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Aural Concentration Game (Pelmanism)

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ABSTRACT

Many intelligent and sophisticated video games using video and audio have been developed and provided as edutainment. Even so, there are very few video games which visually impaired person can play. A game system for music education is developed by using sounds only. The game is based on a concentration game (Pelmanism). Virtual sound cards are used instead of the trump cards and several kinds of chords are used as sound materials in this game. Both visually impaired and visually normal person can learn music chords by enjoying this game.

I. Introduction

There are few video games on PC for a visually impaired person who is difficult to get information from display. An aural concentration game (pelmanism) can entertain the visually impaired person with sound only, and a visually normal person also can enjoy the game. Additionally, music dictation, chords, chord progression, melody, rhythm and so on as sound materials will be used for this game. The main goal of this game is to acquire musical education naturally with enjoying, because these materials are essential to develop musical ability.

II. Generic rule of the concentration game

The concentration game uses cards or other graphic cards and is played two persons under ordinary circumstances. Generic rules are as follows,

1) Turn cards face down and mix them up and spread them.
2) Select two cards and turn up them.
3) - If two cards are same, a player succeeds to make a pair and continue to play.
   - If two cards are different, a player puts them back (cards face down) and switch with a next player.
4) Repeat 2) and 3) until there are no more cards in play area. Eventually, a player who gets cards more than the other player wins the game.

III. Structure of the aural concentration game

We express cards by aural information without using cards drawn numbers or pictures in this study. We call these cards "virtual sound cards".

A. Operation of the game

The virtual sound cards are set on two places (A area and B area). Each area has randomly placed seven cards in pairs. A player chooses a card and listens to a sound from each area. Rule is the same as generic rule, except a player chooses a card from each area. Flow chart of this game is shown in Figure 1.

In addition, virtual sound cards are drawn on display prior to start of the game for convenience. When the game starts, the pictures are cleared.

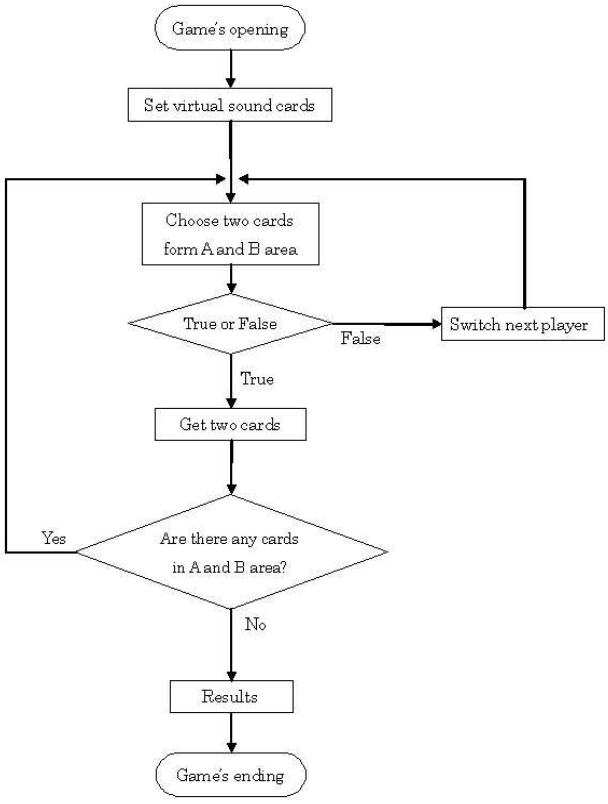

Figure 1. Flow chart of the aural concentration game

B. Operation of keyboard

Players only use a keyboard in this system. F key and J key on keyboard have a protrusion, there for player can grasp the key positions. The protrusion on the key enables operation of the game without visual information. We make full use of the characteristics, which means that keys on the left side of F key (A, S, D, W, E, R) are virtual sound cards in A area, keys which are located on the right side of J key (K, L, U, I, O, P) are virtual sound cards in B area, similarly. Keys that are used in this game are shown in Figure 2.

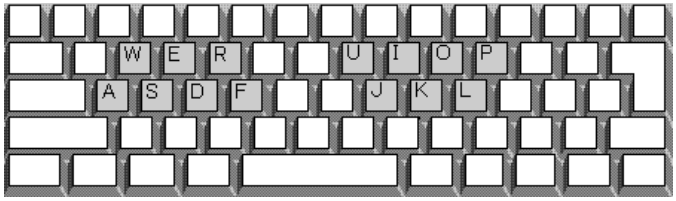

Figure 2. Keys used in the aural concentration game

IV. Sound materials

Sound materials used in this game are created based on music theory to get elements required for music education. The sound materials that have six groups are shown in Table 1. At the beginning of the game, difficulty level of this game is changed depending on the group of player's choice.

A area and B area are same register (root : C) in Group 1. A area and B area are different register except C in Group 2. Register of Each chord is different in group3. Area A and area B are same register. (root : C) in group 4. Area A and area B are different register except C in Group 5. Register of Each chord is different in Group 6. Group 1, 2 and 3 are composed of triad and four notes chord (seventh chord). Group 4, 5 and 6 are composed of four notes chord only.

Table 1. List of the sound materials

Group	Area A	Area B
Group 1	C	
	Cm	
	Cdim	
	Caug	
	C7	
	Cm7	
	$Cm7^{(5)}$	
Group 2	C	C
	Cm	Am
	Cdim	F dim
	Caug	Daug
	C7	F7
	Cm7	G m7
	$Cm7^{(5)}$	$D\ m7^{(5)}$
Group 3	C	F
	Am	E m
	Gdim	Bdim
	Faug	Daug
	F 7	A 7
	Em7	Fm7
	$F\ m7^{(5)}$	$Am7^{(5)}$
Group 4	C7	
	C9	
	F dim7/C	
	CMaj7	
	Cm7	
	$Cm7^{(5)}$	
	CmMaj7	
Group 5	C7	C7
	C9	D9
	F dim7/C	Adim7
	CMaj7	FMaj7
	Cm7	G m7
	$Cm7^{(5)}$	$D\ m7^{(5)}$
	CmMaj7	F mMaj7
Group 6	C7	E 7
	G9	B 9
	Adim7	F dim7
	AMaj7	D Maj7
	D m7	F m7
	$D\ m7^{(5)}$	$F7^{(5)}$
	FmMaj7	F mMaj7

V. How to play this game

There are two patterns of how to play by the number of players. Here are concrete steps of the game.

A. In case of playing alone

1) Select difficulty level
2) Place virtual sound cards 7 each in A area and B area.
3) Select a virtual sound card in A area.
4) Select a virtual sound card in B area.
5) - If two virtual sound cards are same, the cards disappear.
   - If two virtual sound cards are different, the cards stay in.
6) Alternate between 4) and 5).
7) The game ends when all virtual sound cards disappear in A area and B area.
8) Show number of steps by the end of this game.

B. In case of playing with two players

1) Select difficulty level
2) Place virtual sound cards 7 each in A area and B area.
3) Player A selects a virtual sound card in A area.
4) Player A selects a virtual sound card in B area.
5) - If two virtual sound cards are same, player A gets 1 point and the cards disappear.
   - If two virtual sound cards are different, the cards stay in.
6) - If player A got point, player A does 3) and 4) again.
   - If player A didn't get a point, player B does 3) and 4) next.
7) Alternate between 4) and 5) by player A and player B.
8) The game ends when all virtual sound cards disappear in A area and B area.
9) Determine whether player A or player B won the game by their points.

In case of playing with two persons, when a player pushes a key, this system reads out the key's name.

VI. Trial of this game

In the trial, music chords of group 1 that are shown in Table 1 were used. 5 visually normal persons tried playing of this game 5 times. They received a brief aural explanation about sound materials and key operation. We got each player's steps and the average until the end of this game as a result. The result is shown in Table 2.

Table 2. Result of the game

	1	***2***	***3***	***4***	***5***	***average***
Player A	19	10	21	21	19	18
Player B	16	11	11	19	15	14.4
Player C	16	18	11	17	13	15
Player D	14	17	14	17	19	16.2
Player E	20	12	26	16	23	19.4

VII. Discussion

As a result, average of players was within 20 steps. All of player's steps were up and down. But every player made an effort to memorize chords. We need to correlate a chord sound with a chord name for players. We suggest making a function that this system reads out chord name after playing a chord sound. We can expect to learn the effect of the chords by this improvement.

Some players said that they are hardly to understand what property of the chords that used in this game. Group 1 and Group 4 are easy to understand because a pair of virtual sound cards is same sound. A pair of virtual sound cards of other groups is different. Therefore, it is necessary to explain sound materials in each group. They also said there are few sound materials. Even so we will develop the contents of music dictation, chord progression, melody, rhythm and so on as sound materials.

VIII. Conclusion

Aural concentration game has a very minimum of function. Therefore, we have to add new function that player can enjoy.

We have to provide a relevant explanation of the sound materials for players. Player can challenge higher levels when player completes easy levels. These functions give feedback to player and inspire motivation in player.

In this study, we developed the aural concentration game for the purpose of furthering music education of visually impaired and visually normal person. We are planning to get results of this game that played visually impaired person for the future.

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