Project Number 8-03

# Game Strategies
# Strategies for the game Art of War

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# 1  Introduction

The game Art of War is a game played during our SOAC (Secondary One Annual Camp), on a 6x6 play area. The game consists of two teams, each team with 6 students. Each student stands in a grid in the play area. The starting positions are shown in Figure 1a. Each team consists of a killer and 5 civilians. The killers of both teams must stand at the diagonal corners of the play area, also shown in Figure 1a. For our project, we are shrinking the play area to a 4x4 grid and will be using chess pieces to represent each student.

Note we are using a checkered board for our project so that it we can explain research question 1 and 2 more clearly. However, the game is played on a normal square and will not be affected by our use of the checkered board.

Figure 1a:
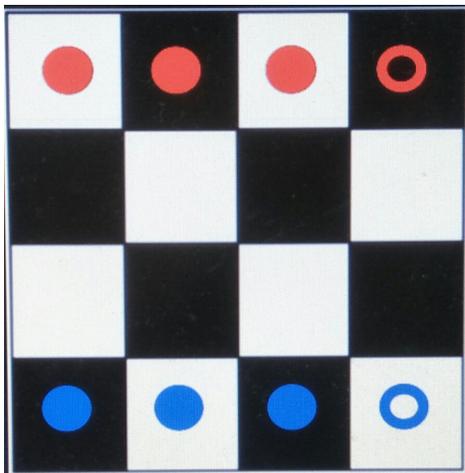


The different roles are represented by:

  ❖ Civilians: Circle( ⬤ and ⬤ )

  ❖ Killers: Ring( ⭕ and ⭕ )

And the colour indicates the team.


## 1.1  Objective

  ❖ To find the best strategies to get the highest chance of winning the game Art of War.

## 1.2    Research Questions

- ❖ Is there any way for the civilians to move in order to reduce the chances of meeting the killer?
- ❖ Is there any way for the killers to move such that he meets more civilians?

- ❖ How does probability affect the game results (When a civilian meets another civilian and has to play Rock Paper Scissors)?

Note that there is no foolproof way of winning in rock paper scissors, and all methods applied will only increase the chances of a win.

## 2    Methodology
We did case analysis to complete research question 1 and 2, by suggesting possible moves that the civilians and killers might take in response to each other's moves, and developing the moves from the civilians' and killer's perspectives for the respective research questions.
We researched on the strategies of winning Rock Paper Scissors and the probability involved, through articles published by the World RPS Society.

## 3    Results

Research Question 1
- ❖ -Research Question 1 is about the strategies for the civilian to avoid meeting the killer. The civilians and killer who can meet each other are on tiles of the same colour.
- ❖ Findings:
  Basically, some civilians will never meet the killer. The only civilians who will meet a killer are the civilians who are on a tile which is odd counting (number of gaps in between the starting positions of the killer and civilian) from the tile the killer is standing on. For play areas with an odd number of tiles, the colour of tiles they will meet on is the colour they were on at the start of the game. For play areas with an even number of tiles, the tile they will meet on will be of the opposite colour as the tile they started on. For the other civilians, the civilians will have to corner them, forcing them to play a game of rock paper scissors to decide who gets eliminated. Rock paper scissors will be mentioned later on. When a killer is near, the civilian's best option is to manoeuvre either up or down and avoid being cornered. The civilian is to on no account move backwards to a tile away

from the civilian as that would likely mean certain death. Also, avoid bumping into the opposite team's civilians as that would mean an even less chance of survival. Even so, meeting a killer is worse than meeting an opposing civilian because meeting a killer means sure death whereas meeting an opposing gives you a chance of surviving. So, the civilian has to consider whether he would rather get corner or risk getting killed by an opposing civilian. If you cannot meet the killer, it also means that you are on the same coloured tile as your killer, so you should help your killer eliminate other civilians.

As only people on same coloured tiles would actually meet, a civilian is not able to meet all the other civilians in a game. At the start of the game, the civilian needs to first analyse which of the opponent's civilians it is possible to run into first before deciding on the route in the game.

Research Question 2
❖ Research Question 2 is about the strategy of the killers so that they can meet more civilians.
❖ Findings:
The killer can only meet civilians on the same colour of the tile he is standing on a play area with an odd number of tiles, and vice versa for an even number of tiles. The best way for the killer to move is in a formation which allows it to corner an opposite team's civilian, thus it should move first towards the centre and look for likely targets first before attempting to corner it. The best way for a killer to hunt for victims is by moving in a zig-zag formation to ensure it covers maximum area. When engaged with a civilian, the killer can manoeuvre the victim to a civilian of the killer's own team to try to trap the opposing civilian against a corner for a higher chance of eliminating him.

Research Question 3
❖ Research Question 3 is about the techniques of rock paper scissors so that the chance of a civilian using our rock paper scissors techniques will have a significantly higher chance of winning in a fair civilian vs civilian game as compared to one that does not.
❖ Findings:
Statistically, the expected average is 33.3% if everything is completely random (e.g. when playing against the computer). It turns out that the most common throw is rock (35.4%), scissors (35%), and then paper (29.6%). Picking paper may give you a very slight advantage. This means that in a game of rock paper scissors with the opposing civilian, throwing paper would give an added advantage if you opponent is a male rookie, as:

- Rock, represented by a closed fist, is commonly perceived as the most aggressive throw. It taps into memories of fist fights, tall and unmoving mountains, rugged boulders and the stone axe of the caveman. Without realizing it, most players think of Rock as a weapon and will fall back on it for protection when other strategies appear to be failing.

- Scissors are a tool. As children, we use them to cut construction paper for craft projects. As adults, we may cut cloth for clothing or use scissors to open plastic packaging. Scissors are associated with industry, craft work, making things. There is still a certain amount of aggression associated with scissors; they are, after all, sharp and dangerous implements. Scissors, however, represent aggression that is controlled, contained, re-channeled into something constructive. In RPS, scissors are often perceived as a clever or crafty throw, a well-planned outflanking maneuver. As such, players are more likely to use scissors when they are confident or winning.

- Paper is often considered the most subtle throw. There is nothing aggressive about the limp documents that move through our desks and offices. Even the gesture used to represent paper is peaceful – an open palm like that used in a salute or handshake. Historically, an open palm has been a sign of friendship and peace because an open hand cannot hold a weapon. Some players, who unconsciously perceive Paper as weak or a sign of surrender, will shy away from using it entirely or drop it from their game when they are falling behind. On the other hand, Paper also connects with a player's perceptions about writing. There is a quiet power in the printed word. It has the ability to lay off thousands of employees, declare war against nations, spread scandal or confess love. Paper, in short, has power over masses. The fate of the entire world is determined by print. As such, some players perceive Paper as a subtle attack, the victory of modern culture over barbarism. Such players may use Paper to assert their superiority and dignity.

    If one does not know his opponent very well, he could use the given data above and conclude the safest move as paper, as it is the least commonly thrown and most subtle move, an appearance of 29.6%, compared to the typical 33.3% of a random Rock Paper Scissors game.

## 4  Conclusion
<Strategies that the civilian and killer should use to have a greater chance of winning the game.>

Civilians:

- ❖ Stay in the centre whenever possible to increase the number of escape routes and not get cornered.
- ❖ If you are on the same coloured tile as your killer, help him corner other civilians.
- ❖ If you are on the same coloured tile as your opponent's killer, avoid playing scissors paper stone with their civilians to stay alive as long as possible.

Killers:

- ❖ Identify those civilians you can kill beforehand to avoid chasing after the wrong civilians.
- ❖ Work with your civilians to corner your opponent's civilians.
- ❖ Target one civilian and not constantly change your mind.

## 5    References

Walker, D. (2015, May 29). How to Beat Anyone at Rock Paper Scissors. Retrieved July 10, 2018, from http://worldrps.com/advanced-rps/sample-page/

Advanced    RPS.    (2015,    May    29).    Retrieved    July    10,    2018,    from http://worldrps.com/advanced-rps/

## 6    Limitations

The limitations for this project are

- ❖ We were not able to extend the board size to 5x5 and 6x6, and do research on it.
- ❖ Our strategies do not provide players with  a definite chance of winning the game, only increase his chances of winning.
- ❖ Calculating the probability relies heavily on rock paper scissors.

**~THE END~**