Emotionally Affected Poker Players

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In the course of a four-month project, our group of nine students has developed an enhancement of a poker game (PokerTH, an open source Texas Holdem implementation at `http://www.pokerth.net`), which, in contrast to commonly known programs, puts emphasis on modeling human-like opponents (cf. fig. 1).

Common *non-player characters* (NPC) in poker or other strategy games focus on just winning the game or maximizing their profit. In the case of poker this would lead to moves being mostly based on statistical analysis of card-values due to incomplete knowledge concerning the opponent's cards. This often entails relatively predictable actions and strategies which do not really take any risk into consideration (such as bluffing). This makes the NPC look quite artificial and static.

Fig. 1: Poker TH screenshot with chatting NPCs and emoticons indicating the players emotional state.

Human-like players shall not be confronted with such opponents, as playing against these does not provide a lot of fun. Our newly designed NPCs show emotions and strategical flaws similar to humans. For instance, the human ability of calculating the value of hands in terms of probability, is usually inferior compared to computer players. The model used in this project contains properties like the ability to communicate, the ability to memorize moves, and basic character traits such as honesty. Also emotions like anger/hatred, self-confidence, sadness/euphoria are simulated during the game. The emotional state of NPCs changes and so does their strategy (e.g. the willingness to take risks).

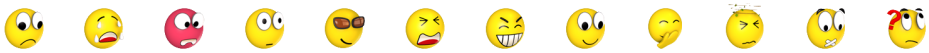

Fig. 2: A selection of emoticons to depict emotions.

Within the game, the emotions are expressed in three manners, either by communicative means or directly affecting the actions players choose:

1. A player's current emotional state is represented by an emoticon depending on his honesty (recognizing his real emotional state as well as the ability to hide it, see fig. 2).
2. By printing text messages each player can send emotion-laden messages to the whole table as well as to individual players. (e.g. "I can't be bothered anymore")
3. The emotional state also influences playing habits directly. For example, an NPC is more likely to raise if he possesses a high level of aggression and/or self-confidence.

The simulated emotions are one of three factors which influence the player's behaviour. The other two being the current situation of the game (own money, current bet, own hand, etc.) and the presumed character traits of the opponents.

The NPC is based on several well known CI-techniques. A feedforward neural network is used to map the current game situation as described before onto the ingame-behaviour. Its architecture is based on 47 input neurons, 47 hidden neurons and three output neurons. In order to reduce the number of output neurons and the complexity of the network, we categorized similar behaviour. One output neuron represents active behaviour (bet, raise and all-in), another passive behaviour (call and check) and the third the option "fold the cards".

In total, we had to adjust 2350 net weights for optimizing our players. In our approach we do not use a classic backpropagation algorithm but an evolutionary algorithm with neural nets as individuals in order to establish a learning system. By using our algorithm in an offline-learning process, we were able to improve our net and evaluate the quality using cross-validation. The testdata for creating one CI-player includes 500 to 1000 gamesituations consisting of 47 floating values, describing the game situation and the desired behavior. For the purpose of mining the needed testdata human players where observed while playing poker and their behavior in the different game situations was written into a history log which could be easily converted into a test data file. Our CI-players thus "imitate" their human counterparts.

During a survey at the university, interviewed students evaluated our approach. The result of the survey indicates that our game was able to provide more different characters with plausible playing-styles than seen in other comparable approaches and the introduced emoticons also advance the gameplay experience.