

24 The design and implement of a software system for analyzing technical – tactics of table tennis match

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1 Introduction

Currently there are few computerized decision support system that allow head coaches to gather match information in real time about players' technical – tactical actions (technical – tactical gestures and technical – tactical conducts). During training and competition, head coaches must take technical and tactical decisions based on his intuition and experience without the support of technical – tactical data. For this reason, it is important to develop computerized decision support system for the analysis and evaluation of quantitative and qualitative elements both in and after the training and competition. In the last decade, some computer programs which have tried to analyze players' actions in collective sports have been marketed, for example Data Training Basketball and Data Volleyball. The first programs provide support for the head coach's work by managing the databases of exercises and making a theoretical analysis of the training programmed by the head coach. The second software system is useful for making statistical studies of the actions performed during match play, but focusing on the indicators that can be easily quantifiable (points, blocks, attack, etc.). However, there are few computerized decision support system that are famous in quantitative process (collecting and analyzing technical – tactical scenario data in more detail), especially for table tennis match.

The Chinese national team has built a database system for analyzing the main opponents in the Olympic Game by storing variety of opponent's information. Nearly 50,000 pieces of records has been entered into database and provided as much supports as possible for the head coaches, players, and researchers. A huge success has been achieved by using that database information system. Chinese players swept up the gold medals in the 27th Olympic Games in Sydney, Australia, after doing the same in Atlanta in 1996. However, this information system only demonstrates ability on information supporting, not on technical and tactical analyzing.

Looking for a method to analyze technique and tactic of table tennis, A. Baca and R. Baron propose a valuable model that orients structure and process of the match. Taking advantage of this model, a temporal evolution of the match may be described. This approach has been successfully applied to table tennis (e. g. Boguschewski et al. ,1994, *Tischtennis Lehre*, 8 (1), 5 – 8). It has therefore been selected to analyse and improve the behaviour of players of the Austrian national and youth national team.

The paper is structured as follows: After a short introduction about the ideal and rule of system design in Sections 2, the function and the methodology are demonstrated in Section 3, where different approach for technical – tactics analyzing are discussed. In Section 4, a match analysis example is outlined to support above study. Section 5 summarizes and concludes this paper.

2 Technical Tactics Collecting

Two aspects that influence system performance are technical – tactics collective and analysis. In next two parts, a script descriptive language called Table Tennis Descriptive Language (TTDL in short) and technology for analyzing match is demonstrated respectively. The first is for data collecting and the latter is for analysis.

2.1 TTDL syntax and Application

TTDL have tow types of sublanguages, the Action Based Notation (ABN in short) and the Technical – Tactics Based Notation (TTBN in short). Each sublanguage represents a precise syntax with a composition of the 4 phase code. In the following part TTDL syntax and some application will be introduced.

2.1.1 Action Based Notation

Some of characters of code have to follow the program terminology; others may be customized according to the coach or scout – man needs.

Therefore, a code may assume the format in figure 1 and figure 2:

Mode of Skill

Model of Skill represents the way a sport man performs skill. For example, if a right hand person attacks a ball in right side then the mode of skill is Rright.

Skill

The second part of the code is reserved to the definition of the skill. As you may see, it has been used a table tennis jargon. Following enlisted are the table tennis skills allowed by Five Stars and their respective code;

SZ. *(i)*

Starting zone is considered generally the zone of the court where a shot has

been performed, thus identified by a number. Five – Star subdivides the table as 9 zones. 6 zone in table and 3 out as figure 2 – 1 shows.

RZ

The receiving area of the shot is mostly used in the scouting of the attack trajectories and those of the services. It requires great scouting rapidity and, therefore, is not advisable in the learning phase of the program. This aspect of the scouting process can be simple or complex, depending on the capacity of input and above all the trainer’s technical requirements.

In according with above syntax Five – Stars

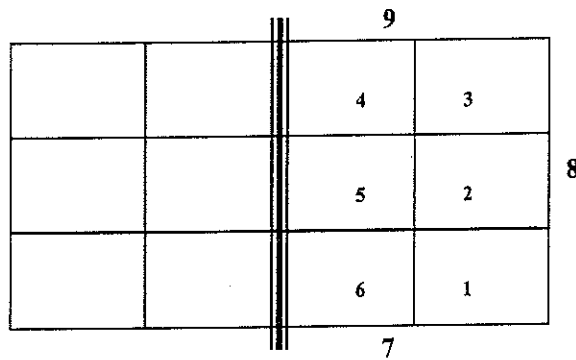


Figure 1. Zone arranged in table

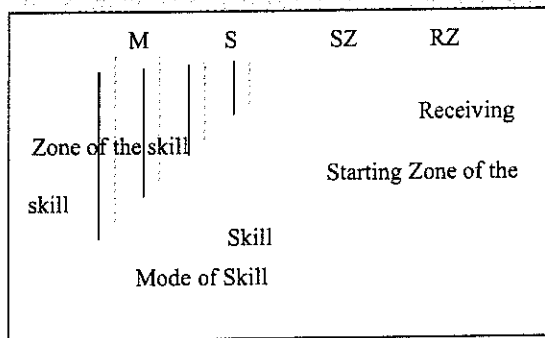


Figure 2. Syntax structure

2.2 Technical – Tactics Based Notation

Liking ABN, the TTBN describes technical – tactics characteristic still with 4 phase code. Some of them follow table tennis terminology, and some may be customized in according with the coach or scout – man needs.

Therefore, a code may assume the format in figure 3.

There are three different kinds of application model, serve – attack, receive – attack and attack – attack. For example, a typical application model of serve – attack is demonstrated as figure 2.4.

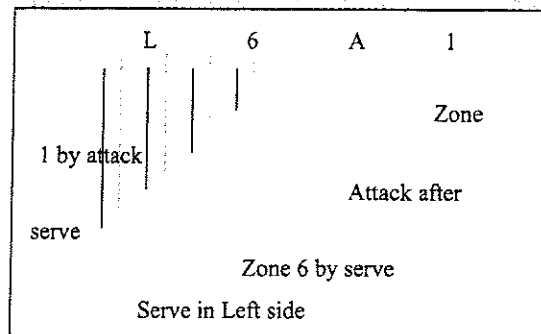


Figure 3. The format of the code

3 Technical – Tactics Analysis

In addition to traditional statistical method such as total, sum, average and max etc, further analysis allows user to know where the skills have been performed and where they have been received or ended. Obviously, to obtain these charts, you have to scout starting and receiving zones also. In order to analyze the performance, two kind of chart are employed, one called point chart and another named line chart.

4 Conclusions

Based on above ideas, a software system called Five Stars for analyzing technical – tactical data of table – tennis competition is designed. The characteristics of this software system are as follows.

Head coaches can use Five Stars to achieve and analyze information both in and after the training and the competitions

To quickly and massively collect technical – tactical data of the match, a coding system called Table Tennis Script Description Language (TTDL in sort) was designed. By using the SDL, the service, receive, and final action of a rally of the match can be described and collected. Not only the action but also the corresponding line of ball flying and the point of ball dropping can be expressed. Base on the collected data, the performance of a player or a pair of players can be analyzed in more details.

Many advanced technical measures of data analysis have been used. In addition to traditional statistical method (total, sum, average and max etc), a new data analysis technology called Data Mining have been used. By comparing the relative actions in each rally, some new technical – tactical patterns can be figured out so that the head coach can make accurate inter – active decision in real time.

Advanced video technique has been used to collect and analyze technical – tactical data. By embedding a video player the operator of Five Stars can quick-

ly input active script without moving his eye away from computer screen. Not only for data collection but also for analysis, it can replay a specific scenario of match that is indicated by head coach. For example it can replay all service actions in a rally if only the head coach enters an instruction.

In order to test the fitness of Five Star, some test suits have been executed. The test result shows the TTDL can better describe all technical – tactical actions, and the speed of operator collecting data can be specialized by two or three practice, and the analysis effect can be better enhanced by visual descriptions (picture and video).