Enhancing the Model Matching Algorithm to provide a better match for models in DCIM

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一、摘要

The Update Models Library operation and CSV file import operation are used by the DCIM; a software that gives data center operators the ability to run efficient data center operations and improve data center infrastructure planning and design. The Update Models Library allows a user to update the reference models in the DCIM database while the CSV file import in the DCIM allows a user to import a newly acquired model into the DCIM. The goal is to improve the model matching algorithm so that it can show either an exact match or the most similar match for the input makes and models, up to the 20 most similar. If provided, it also compares the models' Rack Units' height and Class for a more accurate comparison.

關鍵詞：DCIM, Data Center Infrastructure Management, Software.

二、緣由與目的

Our topic is a collaboration between Sunbird Inc and NTUT to improve Sunbird's DCIM software. Our aim is to gain experience to be able to collaborate on other projects, thus actively engaging in the industry development process. We intend to strengthen our knowledge of relevant technologies and capabilities by achieving the following objectives through this final project:
(1) Use the Java and Spring Framework to accomplish the Backend development.
(2) Complete Sunbird's development criteria and satisfy the process requested by Sunbird.
(3) Create relevant test cases to avoid unwanted results from the algorithm.

三、研究範圍

The Update Models Library allows a user to update the DCIM's reference models in the database. The algorithm will first evaluate the input models' make, returning either a perfect match or an approximate match, "Best Match". For the latter, the user will have to confirm the make selection. The algorithm will then evaluate the input models' names based on the previous step and, if provided, the models' class and RU Height. The CSV file import operation allows a user to add a newly acquired model. Similarly, it first evaluates the input model's make and then the input model's name. If the algorithm only finds the Best Match or cannot find a model at all, it prompts the user to manually select a model, with the Best Match models appearing first.

To improve the customer experience when using either of these operations, the requirement document specifies the following three additional features. First, the algorithm used to compare descending order of scores must be improved. Such improvements to these model matching operations allow users to have more accurate results. Second, compare the input models with other models with the same "Class" and "RU Height" (Rack Unit Height) values when these are provided. Third, the algorithm will return a listing of the suggested close matches by descending order of score and up to 20 similar results.

四、使用技術方法

The following software development process, framework, and database are used:
(1) The Scrum process for agile and organized software development.
(2) Used Java, Spring Framework and Maven to develop the back end.
(3) Used PostgreSQL for database and pgAdmin to manage the Postgres database and its services.

五、開發流程

We will use a scrum-based development approach with a 2-week increment. We spend 10 to 20 hours per week developing the requirements, which are divided into multiple stories. After two weeks, we will present the results at the Sprint Review at the end of the Sprint. At the start of the sprint, we will decide what we will work on for the next two weeks.

六、系統架構

Both the Update Models Library and the CSV File Import make use of two methods each: one for matching the model's make and another for the model itself. These methods have similar business logic. They will first compare the input make with the makes in the database by using the LCS algorithm, and then compare the similarity between the input model's name and all models with the same make by using the algorithm. If provided, it will also filter out models that do not have the same Class and RU height as in the template.

The Update Models Library operation directly reads and writes from the DCIM's database. As such the make and model matchings are performed in different classes. Meanwhile, other APIs queries the results to display in the UI. If an input makes or model has a perfect match, then there is no need for the user to attend to it and isn't displayed in the Library Update Wizard. However, if only the Best Match is found or the make or model couldn't be matched, then it is displayed in the UI for the user to confirm the best match or perform the appropriate selection.

The CSV file import utilizes "checkMakeByLCSForImportExtAPI" and "checkModelByLCSForImportExtAPI" for comparing the makes and models respectively. Similarly, to Models Library Update, if the make or model names are identical, no user interaction is required. However, if they are best matched or no match was found, the user must either confirm the algorithm's choice or select the appropriate match.

七、實驗結果

(1) After adding the two optional filters and making sure that the headers show up according to the Best Match result; we designed the unit test. After being reviewed by Sunbird's engineers, the CSV file import operation development is completed.
(2) After going through the Integration Test, we ensured that the front-end, back-end and the templates can be properly linked, and all functions can be executed normally. After being reviewed by Sunbird's engineers; the Update Models Library development is completed.

八、結論

We have modified the business logic to return up to 20 best results as well as write tests for the newly implemented code. We began by adapting the matching algorithm to the LCS implementation and writing unit tests for the method, after which we implemented the RU Height and Class filters. We learned the concepts and development of backend components for web applications using the company's method from this project.

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