



UPOV/WG-DEN/1/3
 ORIGINAL: English
 DATE: March 8, 2016

INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS
 Geneva

WORKING GROUP ON VARIETY DENOMINATIONS

**First Meeting
 Geneva, March 18, 2016**

UPOV DENOMINATION SIMILARITY SEARCH TOOL

Document prepared by the Office of the Union

Disclaimer: this document does not represent UPOV policies or guidance

EXECUTIVE SUMMARY

1. The purpose of this document is to report the current situation of the algorithm for the UPOV denomination similarity search tool and to propose the next steps in the development of the UPOV denomination similarity search tool.
2. The WG-DEN is invited to:
 - (a) note the developments in the WG-DST;
 - (b) note that a web page to compare the search results of the refined algorithm and the existing search tools in the PLUTO database will be created by the end of March 2016, and a circular issued to the WG-DEN inviting experts to assess the refined algorithm and to provide feedback by the end of June 2016;
 - (c) agree that the WG-DEN, at its second meeting, which is anticipated to be organized in conjunction with the UPOV sessions in October 2016, be invited to consider the feedback received and to consider whether it would be appropriate to seek expert customization of the refined algorithm to improve the performance.
3. The structure of this document is as follows:

EXECUTIVE SUMMARY	1
BACKGROUND	2
Establishment of the Working Group for the Development of a UPOV Denomination Similarity Search Tool.....	2
First step of the test study	2
Design of the Test Study	2
Steps for the Test Study.....	3
Results of the Test Study	4
Second step of the Test Study	4
Results of the second step	5
Next steps	5

4. The following abbreviations are used in this document:

- CAJ: Administrative and Legal Committee
CAJ-AG: Administrative and Legal Committee Advisory Group
TC: Technical Committee
WG-DST: Working Group for the Development of a UPOV Denomination Similarity Search Tool

BACKGROUND

Establishment of the Working Group for the Development of a UPOV Denomination Similarity Search Tool

5. The CAJ, at its sixty-eighth session, held in Geneva, on October 21, 2013, considered document CAJ/68/9 "Possible development of a UPOV similarity search tool for variety denomination purposes" and approved the establishment of a working group to develop proposals for a UPOV similarity search tool for variety denomination purposes (see document CAJ/68/10 "Report on the Conclusions", paragraph 40).

First step of the test study

6. The WG-DST, at its first meeting, held in Geneva on September 3, 2014, agreed that the function of a similarity search tool should be to identify those denominations that were similar to existing denominations to the extent that they would require further, individual consideration before deciding if the denomination was (sufficiently) different from existing denominations (see Article 20(2) of the 1991 Act and Article 13(2) of the 1978 Act) (see document UPOV/WG-DST/1/4 "Report", paragraph 10).

7. The WG-DST noted that it would be possible to use powerful computing methods to identify a search algorithm if sufficient empirical data could be provided on similarity of denominations (see document UPOV/WG-DST/1/4 "Report", paragraph 11).

8. On that basis, the WG-DST agreed that, as a starting point, it would be essential to organize a study of desirable results on the similarity of a set of test variety denominations (see document UPOV/WG-DST/1/4 "Report", paragraph 12).

Design of the Test Study

9. The design of the study was as follows (see document CAJ/70/4 Add. "Addendum to: Variety Denominations", paragraphs 7 to 14);

"7. Participants in the study will be invited to identify denominations that should be considered by a similarity search tool to be sufficiently similar to a 'test' denomination to require further, individual consideration, i.e. all other denominations could be assumed to be sufficiently different from the other denominations.

"8. For the purposes of the study, a denomination dataset including at least all the denominations in the PLUTO database and a set of test denominations will be provided. Participants will be invited to list denominations which should be considered to be similar for each of the test denominations.

"9. Participants will be able to use all of the existing tools on the UPOV PLUTO website to help to find similar denominations in the denomination dataset (Similarity factor [CPVO search tool], Fuzzy, Phonetic, Contains, Starts, Ends). They will also be encouraged to create other similar denominations that should be considered by a search tool as being similar for this purpose in order to cover possible similar denominations that are not included in the dataset.

"10. A circular (UPOV Circular E-14/222 of September 10, 2014) was sent to the members of the WG-DST with a request to propose denomination classes and test denominations for the test study.

"11. Circular E-14/222 invited the WG-DST members to propose the following information as the basis for a test study:

- a) denomination classes that should be included in the test study (see document UPOV/INF/12/4);
- b) 'test' denominations

"12. In order for the study to be effective, it should cover different naming conventions in different crops/species (i.e. range of denomination classes) and should provide sufficient data in the form of denominations that would be considered (i.e. there should be a sufficient number of test denominations and it should not be based on denomination classes with a small number of denominations). The denominations are for test use, and can be actual or hypothetical denominations. To assist in the selection process, an extract of the denomination classes with the largest number of applications by Technical Working Party was provided and an extract of the number of applications for all genera and species in the PLUTO database was also provided.

"13. It was explained that it would be helpful if the reasons for proposals (denomination classes and test denominations) could be explained in order to assist in consolidating proposals from different WG-DST members.

"14. The WG-DST members were requested to submit their proposals for denomination classes and test denominations to the Office of the Union by September 26, 2014. A report of suggestions made by the WG-DST members will be made to the CAJ at its seventieth session."

10. The CAJ, at its seventieth session, held in Geneva, on October 13, 2014, received a report from the Vice Secretary-General on the first meeting of the Working Group for the Development of a UPOV Denomination Similarity Search Tool (WG-DST), which was held in Geneva on September 3, 2014. The CAJ noted that presentations had been made on the search tools available on the PLUTO database and that the WG-DST members had agreed to share their search tools and procedures with the WG-DST (see document CAJ/70/10 "Report on the Conclusions", paragraph 26).

11. The CAJ noted that the WG-DST had agreed that the function of a UPOV similarity search tool would be to identify those denominations that were similar to existing denominations to the extent that they would require further, individual consideration before deciding if the denomination was (sufficiently) different from existing denominations. In that regard, the WG-DST had agreed to organize a test study to develop an effective denomination search tool, an overview of which was presented to the CAJ (see document CAJ/70/10 "Report on the Conclusions", paragraph 27).

12. The CAJ agreed that the WG-DST should agree the details of the test study before participants were invited to start the study (see document CAJ/70/10 "Report on the Conclusions", paragraph 28).

13. The CAJ agreed that the possibility to participate in the test study to develop an effective denomination search tool should be offered to all members of the Union (see document CAJ/70/10 "Report on the Conclusions", paragraph 29).

14. The members of the WG-DST were invited to submit comments on the details of the test study by February 27, 2015. With the agreement of the members of the WG-DST, a circular to invite all UPOV members to participate in the study was issued on March 6, 2015, with a deadline of submitting lists of similar denominations by April 27, 2015 (see document CAJ/71/3 "Variety Denominations", paragraph 11).

Steps for the Test Study

15. The study was planned to be carried out in the following steps (see document CAJ/71/3 "Variety Denominations", paragraph 12):

"Step 1: Select test denominations to cover a broad range of denominations

Test denominations were proposed by members of the WG-DST and 20 were selected for the study.

Step 2: Provide lists of similar denominations

For each of the test denominations, participants will be invited to provide lists of denominations that they consider similar to the extent that further, individual consideration would be required.

Step 3: Development of an effective search tool

A denomination search tool contains two elements: pre-processing of the denominations (e.g. treating double letters, such as 'll', as a single letter); and an algorithm to provide rank of similarity.

Different settings of pre-processing (e.g. treat 'll' as one or two letters) and algorithms (e.g. different combinations of algorithms) will create a broad range of pre-processing/algorithm sets (PPA sets). It is intended to find a PPA set that will provide an improved ranking of denominations compared to PPA sets in existing tools.

The most effective search tool will be identified by repeated testing of different settings of pre-processing and algorithms from the PLUTO database (e.g. Similarity factor [CPVO search tool], Fuzzy, Phonetic, Contains, Starts, Ends), the Global Brand Database and possibly other sources.

The PPA sets will be evaluated by two aspects: precision and recall. 'Precision' is the proportion of the correct results (i.e. those considered similar by the participants) in relation to all the returned results, and 'recall' is the proportion of the correct results it returns in relation to all the correct results (i.e. including the correct results it did not return)."

16. The CAJ, at its seventy-first session, held in Geneva, on March 26, 2015, noted the work on the possible development of a UPOV similarity search tool for variety denomination purposes by the WG-DST, including the test study, as set out in document CAJ/71/3 (see document CAJ/71/10 "Report on the Conclusions", paragraph 42).

Results of the Test Study

17. The WG-DST, at its second meeting, held in Geneva, on June 9, 2015, received a presentation by Mr Glenn Mac Stravic, Head, Brand Database Section, Global Databases Service, on the intermediate results of the Test Study (see document CAJ/72/3 "Variety Denominations", paragraph 9). A copy of the presentation is available in document UPOV/WG-DST/2/4.

18. The Test Study identified the 11 best algorithms out of 15 which, after initial testing, performed better than all existing tools as measured by F3¹. The F3 measure had been chosen because recall was of higher importance than precision (see document CAJ/72/3 "Variety Denominations", paragraph 10).

19. The selected algorithms had been used to form 2,047 different combinations, and each of the combinations had been tested with 100 different "cutoff values"² (total of 204,700 settings). The top 10 settings that showed the best performance among all the tested settings measured by F3 were shown in the Presentation (see document CAJ/72/3 "Variety Denominations", paragraph 11).

20. The WG-DST agreed on using the F3 measure as a suitable basis for assessing performance because of the importance of recall for denomination similarity search purposes (see document CAJ/72/3 "Variety Denominations", paragraph 12).

Second step of the Test Study

21. The WG-DST agreed that the second step of the Test Study should be to consider whether to add an additional layer of phonetic criteria to the potential algorithms, by assessing if it would improve performance. In particular, it was agreed that it would be necessary to assess if precision would be sacrificed (see document CAJ/72/3 "Variety Denominations", paragraph 13).

22. The WG-DST agreed to prepare two or three algorithms with a phonetic layer and to compare the results to the algorithms without a phonetic layer. It was further agreed that the second step of the Test Study should be done on the PLUTO database using a dedicated test site. The WG-DST proposed to invite CAJ members and observers to participate in the second step of the Test Study, subject to consultation with the Chair of the CAJ. The Chair of the CAJ, Mr. Martin Ekvad, agreed on the plan and schedule of the second step of the Test Study and on the invitation to the CAJ members and observers to participate (see document CAJ/72/3 "Variety Denominations", paragraph 14).

¹ F3 = (1 + 3*3) x (precision x recall)/(3*3 x precision + recall).

² The size of difference between a denomination and the test denomination calculated by an algorithm is called the similarity index. Cutoff value is the threshold of similarity index to determine whether the denomination is regarded as not so similar to the test denomination to the extent that it would require further, individual consideration before deciding if the denomination was (sufficiently) different from existing denominations (see Article 20(2) of the 1991 Act and Article 13(2) of the 1978 Act and 1961 Convention).

23. During the process to prepare the selected algorithms with a phonetic layer, it was found that the selected algorithms showed substantially lower performance when applied to the PLUTO database. In particular, the algorithms produced too many denominations that were above the cut-off value for similarity (low precision) (see document CAJ/72/3 "Variety Denominations", paragraph 17).

24. On that basis, the WG-DST, at its third meeting, was invited to consider a new proposal for a next step and its conclusion was reported to the CAJ, at its seventy-second session (see document CAJ/72/3 "Variety Denominations", paragraph 18).

25. The CAJ, at its seventy-second session, noted the following elements from the oral report by the Vice Secretary-General on the third meeting of the WG-DST, held in Geneva on October 2, 2015 (see document CAJ/72/9 "Report on the Conclusions", paragraph 22):

"(a) Members of the Union had been invited, by means of a circular E-15/156 of August 19, 2015, to participate in the second step of the Test Study for the development of an effective denomination similarity search tool. The objective of the second step was to refine the algorithm that had been identified as the best algorithm in the first step of the Test Study. On the basis of the results of the second step, the Office of the Union would refine the algorithm during November/December 2015 and would customize the algorithm by December 2015. The revised algorithm would be reviewed by the WG-DST at its fourth meeting, to be held on February 4, 2016;

[...]."

Results of the second step

26. The WG-DST, at its fourth meeting, held in Geneva, on February 4, 2016, considered document UPOV/WG-DST/4/2 "Report of the WG-DST Test Study and possible use of a UPOV denomination similarity search tool within UPOV".

27. The WG-DST, at its fourth meeting, noted that the response to the second step of the Test Study showed considerable diversity in the number of denominations that were selected as similar and that further investigations had revealed that there was not a very high coincidence in the denominations selected as similar.

28. The WG-DST, at its fourth meeting, noted that a further exercise had been proposed by Circular E-15/291, of December 21, 2015. The WG-DST noted that a summary of the responses to that additional exercise was presented in Annex III and Annex IV of document UPOV/WG-DST/4/2 "Report of the Test Study and possible use of a UPOV Denomination Similarity Search Tool within UPOV".

29. The WG-DST, at its fourth meeting, noted that all the contributors to the second step of the Test Study, and a further three experts, had contributed to the additional exercise.

30. The WG-DST, at its fourth meeting, received an oral report from Mr. Glenn Mac Stravic, Head, Brand Database Section of the World Intellectual Property Organization (WIPO), on the preliminary results of the refinement of the algorithm ("the preliminary results") by using the responses of the additional exercise. Mr. Mac Stravic reported that the preliminary result indicated an improvement of 20 to 30% on the performance compared to the CPVO similarity factor algorithm.

31. In relation to the comparison of the refined algorithm and the CPVO similarity factor algorithm, the CPVO noted there might be some differences between the CPVO similarity factor algorithm used in the CPVO database and that used in the PLUTO database, which could affect the result of comparison.

32. The WG-DST, at its fourth meeting, agreed that it would be useful to check whether any differences existed between the algorithms used in the CPVO database and the PLUTO database. In that regard, the CPVO agreed to provide examples of different results to Mr. Mac Stravic for him to investigate.

Next steps

33. For further assessment and possible improvement of the refined algorithm, Mr. Glenn Mac Stravic suggested that users' experience of the algorithm on seeking similar denominations from the PLUTO database would be useful.

34. The WG-DST, at its fourth meeting, agreed that the next steps should be as follows:

- (a) Prepare a web page to compare the search results for similar denominations by the refined algorithm and the existing search tools in the PLUTO database;
- (b) Invite the members of WG-DST to provide feedback on the performance of the refined algorithm by March 7; and
- (c) Report the feedback at the Working Group on Variety Denominations (WG-DEN), to be held in Geneva, on March 18, 2016, and consider whether it would be appropriate to seek expert customization of the refined algorithm to improve the performance.

35. A web page to compare the search results of the refined algorithm and the existing search tools in the PLUTO database will be created by the end of March 2016, and a circular issued to the WG-DEN inviting experts to assess the refined algorithm and to provide feedback by the end of June 2016.

36. The WG-DEN, at its second meeting, which is anticipated to be organized in conjunction with the UPOV sessions in October 2016, will be invited to consider the feedback received and to consider whether it would be appropriate to seek expert customization of the refined algorithm to improve the performance.

37. *The WG-DEN is invited to:*

(a) *note the developments in the WG-DST;*

(b) *note that a web page to compare the search results of the refined algorithm and the existing search tools in the PLUTO database will be created by the end of March 2016, and a circular issued to the WG-DEN inviting experts to assess the refined algorithm and to provide feedback by the end of June 2016;*

(c) *agree that the WG-DEN, at its second meeting, which is anticipated to be organized in conjunction with the UPOV sessions in October 2016, be invited to consider the feedback received and to consider whether it would be appropriate to seek expert customization of the refined algorithm to improve the performance.*

[End of document]