Speech Recognition – The Adacel Difference

Adacel’s technology is comprised of a multi-tiered software platform designed to improve and augment the effectiveness of existing speech recognition engines for specific application in noisy, high stress environments with demanding grammar and vocabulary constraints. Adacel currently employs commercial speech engines developed by third party providers as its base platform. However, these third party engines, while capable of high word accuracies in controlled test environments, generally prove to be inadequate on their own for advanced simulation and real world command and control applications. Further refinement is required to achieve required performance levels.

Adacel incorporates proprietary techniques and technologies to enhance the capabilities of the commercial speech engines in order to ensure robust, reliable and accurate performance in Adacel’s product applications. Adacel’s speech recognition technology possesses several advantages relative to other offerings, including:

- **Flexible Speech Recognition:** Adacel’s unique software architecture allows its systems to identify and analyze commands regardless of the speed or pattern of speech. As a result, users do not need to artificially modify their method of speaking to suit the software. The Company’s simulation and training systems are capable of identifying commands even if the speaker stutters, hesitates or corrects himself in the middle of a command. The result is a system that allows students to focus on key objectives without unnecessary distraction.

- **No Accent Bias:** Because of the Company’s unique approach to developing its speech recognition software, Adacel’s simulation tools function regardless of the operator’s accent. This capability allows Adacel to market its systems to a wide range of customers without significant modifications or customization.

Arguably the most powerful set of Adacel intellectual property (IP) is that found in Adacel’s proprietary Speech Integrated Development Environment (SIDE). Developed solely by Adacel, SIDE combines a number of speech recognition technologies that permit speech applications to be designed, developed, tested, optimized, deployed and supported faster, cheaper and more robustly. SIDE includes the following unique key capabilities:

- Grammar Development – SIDE provides an efficient interface for developing new grammar. The interface includes comprehensive error detection, with errors being highlighted in real time.
• Dictionary Development – A typical speech engine will contain a dictionary of a few thousand words all of which are typically found in an English language dictionary. However, many aviation terms use words that are not found in the English language, such as, Alitalia the callsign of the Italian National Airline. SIDE will highlight words used in the grammar and automatically suggest a phonetic representation of that word to be added to the supplemental dictionary. Expert users can also create their own phonetic representation.

• Automated Batch Grammar Testing – SIDE permits the automated testing of the developed speech system. Recorded sound files are fed into the recognition system and an accuracy score produced. Rejected phrases are highlighted for further analysis.

• Grammar coverage Query – This function permits the user to enter a phrase to check if it is supported. SIDE will indicate supported phrases, unsupported phrases and partial support giving an indication of where in the phrase the support fails. This tool is especially useful when dealing with customer support queries.

• Phonetic Distance Analysis – Evaluates the grammar and detects words and phrases that are phonetically similar to each other. By identifying these words and phrases early, steps can be taken to reduce and eliminate the errors that they typically cause.

• Perplexity Analysis – Perplexity is the weighted number of choices at any point in a sentence. In our context, the use of a perplexity measure is to predict future performance of a system after a grammar modification: if the perplexity increases, expect performances to degrade.

• Co-articulation Handling -When users enunciate words consecutively and rapidly, they tend to slur them together, a phenomenon known as the “co-articulation” effect. Since the co-articulation occurrences are tied closely to the domain of application, a speech engine vendor is unable to provide co-articulation support. This must be defined by the application developer. One of the most complex tasks for the speech developer is to identify where co-articulation occurs. The creation of these words requires expertise in linguistics, phonology, and morphology to adequately optimize them using the proper set of phonemes for the supported language. Adacel has extraordinary expertise in identifying and creating new combined words in a custom phonetic dictionary. This creation process is greatly facilitated by using the Adacel SIDE tool. In some applications, Adacel has achieved 5% more accuracy just by supporting the co-articulation effect.

Additional Adacel speech IP includes the Command Based Confidence Algorithm, Accent Tolerability Handling, State Based Dynamic Grammar, Press to Recognize Detection, Clipped Audio Recovery Processing and much more.

SIDE has provided Adacel’s engineers with a toolset that has significantly reduced the time taken to develop speech applications. Some functions that may previously have taken weeks to create can now be completed in just hours or minutes.