

# Rationalization of Goal Models in GRL using Formal Argumentation

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1. Running Example
2. A Framework for Goal-Based Argumentation
3. The Metamodel
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## Running Example: Best Furniture Inc

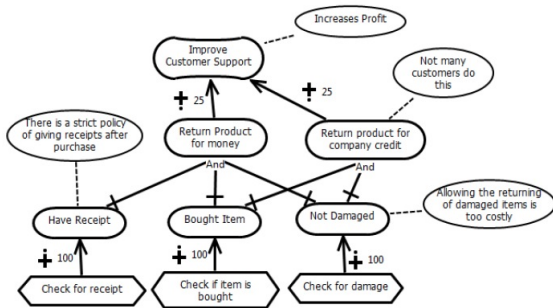
Goal: improve customer support, by allowing users to return products

1. The product is bought from company “Best Furniture Inc.”.
2. The customer has a receipt for the product.
3. The product is not damaged.

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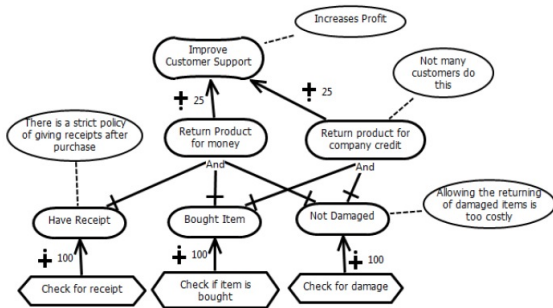
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- ▶ Arguments are not captured.
- ▶ Evidence for elements are not captured.

# Objective, method and contributions

## Objective:

- ▶ Develop a formalism to rationalize goal models based on arguments and evidence.

## Method:

- ▶ Apply an existing formal framework for practical reasoning with arguments and evidence to the Goal-oriented Requirements Language.

## Contributions:

- ▶ An algorithm to automatically compute the acceptability status of elements in a GRL model, based on the acceptability status of their underlying arguments and the evidence, which is computed using attack relations between arguments.

# A Framework for Goal-based Argumentation with Evidence

**Practical reasoning:** Reasoning about which goals to pursue and actions to take.

- ▶ Studied extensively in formal argumentation [3]:  
I have goal  $G$   
Doing action  $A$  will realize goal  $G$   
*Therefore* I should do action  $A$
- ▶ Can be further extended to capture subgoals (i.e. subgoal  $G_1, \dots, G_n$  will realize goal  $G$ )
- ▶ Our assumption: The dynamic discussions about goals and tasks in GRL can be captured using practical argumentation.
- ▶ We choose the  $ASPIC+$  framework for structured argumentation [15].

# The ASPIC+ framework

## Argumentation theory: $(L, K, R)$ :

- ▶  $L$ : Logical language with modalities for goals, beliefs, actions, and evidence.
- ▶  $K$ : premises for arguments
- ▶  $R$ : Inference rules to construct arguments
- ▶ An argument  $A$  is a tree built from  $K$  and  $R$
- ▶ Root of the tree: argument conclusion
- ▶ Subtree: subarguments



## The ASPIC+ framework

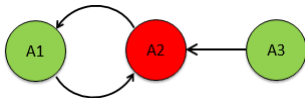
Acceptability of arguments (Dung semantics [7]):

- ▶ Arguments that are unattacked are **IN**
- ▶ Arguments that are attacked by an argument that is **IN** are **OUT**
- ▶ Arguments that are only attacked by arguments that are **OUT** are **IN**
- ▶ Otherwise, an argument is **UNDECIDED**

## The ASPIC+ framework

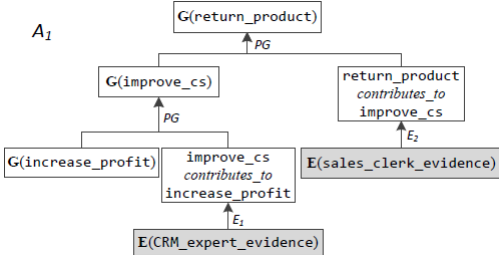
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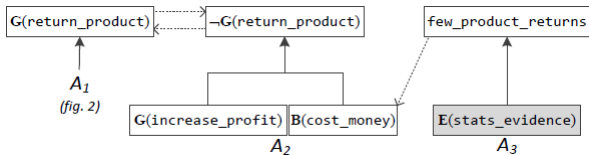
# Best Furniture Inc. Example 1:

Argument for returning a product:

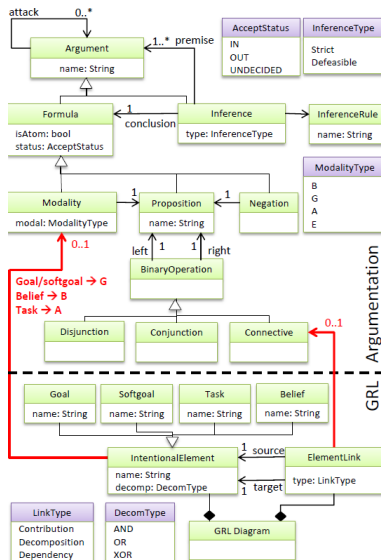


## Best Furniture Inc. Example 2:

Attacks between arguments:



# The Metamodel



# Research Agenda

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- ▶ **Extension:** Capturing specific argumentation patterns and critical questions for evidence-based requirements engineering.
- ▶ **Implementation:** URN has an open source Java implementation called jUMCNav. Argumentation frameworks have been implemented as well. We aim to combine them.
- ▶ **Evaluation:** Test the benefits of using argumentation compared to other formalisms.
- ▶ **Rationalization of Use Case Maps:** URN combines goal modeling with developing use cases. We have omitted the latter but aim to include it in future work as well.

# Conclusion

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- ▶ We propose a framework for traceability of GRL elements to arguments and evidence put forward by stakeholders.
- ▶ We extend the *ASPIC+* framework for formal argumentation to support goals, actions, and beliefs.
- ▶ We integrate this with GRL using a metamodel.
- ▶ We set out a research agenda for future work.