

Analysis of the ball fall point in table tennis game

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Abstract: During a table tennis game, coaches give players some advice, based on their experience rather than objectivity. In this research, objective data are used to analyze the advice given to players. Coordinate data of the ball fall point in a National University Table Tennis Tournament, held in April of 2008, are analyzed with the help of a video camera. Attack and defensive patterns are analyzed, allowing weak points to be clarified. This research aims to extrapolate objective advice to the advice given by the coach from experience.

Keywords: Table tennis, Sequence of pitches pattern, Strategy, Ball fall point

1. INTRODUCTION

In a table tennis game, when coaches give players advice, they often advise the players using their experience, rather than by analyzing objective data. After recording the content of a game, and doing the statistical analysis, researchers think that it is important to examine the content of the game. Especially, in American football, previous games are analyzed in order to think about strategy. However, in a table tennis game, when the coach gives the player advice, he rarely uses objective data. As a characteristic of table tennis, it is necessary to record and add up the game data fast, so it is thought that the lack of time may be a problem. However there is some research that has actually done game analysis of table tennis. From the research done by objective analysis and subjective analysis, it is said that the basic material [1][4][5][6][7] of the training project plan clearly shows information such as the ball trajectory time, distance, speed, etc. However, according to recent research, the analytical method of tactics of table tennis can not be used directly in table tennis games because there are many problems in data collection and data analysis. The present study analyzes the data collected from an official university student tournament held in April 2008. In the present study the coordinate data of the ball fall point are analyzed for the attack and defensive pattern and weak points are clarified. Later, the result of data analysis can be added to the advice based on the coach's experience, in order to give even better advice to players.

2. MATERIALS AND METHODS

1.1 Analyzed subject: The analyzed subject was a male player from Niigata University Table Tennis Club. This player's ball fall point data in all games he performed in North Shinetsu National Championship tournament was analyzed. This player was chosen because he won his 5 games in the tournament and got the first place.

1.2 Data acquisition process: Using a video camera to record the 5 games, the following points were considered.

- (1) The point to identify the fall area from a high position in the auditorium.
- (2) The point for taking video from the right rear so as not to disturb the optical axis of the camera with which we take the video of the fall area as shown in Figure 1.
- (3) As the flow of the game is important, there is a need to record from beginning to end without stop.

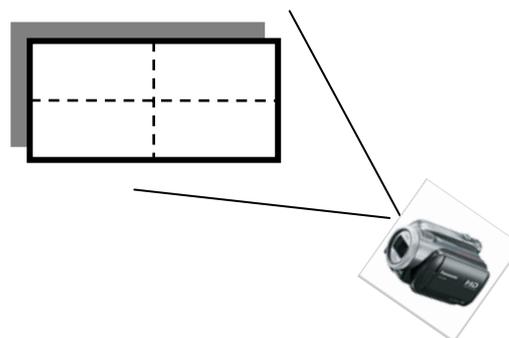


Fig. 1 Filming direction

1.3 Methods of data analysis: According to the order of the player and opponent, we use alphabet capital letters to identify them. The player is A, and the opponents from 1st to 5th games are B, C, D, E, F, respectively. Then we divide each side of the table to 9 equal parts, and so the table has 18 blocks. In a game, the data where the ball bounded were collected. Every block was designated with a number from 1 to 9 on each side of the table tennis court. The block where the ball bounced was sampled for data analysis. For example, in Fig2, the game players are A and D, the first fall point block is 7 when D serves, and the second fall point block is 5 on the other side when D serves, so the fall point block is 7 for A to receive and for B’s third ball. A missed the fourth ball as a result the route of fall point is 7-5-7-7. This method is repeated in all games, and so all the player’s winning and losing routes during the game can be analyzed.

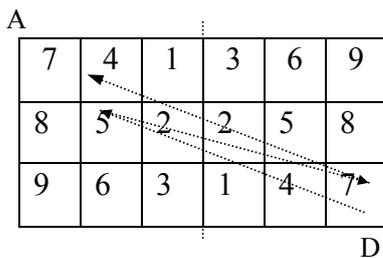


Fig. 2 Example

3. RESULTS AND DISCUSSION

At first, we analyzed the number of rallies that the player hits the ball at every play for each game. From Fig3 we can see that the play ends before or on the fourth ball on 80% of the games, which means only 20% of them have a fifth ball. According to this result, we can see that the most important part of the game is held up to the fourth ball. Table1 shows that the higher level the player has, the more plays involved in the game. The player won the championship, so this data can show us the playing characteristics of a high level Japanese college student. This research analyzed the data of correlation between the ball from service to the fourth ball and winning.

Table 1 About rally in each game

Match	Game match (game)	To forth ball	After fifth ball	Sum
AvsB	3	36	4	40
AvsC	3	39	9	48
AvsD	3	51	12	63
AvsE	3	54	8	62
AvsF	5	60	17	79
Sum	17	214	51	292

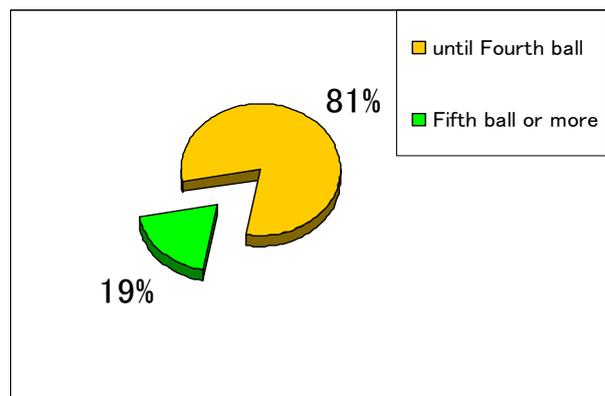


Fig.3 The rate games up to forth ball and longer then fifth ball.

3.1 Review of Player A and Player B.

Fig.4 shows there are 20 balls which A served including 8 misses when receiving by B. This is because B could not forecast the circumrotation of the ball which is served by A, and further more there is only 2 balls that can insist to the fourth ground in which A served. It also means B could not forecast the circumrotation of the ball which is served by A, even though B got the ball A served, it also a chance for A.

Fig.5 shows that in the 19 balls which B served, on only 3 he scored. In contrast, A got 19 scores from serving. All of these facts mean B’s level is lower than A’s. In those games, the necessity of tactical analysis is not so great.

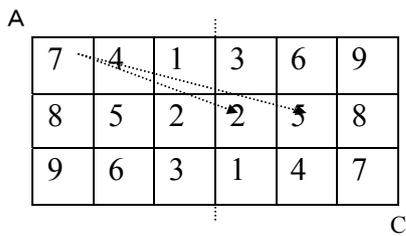


Fig. 7 Score pattern when player A was at service and got an advantage

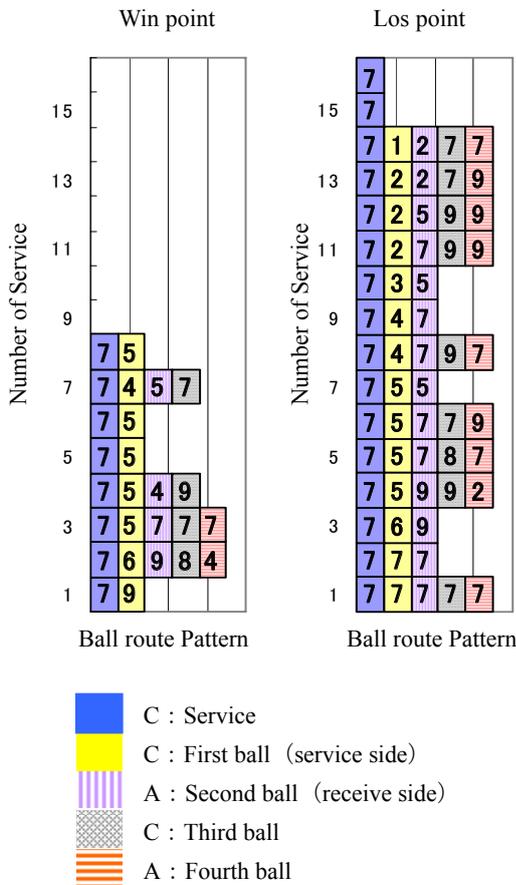


Fig. 8 Getting and Losing score when player C was at service.

3. 3 Review of Player A and Player D.

Fig.9 shows that A served 26 of the 31 balls on block 5 and took the advantage. We also see that although A didn't take advantage in route 7-5-9(Fig10), he had a great advantage in both routes 7-5-7(Fig11) and 7-5-5(Fig11), so it's good for D to use the route 7-5-9(Fig10).

From Fig.12 we can see D had a disadvantage when D served ball in block 4 and so A can use the route 7-4-7 to get an advantage. Oppositely, block 8 is an advantage for D as can be seen by the third ball of D. It is better for D to serve the ball on other blocks except block 4, or forecast the route 7-4-7 and hit the third ball onto block 8.

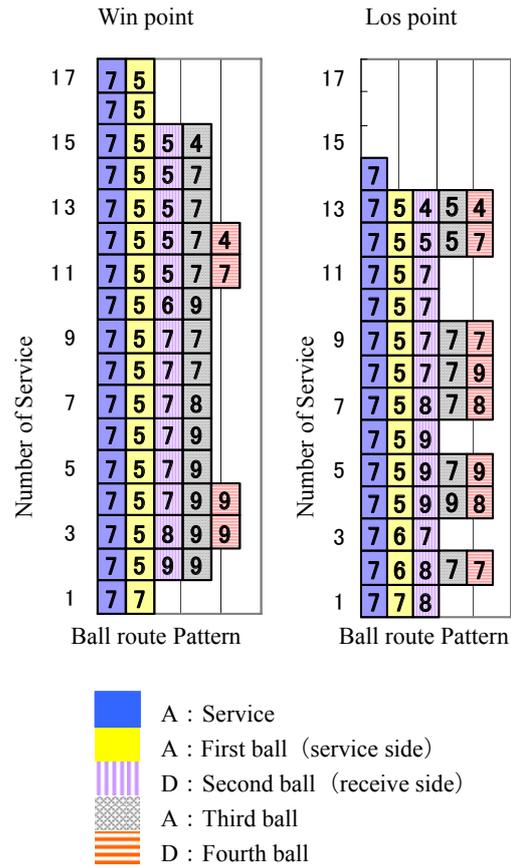


Fig. 9 Getting and Losing score when player A was at service.

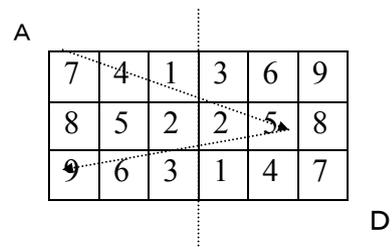


Fig. 10 This route was an advantage to D.

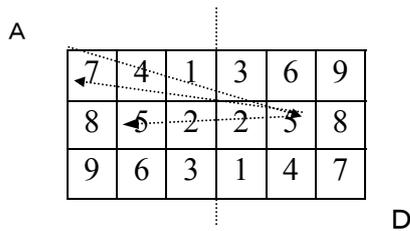


Fig. 11 This route was an advantage to A.

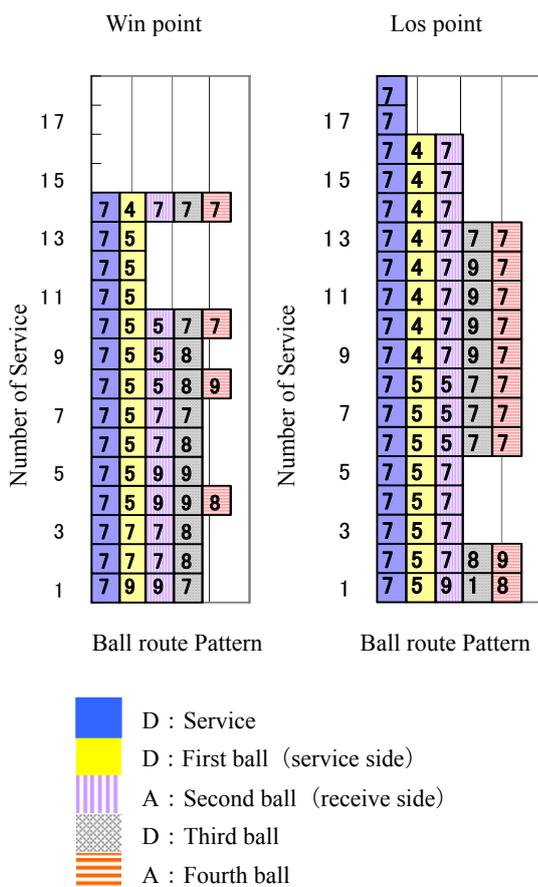


Fig. 12 Getting and Losing score when player D was at service.

3.4 Review of Player A and Player E.

Fig.13 shows that A served the ball around block 5 and took the advantage. However, he could only score once out of the 7 times at services that have fall points in block 3 or 4. Hence if A increases the fall point in block 7 and block 9, and then decreases the fall point in the block 4 and block 3, the situation would be better for A.

Fig.13 also shows that although the block 5 made A have a disadvantage, the block 9 and block 7 are good for A. In other words, E's receiving should use area around the block 5 instead of block 9 or block 7 as often as possible. Another result seen from Fig.13 is that the third ball is an advantage for A, whereas the fourth ball made by E in block 7 is a disadvantage for A. So E could take the advantage if E's receiving were around block 5, and the fourth ball are always close to block 7.

Fig.14 shows that it would be advantageous for A if E's service is in block 5 or block 7, especially use the route 7-7-9(Fig15). However, according to the third ball by E, block 8 is advantageous for A, but block 7 and 9 are not. So it is possible for E to take advantage if he can avoid to using block 7, or forecast the route 7-7-9(Fig15) and hit the third ball onto block 7 and block 9.

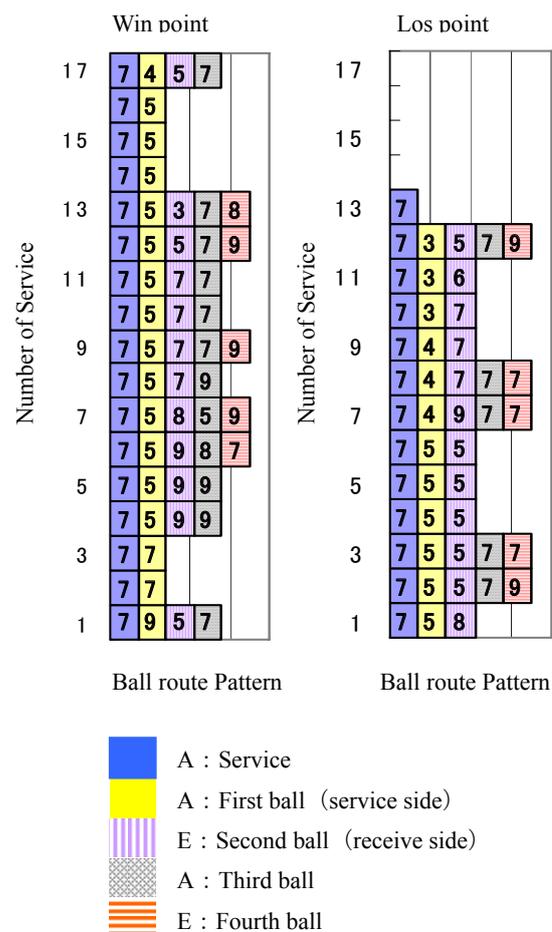


Fig. 13 Getting and Losing score when player A was at service.

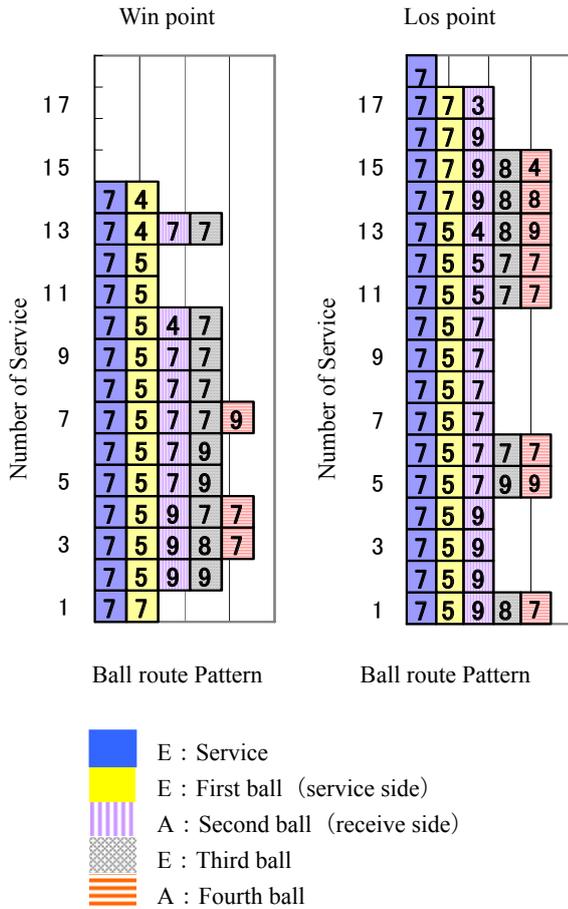


Fig. 14 Getting and Losing score when player E was at service.

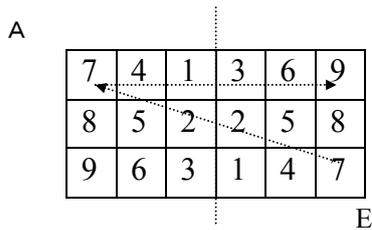


Fig. 15 This route was an advantage to A

3.5 Review of Player A and Player F

Fig.16 shows that A served the ball around the block 5, and A took advantage in route 7-5-7(Fig17), but had a disadvantage in both routes 7-5-8(Fig18) and

7-5-9(Fig18). Hence F should use the routes 7-5-8 (Fig18) and 7-5-9(Fig18) and avoid to using route 7-5-7 (Fig17) to let him take advantage.

Fig.19 shows that A received the ball around block 7 and took advantage in the game. A got most scores through route 7-7-7(Fig20) and 7-5-7(Fig21).

Fig.19 also shows that F's third ball's fall points are around block 7, 8 and 9. Although F gets the advantage in block 8 and block 9, he take disadvantage in block 7 which has most of third ball's fall point. The above results show that if F forecasted the route 7-7-7(Fig20) and 7-5-7(Fig21), and then make his third ball's fall point around the block 8 and 9, it might be advantageous for F in a game.

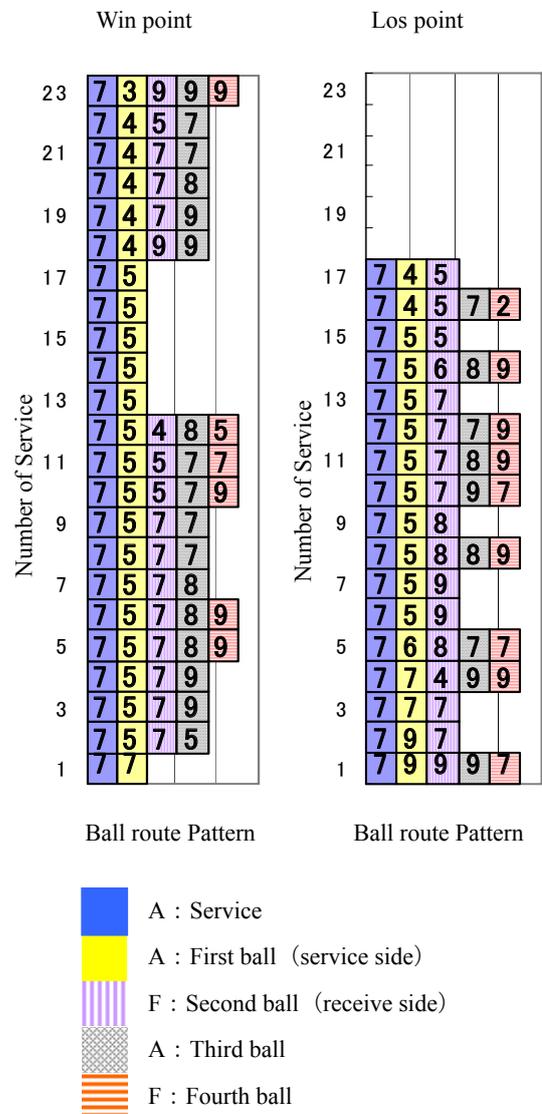


Fig.16 Getting and Losing score when player A was at service.

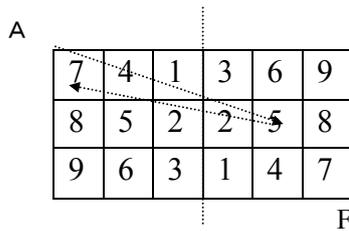


Fig. 17 This route was an advantage to A

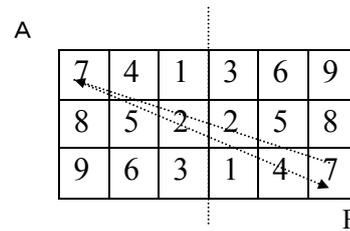


Fig. 20 This route was an advantage to A

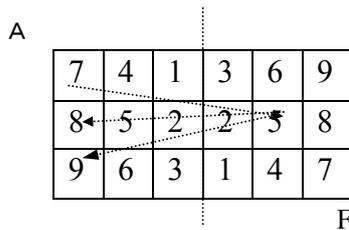


Fig. 18 This route was an advantage to F

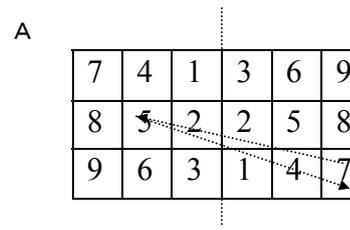


Fig. 21 This route was an advantage to A

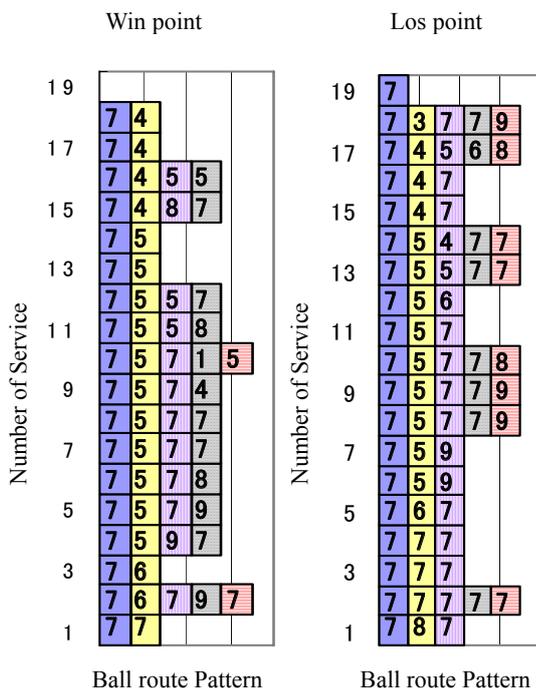


Fig. 19 Getting and Losing score when player F was at service.

4. CONCLUSION

This research concerns the routes of the ball in table tennis games. This research has college student games as an object of study. From the results we see the differences between winning score routes and losing score routes of players. We give the possibility to use the data about getting score routes and lost score routes of players to give them correct advice. Recently, we can only focus on the analysis of the routes of whole game to help to win a game. It is also very necessary to focus on every game and do some research about practicability. Moreover, designing a practical analysis system to record the fall point instantly that can be used during the game is also necessary.

REFERENCES

[1] T. Kuraki, *Table Tennis for the Coach: III Table Tennis for Becoming a Champion*. Fumito, 1995.
 [2] Y. Ushiyama, and K. Yoshida, "Computer use for Table Tennis Coaching," *CIEC Computer & Education*, vol. 5, pp. 91-96, 1998.
 [3] N. Ashida, M. Miyaki, K. Takashima, T. Azuma, T. Isomoto, and H. Turuta, "Data Accumulation

Method in Table Tennis Competition using Computer,” in *Conf. Japan Society of Physical Education, Health and Sports Science*, Sep. 10, 1989, pp. 653.

- [4] Z. Shi, “Rerecognition for characteristic of Table Tennis tactics,” *Table Tennis World*, vol. 11, 2007.
- [5] J. Kasai, and others, “Game Analysis for men’s single final game in World Table Tennis Championships,” in *33rd Conf. Japan Society of Physical Education, Health and Sports Science*, 1987, pp. 272.
- [6] J. Kasai, and others, “Analysis of Top Table Tennis Players’ Tactics,” *Japan Society of Physical Education, Health and Sports Science, Science Research Report, No.2: Research on the Competition Power in Different Competition Categories*, pp. 117–121, 1989.
- [7] K. Yamada, and K. Yoshida, “Difference between Subjective Evaluation of Service Receive, and Offensive of Third Ball from Service,” *Sports Method Research*, vol. 13, No. 1, March, 2000.