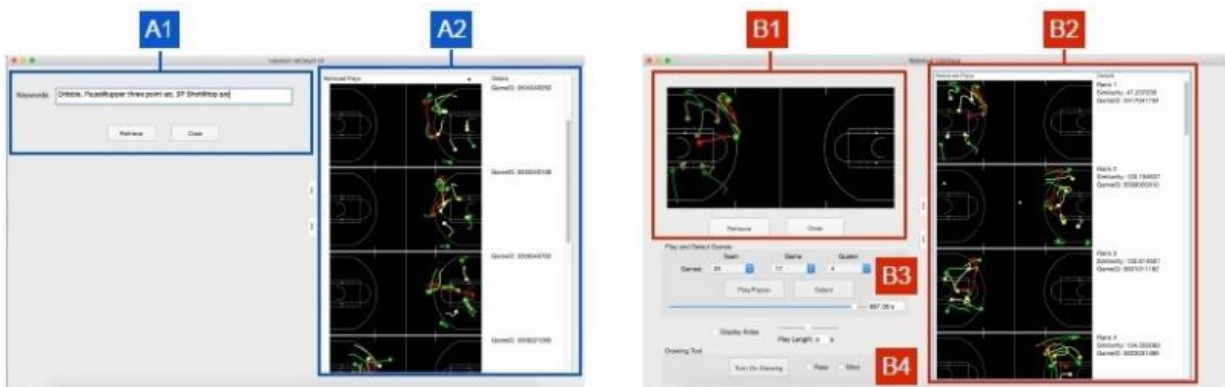# Slamdunk: Graphical user interface uses 'X's and O's' to retrieve basketball plays

March 10 2016

A new search tool for the brave new world of sports analytics would be recognizable even to an old school coach: a chalkboard-like interface enables users to quickly retrieve plays from a database by sketching what they seek using the equivalent of a coach's X's and O's.

The new approach, called Chalkboarding, was developed at Disney Research in collaboration with researchers from STATS, Queensland University of Technology and Caltech as an alternative query language to the keywords typically used to search through massive databases. In user testing with a basketball database, the graphical user interface returned results that were far superior to those identified using keywords.

A user can sketch out the desired play or select a play from an actual game and then rapidly search a database to find similar, ranked examples. The researchers presented the method at the Association for Computing Machinery's Intelligent User Interfaces conference in Sonoma, Calif.

"Sports analytics is experiencing explosive growth in both the quantity and the granularity of data available for a wide variety of sports leagues," said Jessica Hodgins, vice president at Disney Research. "Chalkboarding promises to be an important tool for accessing information that would otherwise be difficult even to find in these huge databases."

In professional basketball, for instance, the sports data company STATS tracks every player and the ball 25 times a second for every game. Simply querying "three-point shot" in a database of 600 games might return 20,000 candidate plays, said Patrick Lucey, director of data science at STATS who began work on Chalkboarding while a scientist at Disney Research. Manually searching to find the most relevant examples would be prohibitively time consuming, he noted.

Using more keywords would narrow the search, eliminating the retrieval of unrelated plays, but the results would still be unranked, requiring manual review of all the plays, he said.

"Moreover, obtaining fine-gained information such as the location and motion of the players would require an enormous amount of keywords to capture all of the specifics, a prohibitive task," Lucey said.

Using a visual representation of plays, similar to the X's and O's coaches have used for years to diagram plays, makes more sense than keywords, given the spatiotemporal nature of games, Lucey said.

The Chalkboarding interface allows a user to load in a game of interest

and review the plays, visualizing the trajectories of the players and the ball. Once the desired play is identified, the system can then query the database, quickly retrieving similar plays ranked according to similarity.

The user can also manipulate the example play to highlight only those trajectories of interest to make the search even more targeted. Or, rather than use an actual play from a game, the user can simply draw the trajectories and player roles of interest.

It's also possible for the user to draw atop a broadcast feed of a game, a more intuitive means of interacting than the overhead view of a classic chalkboard. In this mode, the system adds an extra step to calibrate the court from the angle of the camera view.

In a user study, 10 people used both keywords and Chalkboarding to perform eight retrieval tasks with a basketball database. For each user, the results with Chalkboarding all had substantially higher precision than those using keywords.

In addition to Lucey, the Chalkboarding team included Long Sha of Queensland University of Technology, Peter Carr and Iain Matthews of Disney Research, Yisong Yue of Caltech and Charlie Rohlf of STATS.

  More information: "Chalkboarding- A New Spatiotemporal Query Paradigm for Sports Play Retrieval-Paper" [PDF, 11.85 MB]

Provided by Disney Research