PROHIS: Project Explanation

In the development of our game, we have used the FreeCBR library, which provides us a ready-to-go API to work with case based reasoning (CBE).

All of our intelligent agents have 3 different phases very different from each other. The first phase is the draw algorithm, where we implemented a **risk-based** decision case, with higher risk meaning that the player will play more aggressively (draw illegal goods if he can, or random if not available), or more conservative (draw legal goods if he can, or random if not available).

Each player has an **internal risk**, calculated from the "observed" benefits of other players (number of cards that each player has on his warehouse * median card value). This **risk** will be higher when the player has less benefits than his counterparts (he is losing), and lower when he is winning, reaching zero when the agent is winning every other agent in the game.

The second phase is making a cargo. This phase is done via the FreeCBR API, designed to work with cases. Each cargo case has information about different game values (some of them are private, such as player risk, and some are public such as "Is an inspector still in the game?").

Based on this information, we try to find the best case that has to comply with some restrictions:

- The case must be a "match" with an exact hit on all the constraints that make the game playable (so we do not consider a case that orders us to do a cargo with 3 legal goods cards if we have only 2 of them).

- The case must have a win ratio higher than 50%, since we want to maximize our winnings, and playing random has an experimental win ratio of 50%.

From all the cases that complain with these constraints, we select the one with the highest win ratio.

Every time we make a cargo (be it from a case, or randomly generated) a case is created/updated accordingly with win/lost values.

The third and last phase consists of the inspection of a cargo. More like the cargo phase, we use case based reasoning, but with different values for cases. Cases must also complain with some restrictions to be considered viable (not inspecting 3 cards with a card that has inspection power of 2 for example).

If a case is not selected, we randomly create one, and once we know the outcome (win/lose) we update it accordingly.

PARAMETERS

Cargo Case

Lieutenant_proc	Probability of a lieutenant being on the game.
Inspector_flag	If there are still inspectors in game.
Captain_flag	If there are still inspectors in game.
Risk_rate	Risk rate of the player searching.
Legal cards	Number of legal cards in hand.
Illegal cards	Number of illegal cards in hand.
Inspector cards	Number of inspector cards in hand.
Lieutenant cards	Number of lieutenant cards in hand.
Captain cards	Number of captain card in hand.
Won rounds	Number of won rounds using this case.
Lost rounds	Number of lost rounds using this case.
Cargo value	Cargo to make when using this case.

Inspector case

Risk ratio	Risk ratio for the player using this case.
Illegal proc	Proc of selecting a card, it is illegal.
Legal proc	Proc of selecting a card, it is legal.
Inspected player	Internal identifier of the player being inspected.
Inspect power	Quantity of cards that we can inspect.
Cargo size	Number of cards of the cargo being inspected.
Won rounds	Won rounds using this case.
Lost rounds	Lost rounds using this case.
Action	Indexes of the cargo that the player should inspect using this case.