Consider the following process:

In order to resolve an exception, several participants should collaborate and exchanging the result of such collaboration.

Consider the following process:

- \( E_1 \): payment not completed (pay)
- \( E_2 \): late delivery (deliver)
- \( E_2 \): wrong order (order)

Consider the commitments for the process:
- \( cc(\text{bookstore, customer, paid(book), delivered(book)}) \)
- \( cc(\text{deliverer, bookstore, paiddelivery(book), delivered(book)}) \)

Assume \( E_1 \) is the case:
- customer pays for the book,
- first commitment is detached; customer starts waiting for delivery,
- after a while, customer notices that delivery is late,
- customer thinks there is a problem with bookstore,
- however, customer realizes that payment is not completed successfully.

Dialogue provide information exchange, e.g., for diagnostic activities.

Request explanation dialogues correspond to delegation of diagnosis from one agent to another.

Three types of utterances:
- \( \text{explain}(\mathcal{A}_1, \mathcal{A}_2, \mathcal{P}) \): agent \( \mathcal{A}_1 \) sends a diagnosis request to \( \mathcal{A}_2 \) asking for a justification for a given property \( \mathcal{P} \).
- \( \text{justify}(\mathcal{A}_1, \mathcal{A}_2, \mathcal{Q}, \mathcal{P}) \): agent \( \mathcal{A}_1 \) provides agent \( \mathcal{A}_2 \) with a justification \( \mathcal{Q} \) to why \( \mathcal{P} \) holds.
- \( \text{rebut}(\mathcal{A}_1, \mathcal{A}_2, \mathcal{Q}, \mathcal{P}) \): agent \( \mathcal{A}_1 \) provides agent \( \mathcal{A}_2 \) with a justification \( \mathcal{Q} \) to why \( \mathcal{P} \) does not hold.

Sample request explanation dialogue, e.g., customer thinks \( E_3 \):

- \( c \rightarrow b \): explain(\text{customer,bookstore,~delivered(book)})
- \( b \rightarrow d \): explain(\text{bookstore,deliverer,~delivered(book)})
  - \( d \rightarrow E_d \): question(deliverer, \neg \text{delivered(book)})
  - \( E_d \rightarrow d \): answer(\text{deliverer,delivered(book)})
- \( d \rightarrow b \): rebut(deliverer,bookstore,answer(\text{...}),delivered(book))
- \( b \rightarrow c \): rebut(\text{bookstore, customer,answer(\text{...}),delivered(book)})

Collaborative Diagnosis of Exceptions to Contracts

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Introduction

- Exceptions constitute a great deal of autonomous process execution.
- In order to resolve an exception, several participants should collaborate and exchange knowledge.
- Argumentation technologies lend themselves very well to be used in this context, both for elaborating on possible causes of exceptions, exchanging the result of such elaboration.

Consider the following process:

- \( cc(\text{bookstore, customer, paid(book), delivered(book)}) \)
- \( cc(\text{deliverer, bookstore, paiddelivery(book), delivered(book)}) \)

Assume \( E_1 \) is the case:
- customer pays for the book,
- first commitment is detached; customer starts waiting for delivery,
- after a while, customer notices that delivery is late,
- customer thinks there is a problem with bookstore,
- however, customer realizes that payment is not completed successfully.

Reasoning

- An ABA framework is a tuple \( (\mathcal{L}, \mathcal{R}, \mathcal{A}, \rightarrow) \), where
  - \( (\mathcal{L}, \mathcal{R}) \) is a deductive system, with \( \mathcal{L} \) a language and \( \mathcal{R} \) a set of inference rules,
  - \( \mathcal{A} \subseteq \mathcal{L} \), referred to as the set of assumptions,
  - \( 
      \rightarrow \quad \text{is a (total) mapping from \( \mathcal{A} \) into \( \mathcal{L} \), where \( x \) is referred to as the contrary of \( x \).}
  
- Two types of rules:
  - Domain-specific facts/rules
    - DR1: \( by\_contract(cc(\text{bookstore,customer,paid(book),delivered(book)})) \)
    - DR2: \( effect(pay(\text{customer,bookstore,book}), \neg \text{paid(book)}) \)
    - DR3: \( justification(\neg \text{paiddelivery(book),} \neg \text{delivered(book)}) \rightarrow \neg \text{paiddelivery(book),} \neg \text{delivered(book).} \)
  - General-purpose rules
    - BR1: \( P \leftarrow \neg \text{believeP, asm(P)} \)
    - BR2: \( \neg P \leftarrow \neg \text{answer(Ex, X, P)} \)
    - CR1: \( by\_contract(c(X, Y, P)) \rightarrow \text{by}\_contract(cc(X, Y, Q, P)) \), \( Q \) \( \neg \text{by}\_contract(cc(X, Y, Q, P)) \)
    - CR2: \( \text{by}\_contract(cc(X, Y, P)) \rightarrow \text{by}\_contract(cc(X, Y, Q, P)) \), \( \neg P \) \( \neg \text{by}\_contract(cc(X, Y, Q, P)) \)
    - CR3: \( \neg \text{by}\_contract(cc(X, Y, Q, P)) \rightarrow \text{by}\_contract(cc(X, Y, Q, P)) \), \( \neg Q \)
    - AR1: \( \text{by}\_contract(cc(X, Y, Q, P)) \rightarrow \text{by}\_contract(cc(X, Y, Q, P)) \), \( \neg P \) \( \neg \text{by}\_contract(cc(X, Y, Q, P)) \)

Case Study

Consider the trace of diagnosis for \( E_1 \):

- initial ABA framework \( \mathcal{F} \) with only contracts (DR$_1$)
- customer pays: executed(pay(\text{customer,bookstore,book}))
- paid(book) (DR$_2$) and by_contract(bookstore, customer, delivered(book)) (CR$_1$) now supported
- customer realizes no delivery: \( \neg \text{delivered(book)} \)
- violated(c(bookstore, customer, delivered(book))) (CR$_2$) now supported
- customer reasons: question(customer, \neg \text{paid(book)}) (AR$_1$) now supported
- customer receives response: answer(customer, \neg \text{paid(book)})
- \( \neg \text{paid(book)} \) (BR$_2$) now supported
- by_contract(bookstore, delivered(book)) (CR$_3$) not supported
- customer removes the violation

Conclusions

- Handled commitment exceptions by integrating the diagnosis process with agent reasoning
- Expressed knowledge and reasoning in a declarative and modular way, and studied properties
- Future work: address time using temporal reasoning capabilities of the KGP agent model [Kakas et al., ECAI 2004]

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