



## Effect of emotion and personality types in human agent automated negotiations

### What is an Automated Negotiation

- Automated Negotiation is a form of interaction in systems that have a single or multiple autonomous agents, which have an aim in reaching the agreements via making offers.
- These can be employed for many tasks human negotiators regularly engage in, such as bargaining and joint decision making.

### Human Negotiators Personality Types

- In the business world, people bring different negotiation styles and strategies to the bargaining table, based on different personalities, experiences and beliefs about the negotiation.
- On knowing more about the opponent parties, negotiation styles can have a significant impact on the way we plan our negotiation.
- Drawing on social motives that drive human behaviour, we have the four standard human negotiation personality types which are Individualist, Cooperator, Competitor and Altruist upon which we model our opponent type.

### Effect of emotion on Human Agent Automated Negotiation

- Human emotion plays a very crucial role in decision making.
- There are many studies in social psychology and economics which show that emotions play an important role in negotiation.
- For example, when they are negotiating with a human opponent, they will be willing to make more concessions to a person who is happy compared to when the human opponent is angry.

### POMDP Model

POMDP can be defined by the tuple  $\{S, A, \Omega, O, R\}$ , where

- $S$  is a finite set of states;
- $A$  is a finite set of actions;
- $T(s, a, s')$  captures the probability of transitioning from state  $s$  to  $s'$  when taking action  $a$ ;
- $\Omega$  is a finite set of observations;
- $O(s', a, o)$  is the probability of observing  $o$  when taking action  $a$  leads the agent to state  $s'$  and
- $R(s, a)$  represents the reward function, i.e., the reward obtained by taking action  $a$ , at state  $s$ .

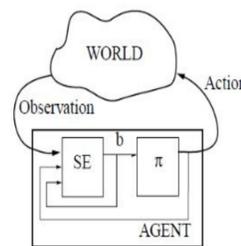


Fig. 2. Working of a POMDP

### Approach

- In this work, we use a Partially Observable Markov Decision Process (POMDP) based modeling of the opponent personality types when there is an involvement of human emotional factor in an Automated Negotiation.
- We use the four standard negotiation personality types which are Individualist, Cooperator, Competitor, and Altruist.
- Our focus is on showcasing how a change in the emotion of the computational agent brings the differences in the personality types individually.

### Initial Results

We compare the effect of positive(happiness) and negative(anger) emotion in the 4 personality types. Based on the initial testing with an initial dataset:

- Individualist could be distinguished from the remaining 3 personality types with a minimum accuracy of 65% in all tests and a minimum of 60% in all tests when the agent is angry.
- Altruist had a minimum accuracy of 70% in all tests and a minimum of 75% in all tests when the agent is angry.
- Competitor had a minimum accuracy of 60% in all tests and a minimum of 50% in all tests when the agent is angry.
- Cooperator had a minimum accuracy of 70% in all tests and a minimum of 55% in all tests when the agent is angry.