Hanabi II @ Splash 2023

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1 Rules

A quick rundown of the rules:

- The aim of the game is for cards to be played in numerical order, with a maximum of 25 cards that can be played correctly.

- We start with 8 hints which are used to clue cards of color or number. Hints are gained from discarding or correctly playing a 5 card.

- There are 3 strikes, the third mistake ends the game.

- When the last card is drawn, one more round of cards is played, and the game ends.

The result is the following:

- In a 3 player game, 12 cards are not played. Assuming all 25 cards are played, only 13 cards can be discarded.

- With the 5 fives (the last clue cannot be used), there are a total of 8+13+(5-1)=25 clues.

The implication? Hanabi is a difficult game! Without agreed upon conventions, it is difficult to get more than 20 points, and 25 points may seem like a stretch away. This is why conventions are useful.
Source: https://hanabi.github.io/docs/beginner/. Here we introduce some ideas they provide, but the convention we give here is not exactly compatible with the source.

2 Principles

2.1 Good Touch Principle

When a card is given a clue of color or number, we say that card is **touched**.
Clues are precious and the team can easily run out of clues. To make clues less ambiguous, we aim to only touch **playable cards**.
Playable cards should, optimally, be the 25 cards required to finish all 5 colors. If a card is already hinted or is played, if it reappears in another hand that should not be hinted.

Example 1 *R1 B1 is played. How would you hint a hand* **Y4 B2 B1 W3 W4** *to play card B2? Number hint 2. Color hint B touches B1 which is not playable.*

This is a very general principle, and implications include the following:

- If a card you want to hint could be a hinted card you have, let someone who can see both hands hint it instead.

- If a person is holding 2 copies of a card, let them discard a copy before hinting the remaining card.

Hence, the cards to be discarded will not be hinted; they have to be automatically discarded without hints. To discard safely, we want some **convention to discard cards**. The convention to decide which card will be discarded next is via determining the **chop position**.

2.2 Chop position

Intuitively, if we want to discard a card, we would want to discard older cards as compared to recently drawn cards. We suggest to standardize it by only **adding cards to the right**. Then the left-most card is the oldest card.

Now, clued cards will eventually be playable so they should not be discarded. Hence, the chop position becomes the **left-most untouched card.**

Example 2 *Cards are **G4 B5 R1 Y3 Y4**, R1 is hinted as R. What is on chop (position)?*
Answer: The Y4 card on the fifth position.

Example 3 *Cards are **R3 R5 B4 W2 Y2**, W2 and Y2 are hinted as 2s. What is on chop (position)?*
Answer: The B4 card on the third position.

Given that we can see other hands and can determine their chop position, we can see the card they could discard next. If discarding that card could be disastrous, **we need a convention to save it**.

2.3 Save Principle

Some cards are important and must be prevented from being discarded. If they have no cards to play and no hints to give, they may reasonably discard their chop, and it is up to teammates to stop this from happening.

Obvious important cards are cards which **only have one remaining copy available**. In particular, this also includes **5 cards**.

We also agree with H-group that **2 cards** are also important; if the second 2 card is the last card of the deck, it is near impossible to finish the game. To prevent that, the first 2 of each color that appears should be played and not discarded.

2.4 Efficient Clue Principle

Due to the number of hints being limited, we must strive to give as much information as possible with each clue. However, ambiguity with Good Touch Principle should not be introduced at the cost of efficiency.

In general, to make a clue more efficient, it is best to pick the clue which **touches the most cards**. Being efficient with clues also leads to more conventions which lead to more cards being played for less hints.

However, all things being equal, it is generally better to **hint the color** of a card instead of its number. Numbers are easier to infer from plays/context than colors, so a color hint is, in general, a better hint.

3 Trust

In this section we suggest possible moves to consider and reasons to use them. When playing, do agree with your friends on which conventions are being played before starting.

3.1 Play Clues

Direct play clue: Hinting someone to play a card on their next turn. [Universal]
Delayed play clues: Hinting cards that the players' current combined cards could manage to play. I.e. Hinting a Y4 when a Y1 is on the stack and there is a Y2/Y3 in others' hands. [H-group]

3.2 Save Clues

5-save: Hinting 5 on the chop card to save it. [Universal]
Crucial card save: Hinting the card on the chop if/when it is the last remaining available copy of that card. [Universal]
2-save: Hinting 2 on the chop card to save it. [Universal]

3.3 Focus

What is Focus? We agreed that we would prefer to give hints that clue multiple cards as it gives information about several cards at once. However, we also want it to be clear which card is of importance (and which is extra information.)
Right-most: The focus card is the right-most card that is not hinted yet. This is easier to keep track of, but it makes it difficult to play the chop card.
Chop focus: If the chop card (which must be unhinted) is hinted, then it refers to this card. Otherwise it refers to the right-most card that is not hinted yet. [H-group]

3.4 2-for-1

Here you can insert your favorite conventions and ideas to make clues more useful when the opportunity strikes.
Prompt/Finesse: When Player 1 hints Player 3 about a card which suggests Player 3 should play, but that card is not actually playable, Player 1 must be indicating to Player 2 as well that they have useful cards.

Example 4 *If there is a B1 on the stacks and there is no hinted B2. However, player 1 hints player 3 of a B3 on their hand. It is hinted that it is blue.*
*In this situation, Player 3 will think that the blue card could be the B2, and would proceed to play it. However, Player 2 should **never assume Player 1 made a mistake**, and must think that they may have the B2 instead.*

Now, which card Player 2 has to play depends on circumstances. In general, unless there is some reason to doubt it, the consideration for which card to play is

1. A card that is known to be the required card (although you wouldn't need the new hint to play it)

2. A card that is hinted once i.e. color or number, and is still possible to be the required card. This is a **prompt.**

3. If cards are hinted at match the missing card, play the **right-most unhinted card.** This is a **finesse.**

For convention, we choose blind-play cards to be placed on the right, while chop cards are placed on the left.

This convention is generally accepted and is very useful, because we get to play multiple cards with one hint. One can also finesse multiple people in one move, say in a 4-player game.

Bluff: One of our favorite techniques of the game is to abuse the Finesse idea given above. In Hanabi, it matters not knowing which pile to play to, but rather whether a card is playable or not suffices. Could I hint to make someone play *thinking that they had another card*? Yes!

Example 5 *Similar to the previous exercise, Player 2 plays their right-most card thinking that it is a finesse and that would be the B2. However what is played is the W1, the last required 1 card in the game.*
Now, Player 3 must be alert and figure out that their card cannot be B2 and they should not play. The reason is that if the card were B2, there would be no reason for Player 2 to suddenly blind-play a card. Hence, it is rather safe to assume that card is a B3.

3.5 Funnies

The space of possible conventions are nearly endless and feel free to try creating some of your own! Here are some game mechanics and ideas to experiment with.

- Finessing random people on the table, including the hinted person themselves!

- The position of the hint?

- Sudden discards to indicate a warning

- Bombs???

In class, we will also go through an example game. We hope you will have fun playing Hanabi as much as we do!