

Sound & Voice Analysis

Modelling Confusions in Aircraft Call-signs

Business Challenge

SYS Consulting was asked by National Air Traffic Services Ltd (NATS) to investigate what they perceived as a growing and urgent problem of confusions amongst aircraft call-signs, and to propose a way of automatically assigning call-signs that were unlikely to be confused.

Call signs typically consist of digits and alphanumeric characters which are specific to the flight: for example BAW 602, DAL 41 etc. An aircraft controller may be directing as many as twelve aircraft at any one time and communicating with their pilots on a single radio-telephone link, and these links are often of poor quality. Hence there is potential for confusion if the call signs are similar—and the consequences could be disastrous.

Our Solution & Expertise

Using our knowledge of speech science and expertise in speech technology, we developed software that was able to predict how confusable a particular call-sign would be with other call-signs, and to give a list of call-signs that were best avoided because their potential for confusion was quite high. This took into account factors such as:

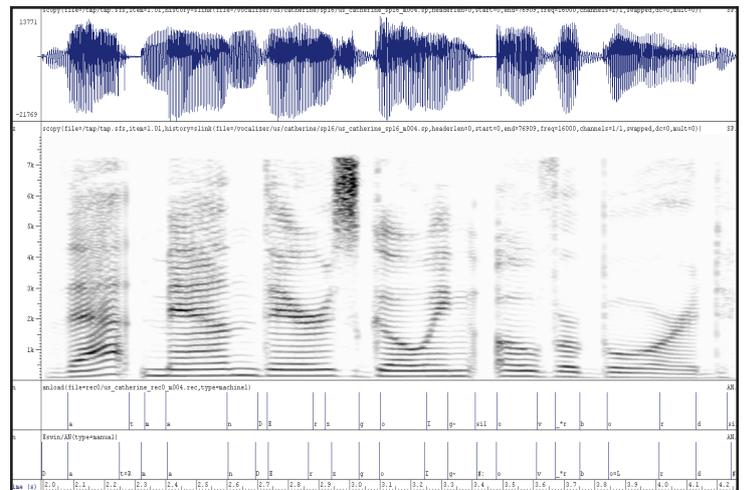
- the vocabulary of competing call-signs;
- the signal-to-noise ratio of the communication link (i.e. the quality of the communication link between the pilot and the controller);
- “co-articulation effects” made by speakers, which are normal in spontaneously produced speech (for instance, enunciating the phrase “five four” as “fie four”).

When we benchmarked the software against a database of actual confusions held by NATS, the agreement was excellent, and our model predicted some specific observed effects, such as words in the middle of groups are more likely to be confused than words at the beginning or end.



Business Benefits

National Air Traffic Services Ltd were able to use this information to improve the assignment of call-signs to aircraft to decrease the potential for call-sign confusion. A possible future development is the development of software that will dynamically create call-signs that have the lowest possible confusion with the call-signs currently under the supervision of a controller.



Above: Representing a speech signal as a pattern enables its characteristics to be analysed automatically.