Patent Searching: A Game of Imperfect Information

Dominic DeMarco
DeMarco Intellectual Property, LLC
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For each of us, searching patents represents something different. It might be...

A job,

a career, or
even a calling.

For me, it is also a fun game. This puts a smile on my face every day I go to work.
But what type of game is it?

Who are the players?
What are the rules?

And what does this have to do with game theory?
John von Neumann wrote the first book on game theory in 1944.

The movie A Beautiful Mind introduced the public to game theory.
Player 1

Player 2

Player 3

You are the dealer

Player 5

Player 4
All in with $100

Pot has $100

3️⃣ 4️⃣ 8️⃣

What do you do?

5️⃣ 6️⃣ 9️⃣

All in with $100
Prisoner’s Dilemma

This is the most famous and one of the simplest applications of game theory.

<table>
<thead>
<tr>
<th></th>
<th>Cooperate</th>
<th>Defect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooperate</td>
<td>(3, 3)</td>
<td>(0, 5)</td>
</tr>
<tr>
<td>Defect</td>
<td>(5, 0)</td>
<td>(1, 1)</td>
</tr>
</tbody>
</table>
# Prisoner’s Dilemma

aka – “The Joint Venture”

<table>
<thead>
<tr>
<th>Scenario A</th>
<th>Company 1</th>
<th>Company 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cooperate</td>
<td>Steal</td>
</tr>
<tr>
<td>Cooperate</td>
<td>(4, 4)</td>
<td>(0, 6)</td>
</tr>
<tr>
<td>Steal</td>
<td>(6, 0)</td>
<td>(0, 0)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scenario B (hostages worth 8)</th>
<th>Company 1</th>
<th>Company 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cooperate</td>
<td>Steal</td>
</tr>
<tr>
<td>Cooperate</td>
<td>(4, 4)</td>
<td>(8, -2)</td>
</tr>
<tr>
<td>Steal</td>
<td>(-2, 8)</td>
<td>(0, 0)</td>
</tr>
</tbody>
</table>
In the game pictured to the left, there are two players. Player 1 moves first and chooses either F or U. Player 2 sees Player 1's move and then chooses A or R. Suppose that Player 1 chooses U and then Player 2 chooses A, then Player 1 gets 8 and Player 2 gets 2.

This decision tree and text is the opening paragraph on “game theory” at Wikipedia.
Let’s try a “real” decision tree: You are a high-tech smartphone company that is accused of infringing a patent!

$100,000,000 is at risk.

Scenario C

- **Fight**
  - **Win**: Lose $1M
  - **Lose**: Appeal
    - **Win**: Lose $2M
    - **Lose**: Lose $102M
- **Settle**
  - How much?
This is not our first legal battle! We have an average win rate in court of 80% and we always appeal.

The **Expected Value** will be

\[
(80\% \times 1\text{M}) + (20\% \times \{(80\% \times 2\text{M}) + (20\% \times 102\text{M})\}) = 5,200,000
\]
Imperfect Information

A game in which at least one player does not know the payoffs to the other players.

For me, this describes my job!
Potential Opponent List:

Job Applicant
Manager, Employee, or Coworker
Patent Classifier, Examiner, or Indexer
Inventor
Patent Attorney
Searcher at Another Company
Outsourced Patent Searcher

*** Not all games are win-lose. Some cooperative games are win-win!
Identify the opponent’s motivation: What might their payoffs be? Do they know your payoffs?

<table>
<thead>
<tr>
<th>Scenario D</th>
<th>Manager</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Review</td>
</tr>
<tr>
<td>Employee</td>
<td>Solid Effort</td>
</tr>
<tr>
<td></td>
<td>Corner Cutting</td>
</tr>
</tbody>
</table>
## Reputations and Signaling

### Scenario E (the wrist slap)

<table>
<thead>
<tr>
<th>Employee</th>
<th>Manager</th>
<th>Review</th>
<th>No Review</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid Effort</td>
<td>(-8, -2)</td>
<td>(-8, 0)</td>
<td></td>
</tr>
<tr>
<td>Corner Cutting</td>
<td>(-10, -2)</td>
<td>(-2, 0)</td>
<td></td>
</tr>
</tbody>
</table>

### Scenario F (the final straw)

<table>
<thead>
<tr>
<th>Employee</th>
<th>Manager</th>
<th>Review</th>
<th>No Review</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid Effort</td>
<td>(-8, -2)</td>
<td>(-8, 0)</td>
<td></td>
</tr>
<tr>
<td>Corner Cutting</td>
<td>(-502, -2)</td>
<td>(-2, 0)</td>
<td></td>
</tr>
</tbody>
</table>
Another Reputation and Signaling Situation

Job Applicant 1 signals the following:
  non-working spouse
  mortgage
  three young children

Job Applicant 2 signals the following:
  independently wealthy
  loves to travel
  gaps in employment history
How is this different than a cost benefit analysis?

At these simple levels, it is not very different. Both involve analyzing the situation and making the most profitable move.

At higher levels, game theory allows the mathematical modeling of complex relationships and multiple payoffs.
What are games of imperfect information:

Poker!

Not Chess

Bridge, Hearts, and Spades!

Not Parcheesi or Sorry

Strategy games with a Fog of War aspect!
Now imagine Star Craft and a million South Koreans training to be patent searchers...

How are they training?

They have limited resources.
They scout to optimize resource usage.
They learn from their peers.
They monitor and adjust on the fly.
They apply singular focus.
They make educated guesses.
They are extremely results oriented.
They love their work and want to get better!
As a searcher, how do I integrate this into my work environment?

Identify the payoffs to others and act accordingly.

Is it an FTO, a validity, or both?
Why did the examiner cite a particular reference?
What will my manager do during a search review?
Where will our competitor search for art?
How much effort should go into an estimate?
Does the new legal client litigate or prosecute?
What signals do I give?
As a manager, how do I integrate this into my work environment?

Team Building Exercises
  Company sponsored poker tourney

Ask different questions during interviews
  “Do you prefer chess or card games?”

Signal your payoffs and build a reputation that engenders the behavior you need in your staff.
Thank you very much
Questions?

Dominic DeMarco
Managing Director