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“SMALL WORLD” ANALYSIS IN YU-GI-OH! TRADING CARD GAME

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OUTLINE

What is Yu-Gi-Oh?

What is Small World?

Results

Summary

WHAT IS YU-GI-OH!?

- Two-player trading card game developed and published by Konami.
- Each player owns a deck containing between 40-60 cards (Monster, Spell, and Trap Cards).
- Maximum 3 copies of each card unless that card is on the Forbidden/Limited List (restricted to 0/1/2 copies each).



HOW TO WIN?

The typical win condition:



To ensure players can reduce the opponent's LP (Life Point, Mana/Health in other games) to 0, they:

- Play monsters with big attack points and powerful effects to apply as much pressure as possible (beatdown strategy)
- Play cards that give them tempo/card advantage to deplete their opponent's resources.
- Play consistency cards to make sure they get to their key cards ASAP.

WHY CARD ADVANTAGE MATTERS

Card advantage is how you win most of your games in Yu-Gi-Oh!

- Example:

You start with 5 cards in hand and nothing on the field, then you activate Pot of Greed to draw 2 cards, now you have 6 cards in hand. PoG goes to the graveyard (GY) since it has been used.

You just went +1 in card advantage with no drawbacks/requirements.

Assume you do 1-to-1 trade with your opponent's cards; you still have 1 more card to work with while they have 0.

That explains why PoG has been banned from tournament plays since 2005 (will probably never be unbanned).

Note: card advantage only counts the net changes of cards in your hand and field, cards in deck do not count.



HOW CARD ADVANTAGE IS BALANCED NOWADAYS:

Meet Small World.

We have these parameters in every monster card: **Type, Attribute, Level, Attack, Defense**

How Small World works in a nutshell:

1st monster in hand -> 2nd monster in deck as a bridge (only one parameter can be the same as the 1st monster) -> 3rd monster in deck to add to hand (only one parameter can be the same as the 2nd monster)

Finally, you banish the first two monsters you revealed.

Say you started with 5 cards, now you only have 4 (-1 in card advantage since you traded SW + 1st monster with the 3rd monster).

Is the -1 worth it? YES! Especially if your deck is inherently less consistent and you play diverse set of monster cards.

With right combinations, you can basically fetch any monster you need in your deck.

If your deck is consistent enough, you may not need SW.



EXAMPLE OF HOW SMALL WORLD WORKS:

1st monster (reveal from hand)



Same
ATK

2nd monster (reveal from deck), the bridge



Same
Type

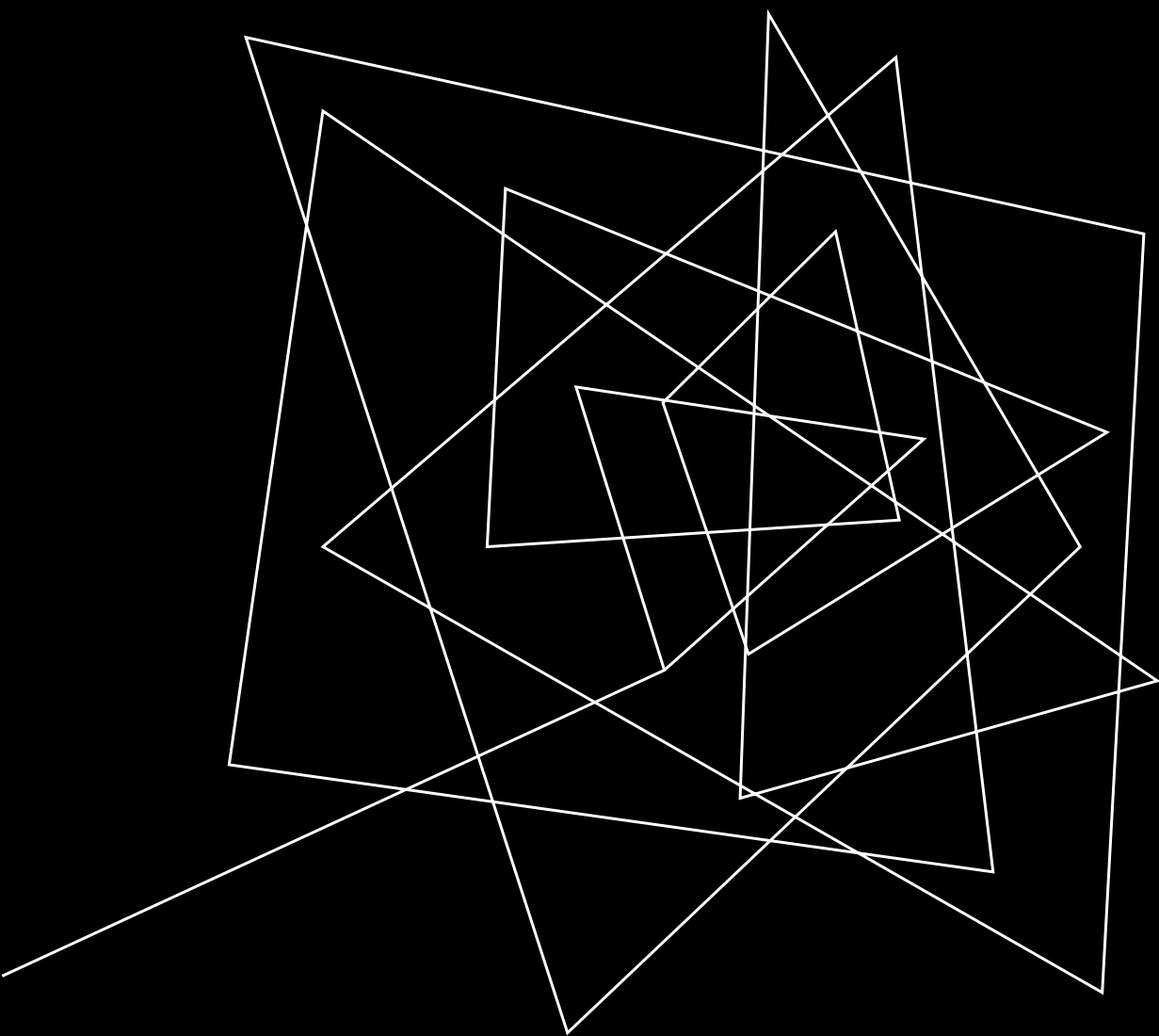
3rd monster (add to hand)



If you already play 3 copies of Water Enchantress, now you have more ways of getting her to your hand with SW, boosting your deck's consistency.

HOWEVER, THIS REQUIRES A GOOD UNDERSTANDING OF THE
DECK TO KNOW WHAT GETS TO WHAT WITH WHAT BRIDGE.

THIS BEGS THE QUESTION:
**“HOW MANY POSSIBLE COMBINATIONS CAN I PLAY OUT WITH
SMALL WORLD + ANY MONSTER IN MY HAND AND WHAT DO THEY
LOOK LIKE?”**



SOLUTION

Web scraping using
YGOPRODeck API and analysis
using Python

Link to Notebook:
https://colab.research.google.com/drive/1AlolBhPgqogwetdt_tfFgs5REuBD3eDz?usp=sharing

WHAT IS YGOPRODECK API?

YGOPRODeck is a website that stores all Yu-Gi-Oh data, and they have their own API to pull the data from.

<https://ygoprodeck.com/api-guide/>

Web scraping tools used: requests to fetch the data using API and json to convert from JSON to pandas dataframe.

Functions: `get_all_card_type(type)`,
`populate_list_parameter(data, parameter)`

Skillsets highlighted: Web scraping, JSON parsing, API usage.

WHAT EACH ELEMENT IN THE JSON FILE LOOKS LIKE:

- ```
{'id': 53804307, 'name': 'Blaster, Dragon Ruler of Infernos', 'type': 'Effect Monster', 'desc': 'If this card is in your hand or Graveyard: You can banish a total of 2 FIRE and/or Dragon-Type monsters from your hand and/or Graveyard, except this card; Special Summon this card. During your opponent\'s End Phase, if this card was Special Summoned: Return it to the hand. You can discard this card and 1 FIRE monster to the Graveyard, then target 1 card on the field; destroy that target. If this card is banished: You can add 1 FIRE Dragon-Type monster from your Deck to your hand. You can only use 1 "Blaster, Dragon Ruler of Infernos" effect per turn, and only once that turn.', 'atk': 2800, 'def': 1800, 'level': 7, 'race': 'Dragon', 'attribute': 'FIRE', 'card_sets': [{'set_name': '2013 Collectible Tins Wave 1', 'set_code': 'CT10-EN002', 'set_rarity': 'Secret Rare', 'set_rarity_code': '(ScR)', 'set_price': '6.72'}, {'set_name': 'Lord of the Tachyon Galaxy', 'set_code': 'LTGY-EN040', 'set_rarity': 'Rare', 'set_rarity_code': '(R)', 'set_price': '3.74'}], 'banlist_info': {'ban_tcg': 'Banned', 'ban_ocg': 'Banned'}, 'card_images': [{'id': 53804307, 'image_url': 'https://images.ygoprodeck.com/images/cards/53804307.jpg', 'image_url_small': 'https://images.ygoprodeck.com/images/cards_small/53804307.jpg'}], 'card_prices': [{'cardmarket_price': '0.97', 'tcgplayer_price': '2.57', 'ebay_price': '6.00', 'amazon_price': '4.99', 'coolstuffinc_price': '2.99'}], 'misc_info': [{'views': 116385, 'viewsweek': 0, 'upvotes': 37, 'downvotes': 8, 'formats': ['TCG', 'OCG'], 'tcg_date': '2013-05-17', 'ocg_date': '2013-02-16', 'konami_id': 10521, 'has_effect': 1}]}
```

We will parse each of them and combine into an organized dataframe.

## AFTER PARSING IMPORTANT VARIABLES AND TRANSFORMING INTO DATAFRAME (FIRST 5 ROWS):

|   | name                      | type   | attribute | level | atk  | def  |
|---|---------------------------|--------|-----------|-------|------|------|
| 0 | 3-Hump Lacooda            | Beast  | EARTH     | 3     | 500  | 1500 |
| 1 | 30,000-Year White Turtle  | Aqua   | WATER     | 5     | 1250 | 2100 |
| 2 | 4-Starred Ladybug of Doom | Insect | WIND      | 3     | 800  | 1200 |
| 3 | 7 Colored Fish            | Fish   | WATER     | 4     | 1800 | 800  |
| 4 | 8-Claws Scorpion          | Insect | DARK      | 2     | 300  | 200  |

As of writing this presentation deck:

There are 6244 Main Deck monsters in Yu-Gi-Oh!

There are 1655 Extra Deck monsters in Yu-Gi-Oh!

There are 2375 Spells in Yu-Gi-Oh!

There are 1803 Traps in Yu-Gi-Oh!.



## HOW TO TELL IF A SMALL WORLD LINE OF PLAY IS LEGAL?

- Check out `find_legal_sw_play(decklist)` function.
- The function accepts a list of strings (monster cards only).
- First, a legal pair is constructed. The code will run through every single parameter and if EXACTLY ONE parameter is equal then those two cards will be put together as a legal pair. And it will run through every single possible pair.
- After we have a list of all possible legal pairs, we will compare each pair with another pair and check if the second element of the first pair is equal to the first element of the second pair. Example:

[“A”, “B”] and [“B”, “C”], then the result = [“A”, “B”, “C”] where “A” is the card revealed from hand, “B” is the bridge, and “C” is the card added to hand.

Skillsets highlighted: data analytics, Python programming.

## EXAMPLE USING MY DECK:

This is a beatdown deck, most monsters have large attack points. However, my deck lacks consistency so I want to run Small World.

Alpha the Master of Beasts and Gizmek Orochi are the best monsters to have in every game.

```
Here, you may enter your monsters' name in your deck. Feel free to change this depending on your deck.
Mind the capitalization, make sure the names are accurate. Might need to add .lower() function later.

decklist = ["Gren Maju Da Eiza", "Danger! Bigfoot!", "Danger! Thunderbird!",
 "Eater of Millions", "Gizmek Orochi, the Serpentron Sky Slasher",
 "Schwarzschild Limit Dragon", "Alpha, the Master of Beasts",
 "Zoodiac Thoroughblade", "Zoodiac Whiptail", "Dogoran, the Mad Flame Kaiju",
 "Fairy Tail - Luna", "Gadarla, the Mystery Dust Kaiju", "Sauge de Fleur",
 "Gameciel, the Sea Turtle Kaiju", "Dinowrestler Pankratops", "Dimension Shifter",
 "Artifact Lancea", "Nibiru, the Primal Being", "Inspector Boarder", "Denko Sekka", "Dogmatika Fleurdelis, the Knighted"]
```

The function will then pull up the subset from the “all monsters” dataframe and apply the functions from there.

# HOW MANY COMBINATIONS CAN MY DECK HAVE?

```
legal_sw_play = find_legal_sw_play(decklist)
```

Output:

There are 1266 legal Small World plays with this decklist.

Of course, we will not use all of them in all games, but it is good to know that we have many combinations. This is especially because our deck has diverse Type/Attribute/Level. If the deck is monotype/attribute then the combination will not be as many as this.

## FIRST 5 ROWS OF THE RESULTS:

|   | Reveal from hand            | Show from deck       | Add to hand                        |
|---|-----------------------------|----------------------|------------------------------------|
| 0 | Alpha, the Master of Beasts | Danger! Thunderbird! | Alpha, the Master of Beasts        |
| 1 | Alpha, the Master of Beasts | Danger! Thunderbird! | Dimension Shifter                  |
| 2 | Alpha, the Master of Beasts | Danger! Thunderbird! | Dogmatika Fleurdelis, the Knighted |
| 3 | Alpha, the Master of Beasts | Danger! Thunderbird! | Dogoran, the Mad Flame Kaiju       |
| 4 | Alpha, the Master of Beasts | Danger! Thunderbird! | Eater of Millions                  |

Fun fact, Alpha can be used to add another copy of itself (I would not recommend this in most scenarios though as you go -1 for no reason).

This code revealed some possible plays that we wouldn't normally do.

For example, if you have Dimension Shifter in hand, you can reverse the second entry to do Dimension Shifter -> Danger! Thunderbird! -> Alpha, the Master of Beasts.



CHECK:



Same level only



Same Attribute only





## SUMMARY

This piece of work can be useful to discover some hidden insights in Yu-Gi-Oh! Trading Card Game, making playtesting more efficient than having to draw out every single possible play manually.

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# THANK YOU

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