

Demo of www.scienceathome.org citizen science games studying human problem solving

Jacob F. Sherson and www.scienceathome.org team

Center for Community Driven Research (CODER) at department of Physics and Astronomy, Aarhus University, Denmark

We will demo the www.scienceathome.org citizen science games explained in detail in [1,2,3] and mentioned briefly here.

Quantum Moves is a game optimizing the manipulation of a single ultra-cold atom using a trap realized by an ultra-focused laser beam of relevance for the creation of a quantum computer. In the game, which has so far been played by 200,000 citizen scientists from around the world. In [1] we demonstrated that the players found solutions outcompeting those obtained by standard quantum optimal control algorithms. Moreover, the player solutions were used as seeds for a human-computer hybrid optimization scheme in which the players intuitively explored the vast 1000-dimensional landscape and the computer algorithm performed efficient local optimization. This combined strategy thoroughly outcompeted the previously best results. Efforts to implement reinforcement learning optimization for this game are currently ongoing.

Quantum Minds was developed in a collaboration between physicists and cognitive researchers in order to systematically investigate the dynamical process of the formation of the choice of strategy. The game play is very similar to Quantum Moves except that in order to proceed to the next level a threshold score has to be surpassed three times in order to give a proxy for true learning.

The Alien Game is an 8 bit puzzle representing fixed underlying landscapes is presented to the player in the form of a puzzle posed by an alien visitor to our planet [2]. The player has 25 trials and in each trial an arbitrary number of bits can be flipped. The main research question is to investigate the distribution among three canonical move types: random, locally optimizing and distant model-based moves. Then, the likelihood for a given player to change strategy based on game feedback and advice from other players is studied.

Crystal Crop Fever features a game play constructed directly around the landscape metaphor by having a 2D landscape with 80x80 tiles. It is a true collaborative problem solving multiplayer game accommodating up to 16 simultaneous players. Again there are 25 game rounds and in each round each player selects a previously unexplored tile to be investigated and then the scores of all player selections is revealed.

References:

[1] Sørensen, J.J. et al. Exploring the Quantum Speed Limit with Computer Games. Nature 532, 210-213 (2016)

[2] Vuculescu O., Bergenholtz C., Kock M. and Sherson J. Fitness landscapes in organizational theory: research challenges and future directions. Druid 20th Conference (2016)

[3] Sherson, J.F. et al, Studying human problem solving using citizen science games, submitted for AISB '17.