**Wildfire Wally: A Volunteer Computing Game**

**Abstract**

The popularity of online casual gaming has the potential to be useful in the research community. It has fallen far short of its full potential. There have been at least four distinct barriers to participation in volunteer computing: lack of awareness, lack of broad appeal (a limited demographic), and lack of technical savvy.

We believe that casual online gaming can be a tool for distributed computing. To demonstrate this, we present **Wildfire Wally**, an online casual game which solves the maximum clique problem. As players struggle to contain a voracious forest fire by creating fire lines and controlling flames, their actions are used to make algorithmic decisions.

**Motivation**

While volunteer computing has proven to be useful in the research community, it has fallen far short of its full potential. There have been at least four distinct barriers to participation in volunteer computing: lack of awareness, lack of broad appeal (limited demographic), and lack of technical savvy.

We believe that casual online gaming can be a tool for distributed computing. To demonstrate this, we present **Wildfire Wally**, an online casual game which solves the maximum clique problem. As players struggle to contain a voracious forest fire by creating fire lines and controlling flames, their actions are used to make algorithmic decisions.

**Adaptability**

**Future possibilities**

While our focus has primarily been confined to casual online gaming, the persistent worlds of MMOGs provide a wonderful opportunity for volunteer computing. A well-designed MMOG can model problems that are either too complex or too large to attempt with traditional approaches. MMOGs can allow users to interact with the algorithm in unexpected ways.

**References**


Fighting a forest fire does not exclude any major demographic. The combination of strategy in building fire lines and skill in quickly extinguishing fires caters to all age groups.

**Wildfire Wally**

**Game Design Features**

**Easy to Extendable**

Different dimensions of gameplay can easily be added to the game:

- **Algorithms that require trees to be burned**
- Players need to protect houses to win.
- Campers can speak trees aloud.
- Geological barriers like rocks (or stairs) can affect the spread.

**Display of Progress**

Updating scores makes the player’s actions feel meaningful in the game and towards the problem. We can see there is a need for creating ways that may encourage competition among players and result in a more structured game.

**Use of Games**

- In most, 0.3% of online computer participants in volunteer computing.
- An estimated 100 million people in the US will play a computer game this year.
- The core and casual downloadable games sector grew over 100% from 2002-2004.
- 69% of American heads of households play computer or video games.

**Button Game Representation**

The button game simply presents the above representation to the player. Every time there are children to choose from, they are displayed as buttons. Which button the player presses determines which child will be explored next.

**Wildfire Wally Representation**

While playing, **Wildfire Wally** the player’s clicks are also mapped to choices in the search tree. Instead of having one button represent each choice, a simple rule maps each square on the game’s world grid to a choice.

This mapping is entirely independent of the display or state of the forest, allowing us to use the player’s actions to work on the problem without disrupting the flow of the game.

**Search Tree to Buttons**

There is only one decision-making step in the process of solving a node choosing which of the node’s children to explore next. We give the player control over this step by representing each child of the node as a button.

**Search Tree of a Graph**

One way to consider the cliques of a graph is in a search tree, as below. The volunteer computing algorithm we use to solve the maximum clique problem is an exact algorithm to find the largest clique. At each node, the algorithm either chooses which child to explore next or, if the node has no children, backtracks to the node’s parent.

**Wildfire Wally**

**One Button Control**

The entire game can be played using nothing but mouse clicks. This provides simplicity and can be at level of computer users.

**Gender/AGE-Inclusive**

Flattening a forest fire does not require any major demographic. The combination of strategy in building fire lines and skill in quickly extinguishing fires caters to all age groups.

**Rapid Gameplay**

The constant clicking corresponds to constant progress in the search tree.

**Display of Progress**

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**Why use Games?**

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**Evolution of the Problem**

**Wildfire Wally**

**How to Play**

- **Wind:** 10 mph
- **Humidity:** 23%

**Level 3**

**Return solution**

- **Return node**
- **Backtrack node**

**Client-Server Model**

This diagram demonstrates the client-server communication during a game of **Wildfire Wally**. All of the game information is contained on the client, while the server accepts and passes information about the game.

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**Acknowledgments**

- Evan Peck (Gordon College)
- Maria Rioio (Cal Tech)
- Charles Cusack (Hope College)

**Future Possibilities**

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**Massively Multiplayer Online Gaming**

While our focus has primarily been confined to casual online gaming, the persistent worlds of MMOGs provide a wonderful opportunity for volunteer computing. Particularly in the realm of human insight. Many MMOGs already control large social structures that work together to accomplish difficult tasks. Since MMOGs typically allow for emergent gameplay, the world would allow users to interact with the algorithm in unexpected ways. Our hope is that emergent behavior can lead to an improvement in the algorithm.

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