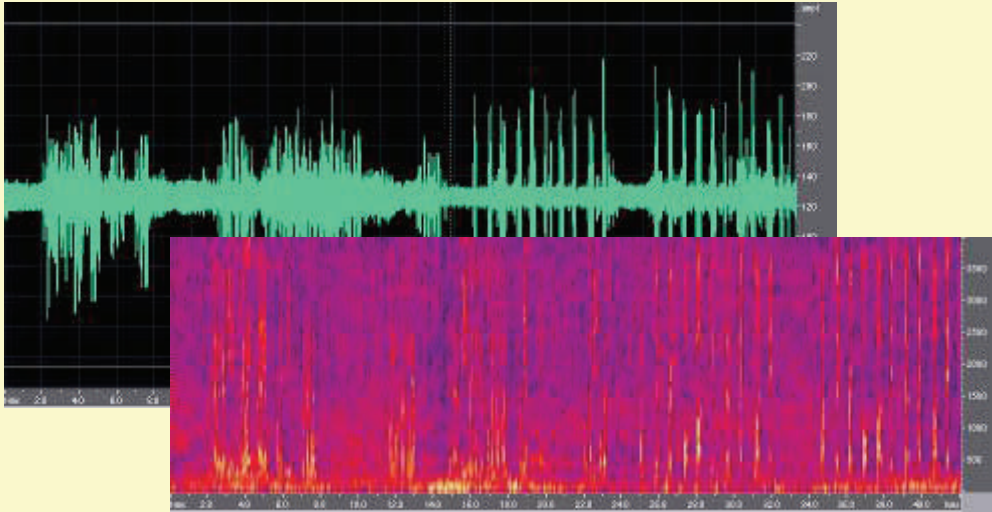


Automatic Speech Recognition

ASR System Forwards Customers To Human Operators



■ **CUSTOMER:**
Tier 1 Wireless
Network Operator

■ **LOCATION:**
Australia

■ **RESULT:**
A substantial
reduction in the
number of calls
referred to a human
operator

The Problem

The customer had set up an automated system to allow subscribers to add credit to their prepaid mobile telephones. Too many of these attempts at topping up credit were ending with referral to a human operator instead of being successfully completed by the automated system. This was costing the customer money in terms of increased call center sizes, customer dissatisfaction and reduced billable minutes.

A subscriber adds credit to their prepaid mobile by dialing a special telephone number and then responding to the voice prompts of the Automatic Speech Recognition (ASR) system. Typically they would respond to message prompts from the system with a “yes” or a “no” or quote numbers such as their credit card details or a menu option.

If the subscriber is having problems with the ASR they can opt to be passed to a human operator to complete the transaction. Alternatively the ASR can automatically forward the subscriber to a human operator if it decides that it is having difficulty understanding the information coming back to it.

Being a leader in the field of voice quality assurance Calyptech was approached by the customer to investigate how the performance of the ASR could be improved.

The Investigation

In order to conduct the investigation Beethoven elements were placed in the customer’s network and test ASR accounts were generated. Interactions with the ASR test accounts were recorded by Beethoven and then modified to introduce various types of typical distortions distortions found in wireless network controls.

Beethoven was then used to play these distorted files back to the ASR. These new interactions were recorded and analysed to assess the sensitivity of the system. Three key areas were identified as causes of concern.

Background Noise

The ASR turned out to be particularly sensitive to background noise. Which had two sources.

The first is the ambient hiss that can be heard when there is silence on the line. This is always there, even when no conversation is taking place. When it is loud enough it becomes difficult for the ASR to determine what valid speech is.

The second source comes from things like busses or cars if the call is being made near a freeway or other conversations that are occurring if the call is being made from an office. These transient noises also cause the ASR to become confused.

“With Beethoven we were able to see things happening in our network that we had never known about...”

Echo

The ASR was also confused by the echoes of the subscribers voice.

Echo is the speech that comes back after the original utterance. There are two major dimensions to echo; its volume and how long it takes to come back. In the network it is the job of an Echo Canceller to remove this echo. Unfortunately there are many sources of echo within a telecommunications network and if it is not sufficiently removed the ASR can become confused.

If a loud enough echo comes back that is sufficiently delayed the ASR thinks that another command has been entered by the subscriber or another digit in their credit card spoken.

Front End Clipping

The customer's ASR turned out to be particularly sensitive to front end clipping.

Front end clipping is where the start of an utterance is removed by some active element in the network. The echo canceller does this when it removes echo from the conversation. It nullifies the echo but also a small part of speech as well.

This is generally not noticed by a human but in the case of the customer's ASR it was quite detrimental and caused the system to miss commands and credit card digits.

The Results

Calyptech produced a set of recommendations based upon the results obtained that when implemented by the customer resulted in substantial reduction in the number of calls forwarded through to human operators by the ASR and the subscribers themselves. Subsequently the customers call centers could reduced their staffing levels.

The recommendations included the provision of specialized voice enhancement equipment and the re-tuning of current echo cancellation equipment.

The specialized voice enhancement equipment contains advanced noise suppression elements to minimize both the transient background noise and the background hiss. It also contains echo cancellation equipment to further reduce the amount of echo getting through to the ASR.

The echo cancellation equipment is re-tuned to reduce the amount of front end clipping.

Beethoven Voice Quality Assurance Solution

The Beethoven Voice Service Assurance solution gives you a scalable, configurable set of hardware and software components that fully instrument your network to assure the quality of the voice service. Beethoven offers a customizable suite of voice monitoring and analysis capabilities that enables you to optimally manage and control your network from a customer experience perspective.

You save money by quickly identifying and resolving issues resulting in increased network reliability, and a reduction in the cost of maintaining the high level of service demanded by end customers and regulatory authorities.

Increased revenues result from reduced customer churn through better customer service management, and higher customer satisfaction.

About Calyptech

Calyptech is leading electronic product development company, offering turnkey product solutions and complete outsource design services to a diverse global client base in a range of industry segments including Semiconductors, Networking, Telecommunications, Consumer, Defence and Medical applications. For more details visit www.calyptech.com.