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*Love letter*

An Implementation using Artificial Intelligence

Love Letter – AI Implementation

**Literature Review**

Introduction

Love Letter is a game of risk, deduction, and luck for 2-4 players. The goal is to get your love letter into the Princess’s hands while deflecting the letters from competing suitors. From a deck of only **16 cards,** each player starts with a state of only one card in the hand. On each turn, you are supposed to draw one card and then remove/play one card, using the effects of that card played. Each card has different effects and values when played and will affect the other opponents depending on each card played. The goal is to expose others and knock them out of the game by knowing their cards in hand and playing moves accordingly.

Love letter is a card came with **incomplete information**. Each player is able to view their own hand, but not others (but there are some exceptions further mentioned). In order for a player (or agent) to win a game, the player needs to know or guess the hidden cards of the other opponents first. Once an idea is created as to what an opponent may have, a game state is created so that the player can try and win the game, by knocking out the players with known/guessed cards. This paper discusses some of the strategies that you can apply to deal with the limitations of incomplete information.

Ways to figure out what players may have, would be to play cards (such as the guard or priest etc) and figure out what the players do and don’t have. Also, as there are only 16 cards in a deck, a realistic probability of how many of each specific card that each player may have can be calculated.

If the agent has complete access to view all the opponent’s cards, then there would need to be less moves played to reach a desired goal. However, with incomplete information about the game state and opponents’ cards, there is some uncertainty applied and there could be many possible game worlds.

* At the start of the game, everything is based on luck, because there is no knowledge of other players cards and their values. There are too many different game scenarios to be played extrapolating from the start.

However, we can assume that at least 1 player has a high value card, as we start from a 16-card deck.

* As more cards are played, some data can be recorded as to what cards each member may have. For example, In each turn, as players show their cards, become immune to some plays, or holds onto cards for a long period of time (such as high value cards which shouldn’t be used, like the Princess) then more of an idea of the game states and cards held can be formed. Every turn that is played, it could give one or two new pieces of information for the agent.

Humans are able to alter their perception of their hand and note which cards are seemingly worthless or have high value, based on the behaviour of others. An agent does not necessarily have this sense.

**Rule Based Approach**

**Mini-Max Determinisation**

**Monte-Carlo Tree Search (MCTS – Incomplete Information)**