TenniVis: Visualization for Tennis Match Analysis

（背景）Existing research efforts into tennis visualization have primarily focused on using ball and player tracking data to enhance professional tennis broadcasts and to aid coaches in helping their students. Gathering and analyzing this data typically requires the use of an array of synchronized cameras, which are expensive for non-professional tennis matches.

（工作）In this paper, we propose TenniVis, a novel tennis match visualization system that relies entirely on data that can be easily collected, such as score, point outcomes, point lengths, service information, and match videos that can be captured by one consumer-level camera. It provides two new visualizations to allow tennis coaches and players to quickly gain insights into match performance. It also provides rich interactions to support ad hoc hypothesis development and testing.

（评估）We first demonstrate the usefulness of the system by analyzing the 2007 Australian Open men’s singles final. We then validate its usability by two pilot user studies where two college tennis coaches analyzed the matches of their own players. The results indicate that useful insights can quickly be discovered and ad hoc hypotheses based on these insights can conveniently be tested through linked match videos.

iTTVis: Interactive Visualization of Table Tennis Data

（背景）The rapid development of information technology paved the way for the recording of fine-grained data, such as stroke techniques and stroke placements, during a table tennis match. This data recording creates opportunities to analyze and evaluate matches from new perspectives. Nevertheless, the increasingly complex data poses a significant challenge to make sense of and gain insights into. Analysts usually employ tedious and cumbersome methods which are limited to watching videos and reading statistical tables. However, existing sports visualization methods cannot be applied to visualizing table tennis competitions due to different competition rules and particular data attributes.

（工作）In this work, we collaborate with data analysts to understand and characterize the sophisticated domain problem of analysis of table tennis data. We propose iTTVis, a novel interactive table tennis visualization system, which to our knowledge, is the first visual analysis system for analyzing and exploring table tennis data. iTTVis provides a holistic visualization of an entire match from three main perspectives, namely, time-oriented, statistical, and tactical analyses. The proposed system with several well-coordinated views not only supports correlation identification through statistics and pattern detection of tactics with a score timeline but also allows cross analysis to gain insights.

（评估）Data analysts have obtained several new insights by using iTTVis. The effectiveness and usability of the proposed system are demonstrated with four case studies.

FencingVis: Visualization and Visual Analysis of Tactics in Fencing

Visualization of technical and tactical characteristics in Fencing

（背景）Fencing is a sport that relies heavily on the use of tactics. Different fencers have different technical characteristics, and reasonable tactical use can help a fencer to win the game when their overall technical levels are equal. However, little research has been down on fencing tactics analysis, except for some based on some statistical models, which is not suitable for discovering unknown patterns. Existing visualization methods for other sports do not applied to show the tactical behavior in fencing. Because in these turn-based games, the use of tactics is reflected in alternate tactical choices. Fencing is not a turn-based game and its tactics are represented by two related time series.

（工作）In this work, we cooperate with experts in fencing to analyze technical and tactical characteristics that are clear or fuzzy in fencing competition, and summarize the requirements of exploring these fuzzy problems through visual analysis. To meet these requirement, we design and implement an interactive visualization system for fencing competition data - FencingVis. We first analyze the sequences of the fencers’ actions in the bout. Then we extract the tactical behaviors and construct a graph model of these behaviors to express their tactical combinations. We design a tactical flow map to show the model we built and provide multiple interactive ways to explore the tactical model. We also provide a number of well-coordinated-views to supplement the tactical flow chart. They can display the information in the fencing competition from different perspectives and integrate organically with the tactical flow chart through consistent visual style and view coordination.

（评估）We demonstrate the usability and effectiveness of the proposed system by two case studies. According to the expert feedback, our system can help analysts find more tactical patterns hidden in the fencing game, as well as the fencers’ technical and tactical characteristics. At the same time, during the trial use of the system, we found that in addition to the ability to analyze professional competition, the system can also be used for fencing beginner’s classroom teaching, or senior fencing enthusiasts and athlete’s tactical demonstration.

背景：

击剑是一项非常依赖战术运用的运动。不同的剑手有不同的而技术特点，当整体技术实力相当的时候，合理的战术运用可以帮助运动员取得胜利。然而之前专门针对击剑战术的分析研究很少，且一般基于一些统计模型，很难发现未知的模式。现有的针对乒乓球、网球等运动的可视化方法无法很好的展示击剑中的战术行为，因为这些运动都是基于回合模式，战术的运用体现在交替的战术选择中，而击剑并非回合制，战术的运用表现为两个相关的时间序列。

工作：

我们同击剑领域的专家深入合作，分析了击剑比赛中明确和还比较模糊的一些战术特点，总结了可以通过可视分析的方法来探索这些模糊问题的需求。

针对这些需求，我们设计开发了一个针对击剑数据的可视分析系统FencingVIS。

我们首先对比赛中剑手的行为序列进行分析，抽取其中的战术行为，对这些行为构建图模型来表达他们的战术组合。

我们设计了一个战术流图来展示构建的模型信息，并提供了多种交互方式来探索其中的战术模式。我们还提供了多个不同的视图来配合战术流图，他们可以从不同的角度展示击剑比赛中的信息，并通过视图关联和战术流图有机的结合在一起。

评估：

通过对实际比赛进行分析，以及对世界顶级剑手的针对性分析，我们的系统能能够很好的帮助分析人员发现比赛蕴含的比较隐蔽的战术模式，以及剑手的技战术特点。

同时，在使用的过程中我们发现，除了对专业比赛进行分析的能力之外，本系统对击剑数据完善的展示能力，也能用用于对于击剑初学者的课堂教学教学，或中高级击剑爱好者和运动员的战术讲解。