

Paper uncovers power of Foldit gamers' strategies

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Researchers studying the nature of crowds playing Foldit called some strategies "shocking" in how well they mimicked some of the methods already used by protein scientists.

Gamers made headlines in September for unraveling the structure of a protein central to research on AIDS. Today, in a paper published online at the [Proceedings of the National Academy of Sciences](#), University of Washington researchers reveal the creative power of Foldit players' strategies and compare them to the best-known scientist-developed methods.

"We enabled players to create and improve each other's best recipes to play the game. Once we looked at the variety and creativity of these recipes, we were shocked to find state-of-the-art algorithms." said Zoran Popovic, principal investigator of the Foldit Project and the Director of the Center for Game Science. Foldit is developed by the Center in collaboration with the biochemistry laboratory of David Baker.

"To us, this paper is even more exciting than the one in September," said Firas Khatib, a co-author on both papers and a researcher in the Baker lab. Baker, also principal investigator on the project, has been exploring ways to further protein structure research using distributed computing for many years with the Rosetta@home project.

By studying the most effective formal recipes or algorithms that players used to solve [protein structure](#) puzzles, the group hopes to formalize

complex strategies and apply them widely to scientific problems, Khatib explained. (An algorithm is a list of instructions for a [computer program](#).) In the game, these lists are called recipes.

"With our previous papers, we proved that a scientific-discovery game can solve long-standing scientific problems, but this paper shows how gamers codified their strategies, shared them and improved them. This is just the beginning of what Foldit players are capable of solving," explained Seth Cooper, the primary architect and co-creator of Foldit and the creative director of the Center for Game Science,

Researchers put 721 gamers under a magnifying glass during a three-month period, and studied their play in detail. These players used tools for creating, editing, sharing and rating game-playing recipes within the Foldit game. One of these, dubbed Blue Fuse, was the most popular recipe used in the game.

In the game, puzzlers must build proteins that show certain characteristics – including using the least energy. This is called "energy optimization." Blue Fuse scored well in designing proteins for this requirement. In a surprising turn, Blue Fuse also bore a striking resemblance to a scientist-built yet-unpublished algorithm from the Baker lab that they named "Fast Relax."

People playing the game, including the author of Blue Fuse who plays under the Foldit username Vertex, were surprisingly willing to share their recipes. Sharing, which may seem odd for competitive people, proved quite common among Foldit players. "I shared BF fully because Foldit is so much more than a game – the competition is serious and fierce, but we are also trying to improve the understanding of huge biological proteins. We collaborate and compete at the same time," Vertex wrote. He pointed out that he built Blue Fuse partly borrowing from the elegance of another recipe by a different gamer, "Acid

Tweaker."

"Blue Fuse spawned from Acid Tweaker...and now has many children of its own. To 'Fuze' has even become a Foldit verb. And the next flash of inspiration can come from literally anyone," he wrote via email.

While researchers hope to find ways to almost automate human intuition, Khatib pointed out that this study demonstrates the remarkably flexible nature of the gamer intelligence.

"Foldit players employ recipes only to do certain tasks at different stages of their puzzling," he said. Used at the wrong time, even Blue Fuse would not give you an advantage. "The art of discovery still rests with creative [game](#) play and how and where to use the codified strategies," explains Popovic. The team has loaded the newest version of Foldit to allow players more creativity and more scripting tools. They wait to see what Foldit-player ingenuity and social gaming will discover next.

More information: Play the game at fold.it/portal/

Provided by University of Washington

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