

An Overview of MightyVoice Pro Systems

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Abstract In this paper, we introduce our product, MightyVoice Pro. It is application based on Korean natural language speech recognition combined with isolated command speech recognition. We will explain how MightyVoice Pro works with existing software of the personal computer and enhances the usability. Then, demonstrate the process of improving usability by reflecting opinions of actual users.

1 Introduction

MightyVoice Pro is Korean dictation software. It is designed to promote benefit of disabled people as part of QoLT (Quality of life technology) national project (2010 ~ 2014). Typical feature of MightyVoice Pro is creating and editing documents with speech recognition. But the goal of MightyVoice Pro is to enable the most of PC's function with several voice commands for who cannot use their hands because of disability. This is the distinction of the existing products. During the 4 years of developing, we improved the accuracy rate of speech recognition and reduced the response time in near real-time. And we also designed new method in user interfaces such as 'Voice Mouse', 'Voice Keyboard', 'Show-Number' etc.



Fig. 1. Technologies of MightyVoice.

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2 Document creating and editing

The most important feature of MightyVoice is creating and editing documents with only voice command and narration. To speed up user's task, it switches input mode to command mode automatically when it does not need dictation. For its efficiency, MightyVoice overlooks windows and maintain only essential words for using activated application to minimize the vocabulary size.

2.1 Movement of input cursor

To fix typo when you finished to type sentence or paragraph, you would move input cursor to the word. Generally, it can be done by selecting the word and moving by 1 character right or left with saying "오른쪽으로" /o.ru-n.c`o.gu-ro/ , "왼쪽으로" /e+n.c`o.gu-ro/ as using direction keys in keyboard.

2.2 Reuse of speech recognition result candidates

While dictation goes on, it would produce dozens of speech recognition candidates in every words and sentences. MightyVoice keeps them until another dozens of new voice for dictation input come. It can be used to speed up correction task. In many cases, the correct word would appear in the candidates. MightyVoice provides the user interface for choosing correct word in candidates.



Fig. 2. Quick correction window using candidates.

2.3 Typing syllable with speech

There are 1700 of different syllable pronunciation in Korean, but there are 3700 of syllable letter in Hangeul. Because there can be several syllable letter in same pronunciation. Naturally, the accuracy rate of speech recognition for monosyllable is relatively low. So, it is essential to use 10-best or more recognition candidate to choose in second stage of voice recognition. Of course, it may need to repeat until aiming syllable come out. MightyVoice perform third stage of recognition for choose homonym syllable, and it reduces the number of repeat monosyllable speech recognition.

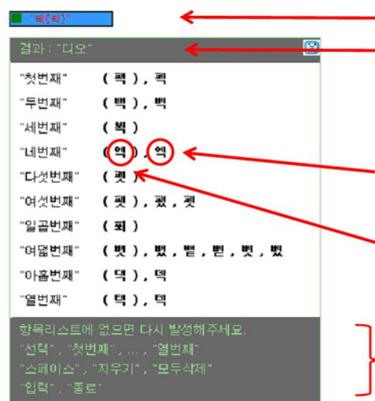


Fig. 3. Syllable typing window.

3 Voice Interface

In common operating environment in graphical user interface, you may operate your computer with shell application as Explorer, and mouse to select menu or launch required applications. MightyVoice utilize such computer inherent visual response with Voice Launcher, Voice Mouse, and Show Number. This voice user interface consist with familiar single features is intuitive enough for users to master it quickly.

3.1 Voice Launcher

Voice Launcher is the feature of MightyVoice that makes possible to launch pre-registered application by voice command. MightyVoice also provide the Voice Launcher manager window for registering applications to launch with speech

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command. In Voice Launcher manager window, it is possible to register application item with only speech recognition. Most of the launcher commands are digit type, and it is for launching and also registering.



Fig. 4. Voice Launcher.

3.2 Voice Mouse

Voice Mouse is the feature of MightyVoice that makes possible to use all the mouse operations with only speech command.

3.2 Show Number

Show Number is the feature of MightyVoice that masking over the UI elements such as menu, button, editor, checkbox, tree, link, etc. Saying the digit of mask will be the meaning of click operation on designated area. Just a couple of voice command can move desired webpage when you use the Show Number feature in web surfing.

4 Customization

MightyVoice can apply customized mic gain and users voice characteristics. Proper microphone gain is very important for accuracy and performance. User can

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easily tune up the microphone gain with Mic Wizard. If you want to improve the accuracy of speech recognition, it will be very helpful that making your profile trained with your voice and applying it to MightyVoice's speech recognition engine. The Profile Manager feature provides easy user interface to compile user's voice for training acoustic model. And it makes profile only for specific user. And there is Tutorial that makes user learn the main functions step by step, without reluctance.

4.1 Profile Manager

Speaker adaptation tool learn the user's utterance characteristics on speech recognition engine.

4.2 Mic Wizard

Automatically adjusts the microphone input gain for the best speech recognition performance. Microphone input gain adjustment is simply done by repeating given utterance 3 ~ 4 times.

4.3 Tutorial

This help program explains main feature to help you learn step by step, without reluctance to MightyVoice.

5 User feedback for MightyVoice Prototype

Through the cooperation with the National Rehabilitation Center, we could get the real Physically handicapped users' feedback. The results are summarized in the table below.

These show an average 76% of satisfaction. They were generally satisfied with the features of the input mode (dictation). However, the accuracy rate of speech recognition was considered as things to be improved. Majority of the users offered more than 200 \$ (approx.) as fair consumer price of MightyVoice.

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Table 1. Physically handicapped users' feedback.

Speaker	Satisfaction (%)	Best function	Worst function	Extra features
Kim 01	70	Voice Mouse	Show Number	Mouse diagonal movement
Park 01	70	Phoneme Mode	Undo	Stability
Seo 01	70	Edit Mode	Voice Mouse	Multiple clearing
Jung 01	100	Input Mode	Accuracy Rate	Support far talking mic
Kim 02	40	Input Mode	Edit Mode	User command support
Bae 01	90	Voice Launcher	Input Mode	Noise robustness
Seo 02	90	Input Mode	Accuracy Rate	Convert between numeric and syllable
Song 01	70	Show Number	Accuracy Rate	Consonant string search
Lee 01	80	Show Number	Accuracy Rate	Remote controlling with smartphone

6 Conclusion

In this paper, we described the major features of MightyVoice and examined the potential commercialization. MightyVoice has been developed to integrate various type of speech recognition technology and design of user interface, for the purpose of full and easy control of PC by especially physically handicapped user's speech recognition. Before long, MightyVoice will be equipped with accuracy rate improved speech recognition technology. In addition, this product would be more essential to physical handicapped person.

References

1. DIOTEK, "The user manual of MightyVoice", 2014
2. DIOTEK, "Questionnaire of advisory in National Rehabilitation Center", 2013