



New Artificial Intelligence Technology from Smart Action Transforms IVRs into More Capable Virtual Agents

Both internal and outsourced contact centers are under increasing pressure to cut costs while improving customer service and sales effectiveness. Neither of the two options most commonly used to meet these goals—foreign sourcing, and automation with IVRs—has consistently delivered on the promise of improved user experience at lower cost.

Users have typically perceived foreign customer service as inferior, and often it has not resulted in the expected cost savings. On the other hand, the inability of IVRs to understand natural language and customer intent with a high degree of accuracy frequently causes high levels of customer frustration, low call completion rates, and poor returns on investment. ***A cost-effective solution that offers the best features of human agents and automation is desperately needed.***

Smart Action has taken a fundamentally different technological approach than traditional speech IVRs to meet this need. Its Virtual Agents are powered by artificial intelligence, which enables enriched caller experiences and less costly applications that can be deployed and modified much more quickly than those of other automated systems. As a result, SmartAction Virtual Agents offer enterprises a consistent and effective way to achieve the “Holy Grail” of serving customers’ needs quickly, effectively, and at low cost, while increasing sales potential.

Development History

The artificial general intelligence (AGI) technology that powers Virtual Agents was developed by Adaptive A.I. Inc.—Smart Action's parent company—over a period of 7 years. After developing an intelligent system with the general ability to learn, adapt to, and execute many high-level applications, the Company focused on commercializing automated personal assistants. These assistants exhibited a wide range of natural language-based web, IM, and email capabilities, which involved learning, short- and long-term memory, and other cognitive functions.

The Company then narrowed its focus to supplying hosted Virtual Agents to handle calls that currently require human operators. Unneeded features were removed and the system was re-engineered to bring it up to full commercial standards of performance and reliability. The Company acquired deep expertise in speech recognition technology, integrated it with the intelligence engine, and upgraded it substantially to effectively recognize phone-quality speech input. This technology now powers Virtual Agents at a growing number of customer sites.

The Technology

Each Virtual Agent is essentially a clone of our proprietary artificial general intelligence engine—an artificial “brain”—whereas practically all other automated conversation systems are based on application-specific scripts or programs (see Figure below). SmartAction Virtual Agents are the only automated speech solution currently available that combines a general intelligence engine with the most advanced speech recognition technology. This combination enables sophisticated, high-value applications to be developed faster and at much lower cost than other automated speech IVRs. The features of the AGI brain and related system enhancements that enable superior performance are described in more detail below.

The intelligence engine ***features a large vocabulary and array of built-in skills and knowledge*** that is constantly enhanced. These include a large vocabulary of synonyms, phrases, hyponyms, negation, ordinals, etc.; general and specialized name and number capture; disambiguation and clarification skills; repeat, help, go back, wait, and other flow control handling; external system interface routines; and much more. These conversational capabilities are inherently available to all new applications and do not have to be specially scripted or coded. This leads to lower cost, faster implementation, and a richer conversation experience.

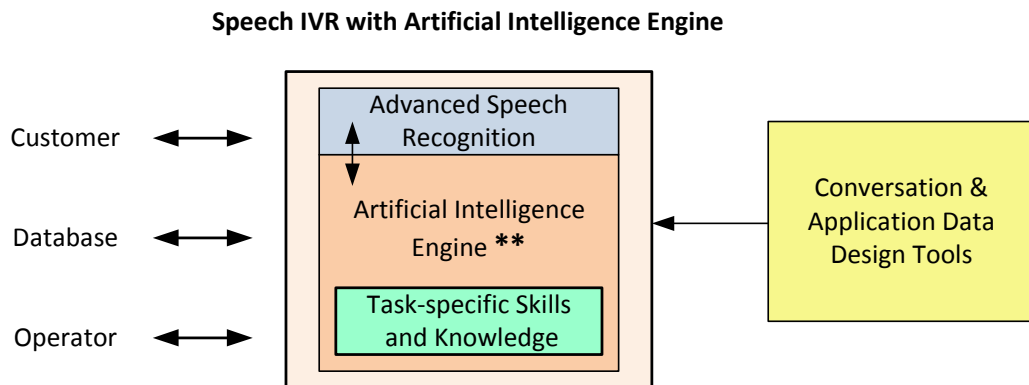
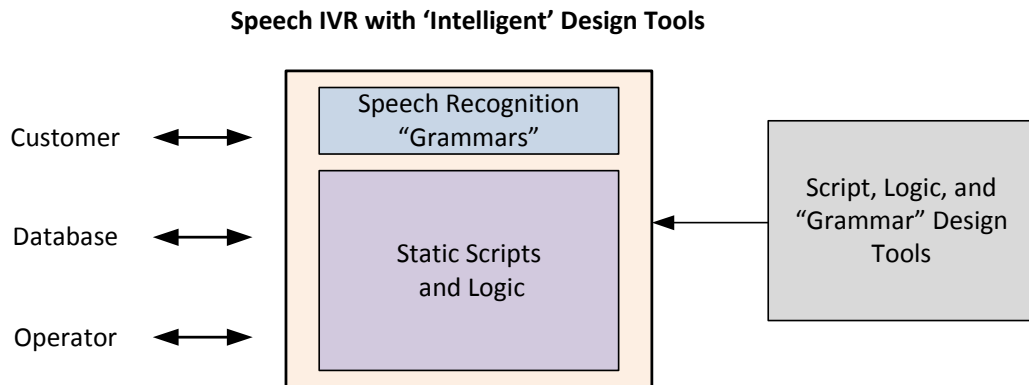
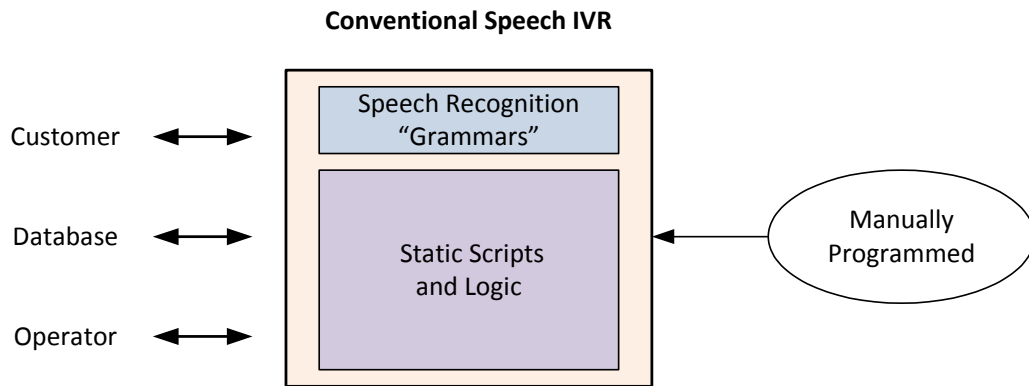
The “brain” ***can be trained with relevant customer-specific information***, including custom data and business rules that are then used in recognition, disambiguation, conversation flow, and reasoning.

The intelligence engine ***dynamically adapts to conversation flow in real time***. Unlike conventional systems, the brain-based approach enables dynamic adjustments to conversation flow based on context, user-specific information, responses given, user knowledge, or company-specific situations (such as out-of-stock or special promotion situations).

The “brain” ***provides significantly improved speech recognition and interpretation***. The system's brain evaluates multiple hypotheses produced by the speech recognition engine and selects the most likely interpretation given the current context. It can also contextually adjust the speech engine to better recognize anticipated responses. Furthermore, built-in language and logic capabilities help to interpret the user's meaning.

The intelligence engine ***possesses both short- and long-term memory***. The brain's short-term memory keeps track of prior conversation flow, and previous information and rejections provided (“I'm 18 and single”, “No, 18, not 80”). Long-term memory identifies previous callers, remembers facts from previous calls, and allows for the continuation of interrupted calls.

Comparison of Speech IVR Technologies



** Includes natural language capabilities, general knowledge & skills base, short & long-term memory, disambiguation & inference logic, and other abilities.
Deep integration between speech recognition engine and AI engine.

The AGI engine **acquires most custom, application-specific knowledge and skills by being taught** or trained, instead of needing to be programmed like conventional systems. This substantially reduces development costs, errors, and debugging requirements.

The brain **incorporates improvements from any new applications as well as R&D upgrades and shares them with all customers**. Conventional contact center automation has to be custom-developed individually for each customer or specific vertical market. The Smart Action approach allows flexible reuse of the AGI brain's adaptive capabilities in an endless variety of new applications. This also automatically offers customers three paths to increased functionality, and thus improved user experience, call retention and completion:

- Customer-specific tuning and improvements
- Generalized improvements from all other customers that are incorporated into core brain functionality
- Ongoing R&D improvements to AGI technology, including both the system's brain as well as other features of our Virtual Agents.

In addition to the AGI Brain, a variety of **related system features** also contribute to the more effective performance of Virtual Agents.

All Virtual Agents utilize top-of-the-line Nuance Tier 4 **natural language, speech recognition technology**. This is the only "open speech" (Statistical Language Model), natural language speech recognition system currently available. Very few companies in the world offer it and virtually all implementations are in very large, expensive projects. Furthermore, in these cases they usually only handle initial call routing ("How can I help you?"), and *not* other parts of the conversation. Because the AGI engine includes a natural language parser and inference logic, it can recognize open speech throughout the conversation. This enables a more pleasant, natural, and robust user experience.

Virtual Agents use the highest quality TTS (text-to-speech) technology commercially available. Unlike pre-recorded prompts, **TTS software allows the system to dynamically generate and personalize speech** for each user. This feature not only improves the user experience by having the conversation personalized, but also allows for much more complex interactions and rapidly changing requirements.

Deep integration between the speech recognition engine and the AGI engine enables superior speech responsiveness (faster and more natural) and better recognition accuracy. The ability to do "streaming recognition" is an important proprietary innovation that arose as a byproduct of this integration.

Smart Action has developed **powerful tools with script and function libraries to create and modify customer-specific conversation** flows. They are designed to automate the validation of application specifications, to optimize Virtual Agent skill reusability, and to help automate quality assurance. The

bottom line is faster, cheaper deployments and changes. These tools together with the AGI engine make it cost effective to service smaller customers with complex requirements.

To improve equipment utilization and reliability, Smart Action uses dynamic agent allocation with a high level of redundancy. The design also allows for “hot” application upgrades with no down time.

The combination of AGI engine with top of the line speech recognition and numerous other enhancements enables performance that exceeds the capabilities of the most sophisticated contact center automation—and at a significantly lower cost. In many cases, especially for small to medium-sized enterprises, the lower cost alone makes the substitution of human operators financially feasible.

More importantly, the existing technology provides a solid foundation for rapid ongoing improvements. In the next few years, the Company will incrementally add back advanced cognitive functionality developed earlier as well as develop additional capabilities. This ongoing R&D effort will allow Smart Action to handle ever more complex contact center conversations, and expand into other higher capability agents.



Smart Action is a new company redefining the future of self-service automation with a new solution that combines breakthrough technology with can-do no-excuses customer service.

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