CourtTime: Generating Actionable Insights into Tennis Matches Using Visual Analytics

Tom Polk, Dominik Jackle, Johannes Hausßler, and Jing Yang

Overview of CourtTime

- Data extraction
  - Semi-automated data collection
- Visual analysis
  - Point selector
  - Shot analyzer
- Video player: play points and videos of interest

CourtTime

- Use match metadata with spatial and temporal information
  - Game score
  - Who's serving
  - Serve side
  - Location of ball
  - Location of player...

More information than summary statistics + spatial and temporal techniques

Background

- 3D ball and player tracking technology becoming commonplace
- Smart courts provide instant feedback
- Full advantage of these technologies is not taken

- Improve specific shots
- Help identify player's strengths and weaknesses
- Helps identify successful strategies

Existing tools

- Use summary statistics to describe a match
  - Points scored
  - Games won
  - Serve accuracy
- Use temporal and spatial information of a player
  - Player locations
  - Ball tracking data

But these tools don't take into account the context of the game

Data (What)

- Two types of events (bounce events and hit events)
  - Location of ball
  - Location of player
  - Time
  - Scores
  - Service side
  - Number of shots in point
  - Point outcome (winner, unforced error)

- Easy way to distinguish between player 1 and player 2
- 1-D encoding of depth and left/right reduces cognitive load

Deriving the Shot

- Aggregate bounce and hit events into a shot item
  - (bounce-hit) or (hit-hit) -> shot

- A collection of shots forms a point

Point analyzer

- Allows users to look at one point with many different views
  - 1-D line charts of player and ball locations for all shots in a point
  - Forehand or backhand
  - Location of ball and player for each event

- A collection of shots forms a point

Point selector

- Explore and locate points to be further analyzed
  - Search by who is serving
  - Search by points scored on a second serve

- Also gives summary level stats
  - Number of points lost with a specific stroke type
  - Number of second serves missed

Visualization

3 main components

- Point selector: Identify points to be analyzed
- Point analyzer: Used to further analyze selected points
- Shot analyzer: Used to further analyze a shot

Strengths

- Detailed information
- Reasonable tools to help users direct analysis
  - Game score
  - Ordering
- Good use of colour as identity channel
- 1D encoding of depth and left/right reduces cognitive load

Weaknesses

- Too many channels used
  - Hard to remember everything
- Hard to gather data
  - 3 + hours per video
  - Manually annotated

- Is their visual encoding/interaction idiom the right one?
- Does it show the right thing?
- Is context data necessary?