

Implementation of interactive Stock Trading System Using VoiceXML

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Abstract: In this paper, we design and implement practical application service using VoiceXML. And we suggest new solutions of problems can be occurred when implementing a new systems using VoiceXML, based on the fact. Up to now, speech related services were developed using API(Application Program Interface) and programming languages, which methods depend on system architectures. It thus appears that reuse of contents and resource was very difficult. To solve these problems, nowadays, companies develop their applications using VoiceXML. Advantages of using VoiceXML when developing services are as follows. First, we can use web developing technologies and technologies for transmitting web contents. And, we can save labors for low level programming like C language or Assembler language. And we can save labors for managing resources, too. As the result of these advantages, we can reduce developing hours of applications services and we can solve problem of compatibility between systems. But, there's poor grip of actual problems can be occurred when implementing their own services using VoiceXML. To overcome these problems, we implemented interactive stock trading system using VoiceXML and concentrated our effort to find out problems when using VoiceXML. And then, we proposed solutions to these problems and analyzed strong points and weak points of suggested system.

Keywords: VoiceXML, Stock Trading System, Implementation, Speech Recognition

1. INTRODUCTION

VoiceXML is a kind of mark up language using XML which was proposed by W3C to overcome the limits of HTML [1]. Advantages of using VoiceXML when developing services are as follows. First, we can use web developing technologies and technologies for transmitting web contents. And, we can save labors for low level programming like C language or Assembler language. And we can save labors for managing resources, too. As the result of these advantages, we can reduce developing hours of applications services and we can solve problem of compatibility between systems [2].

For the reasons mentioned above, many companies use VoiceXML when developing their application services. But, there's poor grip of actual problems can be occurred when they use VoiceXML and their solutions. To hold information on these problems in common, we implemented stock trading system using VoiceXML and discovered some problems which occurred during implementing systems and running implemented services. We described several discovered problems and suggested their solutions in the following chapters.

2. CONFIGURATION OF TRADITIONAL INTERACTIVE STOCK TRADING SYSTEM

Fig 1 shows configuration of traditional interactive stock trading system. In this configuration, service customers used DTMF (Dual-Tone Multi Frequency) as a user interface. And, for the prompt message, recorded wave files were played for the instruction. In this configuration,

we can catch the problems for flexibility and adaptability between systems. If service providers want to change their service scenarios, they have to recompile hard coded software. And, if they want to change prompt messages for the instruction, they have to change recorded wave files. These facts brought about lacking in adaptability of managing services. Also, service customers feel inconvenient, too.

Nowadays, for the convenience of service customers, more convenient user interfaces are provided. For instance, service customer's voices are used as a user interface as well as DTMF. Still and all, in this configuration, if we check the systems in view of the fact that flexibility and convenience of management, there's some problems. Consequently, in this paper, we have implemented newly designed interactive stock trading system using VoiceXML. We detected some problems occurred when implementing new systems using VoiceXML. And we have solved these problems using suggested techniques.

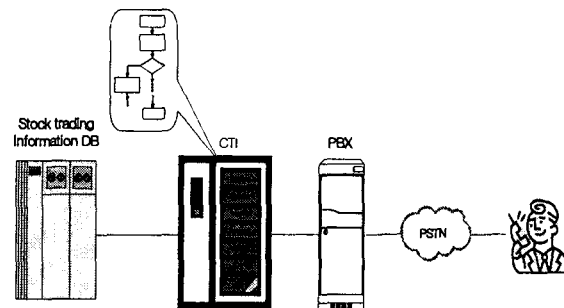


Fig. 1. Configuration of traditional interactive stock trading system

3. IMPLEMENTATION OF INTERACTIVE STOCK TRADING SYSTEM USING VOICEXML

3.1. Generalized configuration of interactive system using VoiceXML

Fig 2 shows generalized configuration of interactive system using VoiceXML. In this configuration, the VoiceXML gateway is composed of three parts, that is to say, VoiceXML interpreter part, speech recognition part and synthesis part [5].

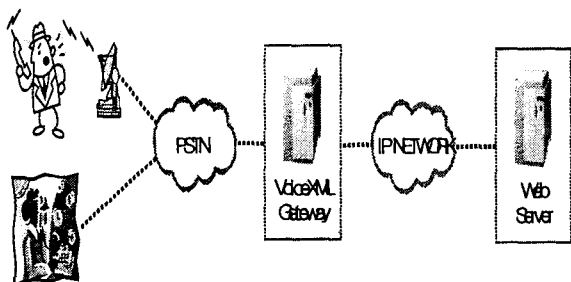


Fig. 2. Generalized configuration of interactive system using VoiceXML

Fig 3 shows hierarchical configuration of interactive system using VoiceXML [5, 6 and 8].

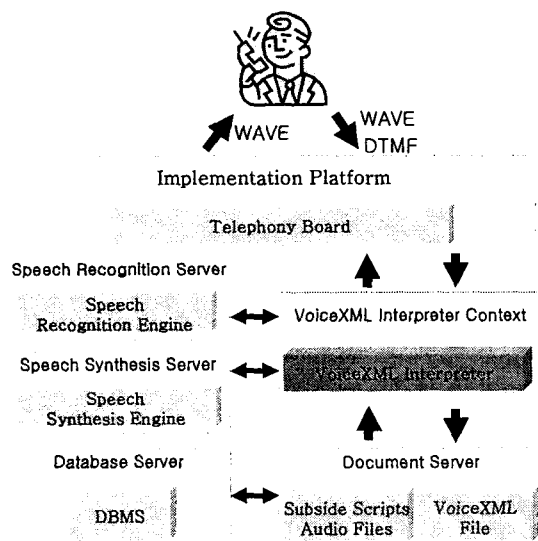


Fig. 3. Hierarchical configuration of interactive system using VoiceXML

3.2. Implementation of interactive stock trading system using VoiceXML

In this paper, we have implemented interactive stock trading system. And then, we carried out an operation and control test to solve problems which are mentioned above.

3.2.1. Configuration of implemented stock trading system using VoiceXML

Fig 4 shows configuration of implemented interactive stock trading system using VoiceXML. We used "Dell precision workstation" as a stock trading system server and used Dialogic 41JCT/LS board.

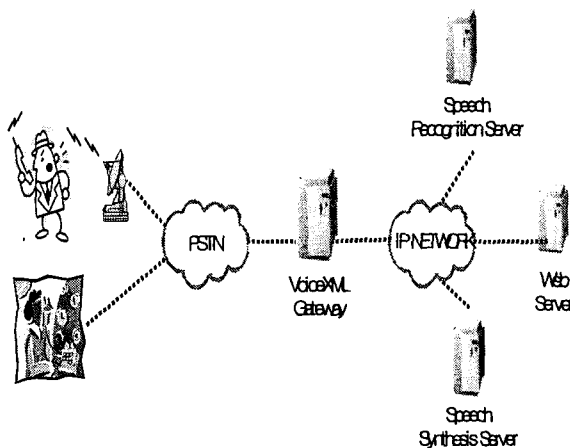


Fig. 4. Configuration of implemented interactive stock trading system

We detached speech recognition server, speech synthesis server and web server from VoiceXML gateway for the convenience of management. Our purpose is not implementing VoiceXML gateway but getting grip of actual problems and solving problems which can be occurred during implementation of systems using VoiceXML. So, we used VoiceXML gateway which was developed by Korea Telecom (Huvoice 1.0). Using this product, we adjusted several parameters for our system. And we also used ASP for effective linkage of implemented database. We itemized VoiceXML files and ASP files for the purpose of convenient use. We provided user interface to operator through IP network for the purpose of managing service scenarios. As a result, operators whoever knows VoiceXML can modify service flows as well as service developer, at any time, at any place, through IP network.

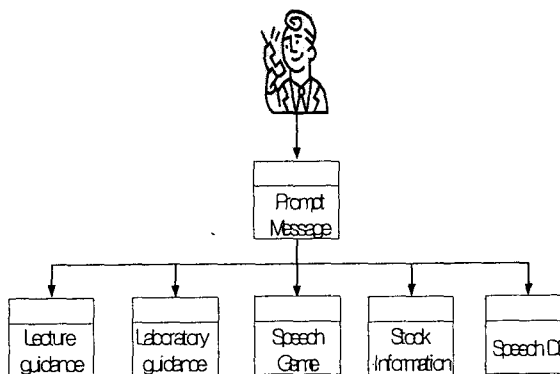


Fig. 5. Outline of implemented services

Fig 5 shows an outline of implemented services on the system and fig 6 shows log in process for stock trading service on the implemented systems. As shown in fig 6, if the customer enters wrong ID or password more than 3 times, log in process will be stopped and all dealings in the account will be stopped for the safety of the account. Our system is open to members only. As shown in fig 6, members can use stock trading market data after log in process.

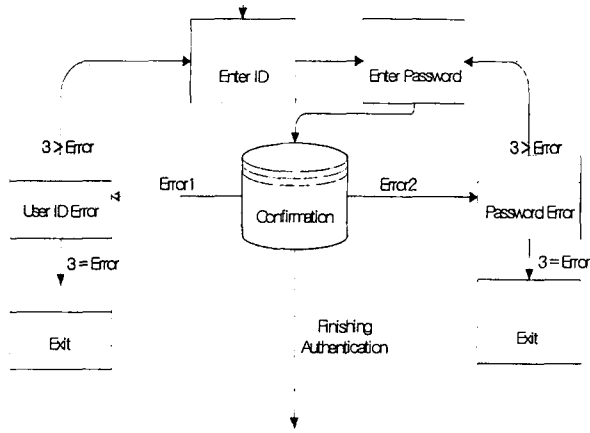


Fig. 6. Log in process for stock trading system

Fig 7 shows the flows of customer's account inquiry process. If members want to inquire information about their accounts after log in process, our system check the number of their registered accounts to our system. After that, if the customers who have finished log in process have plural number of accounts, they will be notified to enter account number which they want to inquire.

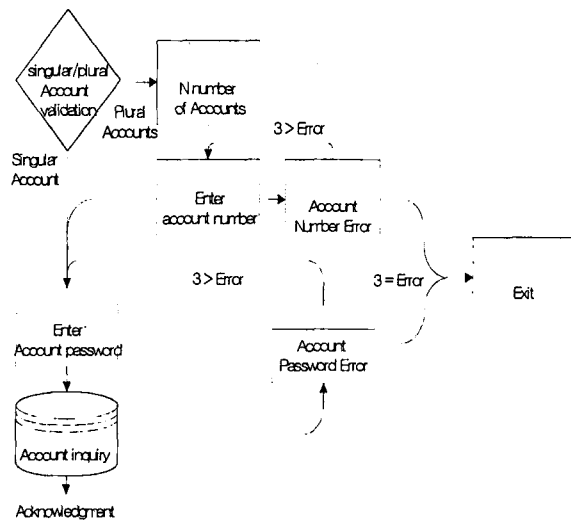


Fig. 7. Flows of customer's accounts inquiry process

Fig 8 shows overall flows of implemented stock trading service. As shown in fig 8, if customer calls to implemented system, the customer will be notified to enter log in ID and password. After login process, several indices (KOSPI, KOSDAQ and so on) prompt messages are informed. Customers can select different kinds of service using their speech at the menu guidance stage.

3.2.2. Features of implemented stock trading system using VoiceXML

We detached service scenario part from VoiceXML gateway separately, for the purpose of changing service scenarios using web interface. In this configuration, service operators can modify service scenario promptly without service developer's help, if needs of changing service scenarios occurred. Fig 9 shows web-user interface

windows. Using this window, service operator can change service scenario at any time, at any places, if they want.

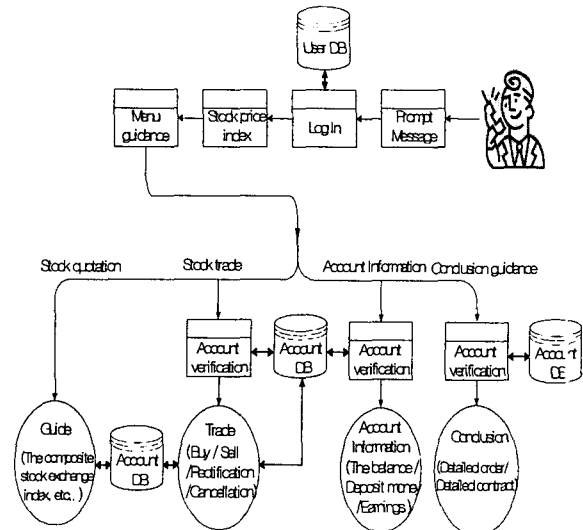


Fig. 8. Overall flows of implemented stock trading service

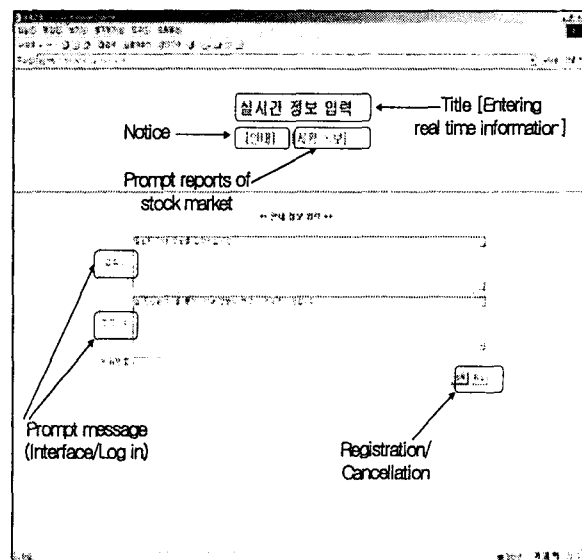


Fig. 9. User's interface window through web

4. ANALYSIS OF IMPLEMENTED SYSTEM

In this paper, we implemented stock trading system for listed stocks and analyzed implemented system. Key notes of this paper are not implementing VoiceXML gateway but getting grip of actual problems when using VoiceXML. In this chapter, we summarize the results of recognition test for 850 of listed stocks through PSTN. After that, we describe actual problems which have met when implementing system using VoiceXML and suggest several solves for those problems.

4.1. Recognition results

To assess validity of the implemented system, 7 men and 3 women involved test. Persons who have involved in test used wired and wireless phone. Table 1 shows conditions of recognition test.

Table 1 Conditions of recognition test

	Through Mobile N/W	Through PSTN	Total
Men	3	4	7
Women	1	2	3
Total	4	6	10

Each person utters the name of 850 of listed stocks through PSTN (or mobile network). The list of listed stocks was printed on papers and was given to each speaker. All the lists of listed stocks are consists of 9 pages. If first speech was recognized correctly, the speaker utters next item on the list. But, if first speech was not recognized correctly, the speaker utters the same item continuously till 3 times.

Table 2 shows results of recognition test on implemented system. As shown in table 2, the results of recognition rate are increased as pages go by. This result comes from that speakers adapt themselves to implemented system as time goes by.

Table 2 Results of recognition rate for 850 of listed stocks

Page Number	Recognition rate - Men (%)			Recognition rate - Women (%)		
	1 st Trial	2 nd Trial	3 rd Trial	1 st Trial	2 nd Trial	3 rd Trial
9-1	93.6	95.6	96.6	64.2	85.2	93.3
9-2	95.2	96.7	99.0	91.5	95.5	97.5
9-3	94.7	96.7	98.5	99.0	99.5	100
9-4	92.5	96.2	97.7	89.0	96.0	97.0
9-5	96.5	98.7	99.5	90.5	97.5	97.5
9-6	97.5	99.5	99.5	94.5	98.0	99.0
9-7	98.2	99.2	99.2	99.0	100	100
9-8	94.7	98.0	98.7	97.5	99.5	100
9-9	97.7	99.5	99.5	93.6	99.1	99.1
Average	95.6	97.8	98.7	90.9	96.7	98.1

Following chapter describes actual problems, which have been occurred when implementing VoiceXML system, and suggests their solutions.

4.2. Actual problems and their solutions

While implementing stock trading system, we have found several problems and solved. The first problem which was found is crash between VoiceXML gateway and web server for saving files and moving files. This appearance frequently occurred when using multiple loop structures. If we want to do repetitive actions in an operation and control test, this problem occurred very often. To solve this problem, we have used ASP with VoiceXML simultaneously.

Second problem which was found is increasing loads. In proportion to increased customer, the loads of system were increased alarmingly. We have solved this problem using parallel processing. We implemented VoiceXML interpreter server, speech recognition server, speech synthesis server on different servers.

Another problem which was found is delay time from customer input to system prompt. This appearance is caused by multiple stage of implemented system. If we compare traditional interactive stock trading system with the system using VoiceXML, we can find that there are so

many stages in VoiceXML system. We solved this problem using mental method and technical method. We inserted background music in the pages which are suspected to be delayed. Along with this management, we used contents expiration options of those web servers, simultaneously.

5. CONCLUSIONS

According to vitalizations of using internet, various kinds of acquired facts are stored to database. Customers can use these acquired facts at any time they want. But, traditional methods of using these databases need essential hardware equipment, e.g. computer, leased line, a monitor, software and so on. Speech services using telephony network currently provided by service provider are formed difficult to use these databases and difficult to change service scenarios, if operator doesn't have expert knowledge about those systems.

But, if we use VoiceXML when implementing interactive systems, we can use, easily, previously stored database. Moreover, we can use existing database on the internet for the various types of new services. In spite of these importance of using VoiceXML, there's poor grip of problems can be occurred when using VoiceXML. For the revitalization of using VoiceXML, knowledge about problems can be occurred when using VoiceXML and their solutions should be hold in common knowledge more and more.

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