

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD., and
SAMSUNG ELECTRONICS, AMERICA, INC.,
Petitioners,

v.

CERENCE OPERATING COMPANY,
Patent Owner.

Case No. IPR2024-01267
U.S. Patent No. 9,026,428

**DECLARATION OF JONAS ANDERSSON IN SUPPORT OF
PATENT OWNER'S RESPONSE TO THE PETITION**

I, Jonas Andersson, hereby declare as follows:

1. I am over the age of eighteen (18) years and otherwise competent to make this declaration.
2. I am a software engineer for Cerence AB, and one of the named inventors of U.S. Patent No. 9,026,428 (the “’428 patent”). I make this declaration based on my personal knowledge, educational background, and training.
3. Based on my experience working at Cerence and its predecessors as a software engineer in the field of handwriting recognition research and development from 2001 to 2025, I have been asked to provide to a summary of the top-level architecture for handwriting recognition algorithms, differences in recognition algorithms between different languages, and challenges that exist in attempting to combine recognition algorithms for different languages.
4. With respect to the top-level architecture for handwriting recognition systems, these systems are typically divided into two separate parts. The first is the lower-level character recognition process. This initial character recognition process involves recognizing a stroke sequence under the premise that the sequence represents exactly one single character. This is often called “single character recognition” (“SCR”) and is the process for solving the initial character recognition problem.

5. The second higher-level process attempts to recognize a sequence of strokes that represents one or more characters. This process is often called “multiple character recognition” (“MCR”).

6. One problem to solve for the MCR stage is to identify which strokes start new characters. This is often called “the segmentation problem.” One way to solve the segmentation problem is to do what we call segmentation by recognition. This is considered a robust way to solve the segmentation problem. It means that the higher-level MCR part or engine is using a lower-level SCR engine to recognize multiple possible segmentations of a stroke sequence and then summarizes all the single character recognitions done for each segmentation to see which segmentation has the best sum of single character recognition results.

7. Based on my experience, both the lower-level SCR, as well as the higher-level MCR processes differ substantially depending on the target language being analyzed. While Cerence and its predecessors have handwriting recognition algorithms for the Alphabetic languages (i.e., for recognition of letters in scripts like Latin, to be used for example for the English language) as well as handwriting recognition algorithms for CJK languages (Chinese, Japanese, Korean), Cerence utilizes different engineering teams for each, with each developing different handwriting recognition technologies.

8. For example, the SCR process, where an input stroke sequence is matched against character templates in a database, requires much more strokes to be matched for CJK languages, because there are a lot more characters in the CJK languages than in the English language and each CJK character contains on average a lot more strokes than an English letter. This means that each SCR operation takes a lot more time for the CJK languages than for English.

9. Additionally, because there are so many strokes in each CJK character, there are a lot more possible segmentations in each CJK writing than in English writing. So, in total, an MCR technology that is based on the robust segmentation by recognition strategy would have to do many more and much heavier SCR operations to solve the segmentation problem, i.e. the MCR operation would be much slower for each CJK language than for English language.

10. Indeed, due to the added complexities of a higher-level MCR process for CJK languages, the engineering team working on the CJK handwriting recognition technologies did not fully develop a higher-level MCR process for CJK languages until more than a decade after a higher-level MCR process was developed for Alphabetic type languages, like English.

11. With respect to challenges that occur at the lower-level SCR stage, there can be variances in handwriting style, multiple possible recognition results for a particular input shape, and misidentifications of shapes due to certain characters

having similar stroke patterns. These challenges are exacerbated if attempting to combine multiple language models, which necessarily increases the potential recognition results, as well as the potential for misidentification of characters.

12. With respect to challenges that occur at the higher-level MCR stage, as discussed above, one problem to be solved in the segmentation problem, i.e., identifying when one character ends and another begins. Here, the content, order, and shape of characters entered by the user may vary significantly even for a single language, depending on the user's education, nationality, handwriting style, and the context of the input being received. Thus, MCR models can vary significantly depending on the application, even for a single language.

13. Moreover, as with the SCR stage, these challenges in the MCR stage are exacerbated if attempting to combine multiple language models. For example, in addition to those discussed above regarding additional complexity added to the segmentation by recognition process, different language models would utilize different dictionary or database lookups, different contextual analysis, different formatting assumptions, and different processes for determining whether one recognized character is associated with another.

14. Based on my experience, these challenges existed as of October 15, 2012, which I understand to be the priority date of the '428 patent.

15. In short, handwriting recognition models differ substantially depending on the target language being recognized, including differences in both the lower-level SCR stage (i.e., the initial character recognition stage) as well as the higher-level MCR stage (i.e., the segmentation post-processing stage). This makes combining recognition models for different languages challenging. Due to these differences, Cerence and its predecessors have used different engineering teams in different countries to develop different handwriting recognition models for the different language types.

Case No. IPR2023-00992

U.S. Patent No. 9,369,081

I declare under penalty of perjury that all statements made herein is of my own knowledge are true.

April 24, 2025



Jonas Andersson