

## French Military Game AI Using Temporal Difference Learning

### 1.0 About

This project is to create a program to play French military game which learns by its mistake. At first it plays with random parameters. And after a while it learns to play well by learning from opponents moves. To learn about the game and how to play go to, [http://en.wikipedia.org/wiki/Hare\\_games](http://en.wikipedia.org/wiki/Hare_games)

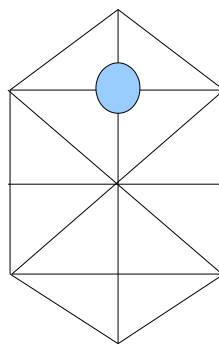
### 2.0 Implementation

This uses temporal difference learning to learn by its mistakes. In the game a state is defined as the three positions of green dots and the position of the red dot.

```
class state:
    def __init__(self):
        self.ai = 0
        self.p1 = 0
        self.p2 = 0
        self.p3 = 0
```

And it use four parameters for learning.

- $\Theta_1$  - number of moves it can take.
- $\Theta_2$  - vertical distance from winning position.
- $\Theta_3$  - Length to the nearest black dot.
- $\Theta_4$  - Is it inn a danger position or not.



 - danger position

figure 2.0 – danger positions

These are used to calculate prediction (V) values for a given state.

$$V(s) = A.\Theta_1 + B.\Theta_2 + C.\Theta_3 + D.\Theta_3$$

Next state (or next move) from a given state is calculated by finding all possible moves from that state, getting the V values for all those states and getting the state which has the maximum V value. After each move the new V value will be calculated and used both V values are used to modify the parameters.

$$A_{\text{new}} = A_{\text{old}} + (V_{\text{old}}(s) - V_{\text{new}}(s)) * \Theta_1$$

When the new V values are calculated 1000 will be added to the v value if the red dot had hit the winning position and 1000 will be subtracted if the red dot was caught. More information Temporal Difference Learning, [http://en.wikipedia.org/wiki/Temporal\\_difference\\_learning](http://en.wikipedia.org/wiki/Temporal_difference_learning)

### 3.0 Prerequisites

This script is written in python. Install 'python' and 'Tkinter' to run the script. (use synaptic package manager in Ubuntu to install them.)

### 4.0 Running the Application

Use following command to run the application.

*Python fr\_main.py*

To move a dot click on it and when it turned in to blue click on the position which you want to put place it. If you need to reset a game click on the red square with a 'R'.

### 5.0 More Info

- [tcg.galahena@gmail.com](mailto:tcg.galahena@gmail.com)
- <http://www.inf0warrior.blogspot.com>

## 6.0 Screen Shots

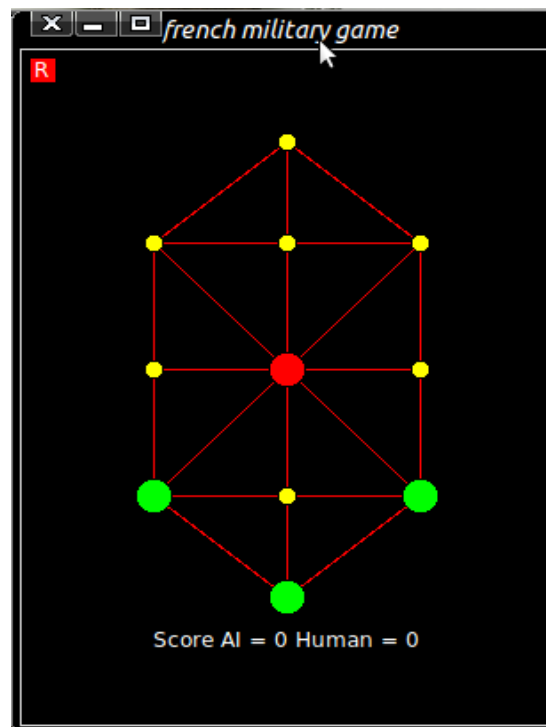


Figure 5.0

## 7.0 Licenses

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