: 2 number of reports: 7

2: id: 1 number of reports: 5

2: id: 3 number of reports: 5

3: id: 4 number of reports: 2

If there are no sensors in the database, the system will inform the user that there are no sensors in the database. This operation does not result in changes to any of the tables in the database. Upon completing the operation, the user will be directed back to the selection menu.

9. Exit

Upon selecting the Exit option, the system will shut down

Other input

If the user provides input that is not one of the given options, the system will notify the user that the provided input was invalid and will be directed back to the selection menu.

**System Limitations:**

All of the operations required by the assignment are implemented.

**Possible Improvements:**

There are several additional operations that I believe could improve the functionality of the system. First, being able to see what is in each of the tables from the application could be helpful with inputting information for the various operations correctly. Next, being able to add a state into the system would allow for greatly expanded functionality. Finally, implementing a way to add intersections between forests and states would round out the functionality of being able to adjust the area of a forest that is in a state.